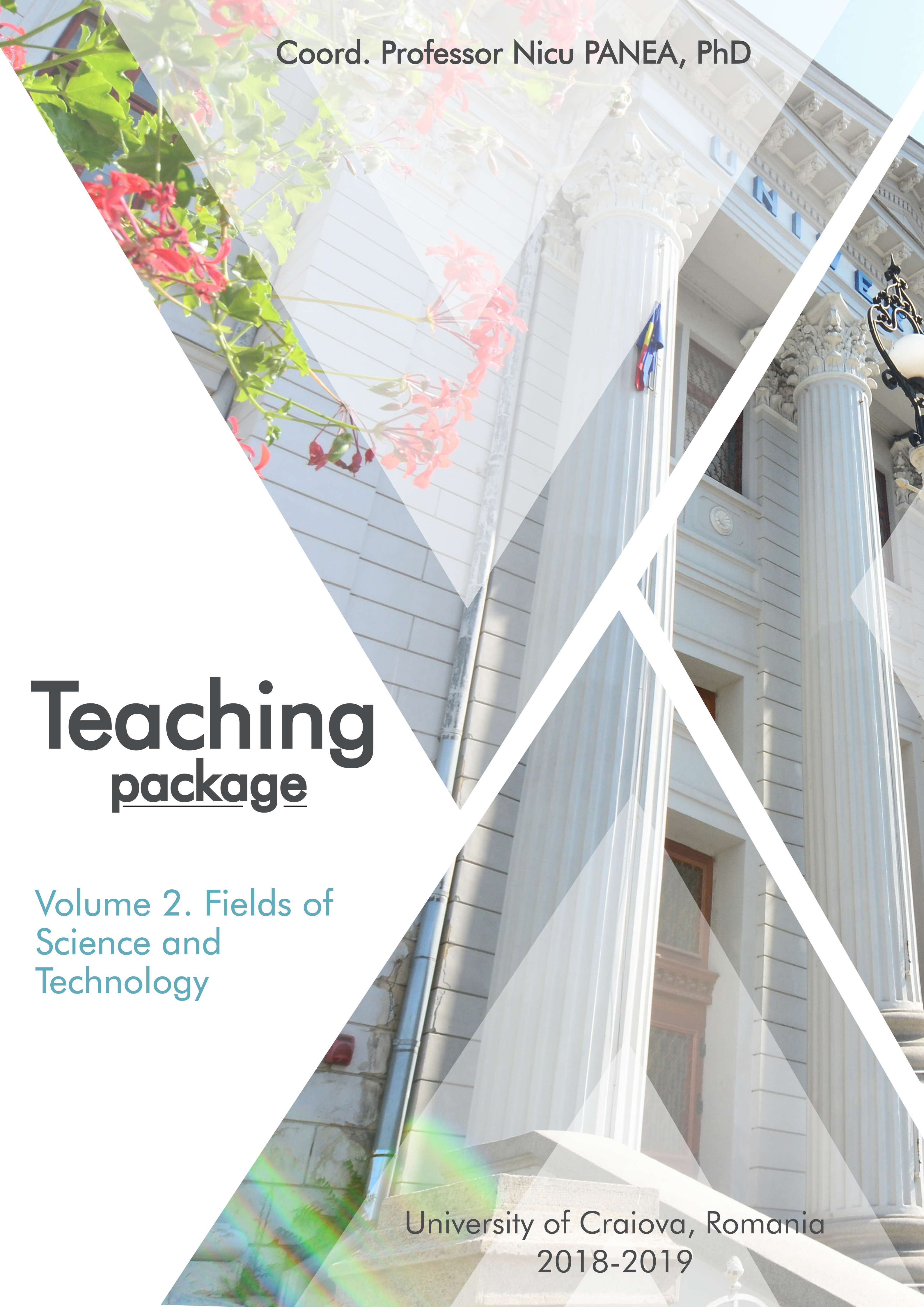

Coord. Professor Nicu PANEA, PhD

Teaching package

Volume 2. Fields of Science and Technology

University of Craiova, Romania
2018-2019

Contents

Faculty of Agronomy

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Faculty of Agronomy

Bachelor's Degree

Duration: 4 years
No. of credit points: 240

Field: *Agronomy*
Programme title:
Agriculture – full-time programme
Agriculture – part-time programme
Montanology

Field: *Geodetic Engineering*
Programme title: Land Measurements and Cadastral Survey

Field: *Forestry*
Programme title: Forestry

Field: *Food Products Engineering*
Programme title: Control Practices and Expert Report on Food Products

Master's Degree

Duration: 2 years
No. of credit points: 120

Field: Agronomy
Programme title:
Consulting Services and Management in Agriculture
Management in Agro-tourism and the Quality of Agro-alimentary Products
Environmental Conservation in Agriculture

FIELD: AGRONOMY
PROGRAMME TITLE: CONTROL PRACTICES AND EXPERT REPORT ON FOOD PRODUCTS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS I

CODE: D32CEPAL101
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Determination of lengths, areas and volumes of geometric objects; Solving specific problems of linear programming, such as crop distribution, setting feed rationfor animal feed and working technology, based on matrix computing techniques. Knowledge of the Fundamental concepts of probability theory, probabilistic computation rules, the main probability schemes, the notion of random variable.Knowledge of the main classical distribution laws.Statistical analysis of the phenomenon.Graphical representation of a statistical series.The distribution of statistical data and graphical representation, the synthesis of data with an indicator representing them, the determination of statistical indicators of populations and samples (for example, indi-cators of the variations and moments).
COURSE CONTENTS: Measurement of lengths, areas and volumes; Linear programming; The calculus of probabilities; Elements of mathematical statistics;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answers to works and homework 30%).

COURSE TITLE: APPLIED INFORMATICS

CODE: D32CEPAL102
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Acquiring the knowledge and skills necessary to use the computer as a working tool;Creating skills in using program packages dedicated to specific tasks: word processing, tables, charts, databases; Ability to solve problems specific to the specialization by using dedicated IT packages; Creating computer models for solving horticultural problems
COURSE CONTENTS: Windows operating systems - overviewMicrosoft WORD:Create/save/open /close file; Page Setup: page margins, page sizes, page orientation header and footer options View Print Preview; Move/copy/paste; Select text; Search and replace, move to document; View Document; Header and footer preview - header and footer creation, ruler, toolbars;Insert to file: page numbers; Page breaks/section breaks; Footnotes; Insert and edit a drawing, diagram, object, text box;Text formatting - specifying all formatting attributes;Create lists numbered/ with bullets/hierarchies; Application borders and shadows; Formatting text in columns, specifying TAB positions and leader characters; Insert table, work with tables.Creating drawings: Drawing toolbar; Inserting equations in the document.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (anwers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: PHYSICS

CODE: D32CEPAL103
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing notions, concepts, laws and principles of physics with implications specific phenomena that determine the structure of environment, living organism and particularly for the safety of food; Knowledge of physical methods for monitoring and physical techniques of investigation and exploration of the environment, living matter and food; Gaining knowledge about physical activities in environmental and food technology assessment.
COURSE CONTENTS: Matter structure and their organization; Elements of spectroscopy; Interaction of radiation with matter; Molecular biophysics; Contact phenomena between liquid and solid; Molecular transport phenomena; Diffusion and osmosis; Introduction in biological thermodynamics; Radiant energy, characteristics of thermal energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, periodic answers to practical work 20%, results to periodic control works 10%).

COURSE TITLE: SPECIAL MICROBIOLOGY

CODE: D32CEPAL104
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Ability to understand the morphological and structural characteristics of microorganisms; Understanding and fixing the basics of microbiological sciences applications, presenting a brief classification scheme of major groups of microorganisms. Deepening the students a systematic bacterial constantly updated, using for this purpose the latest information in the field, including gender or species of interest in the industry that could affect the public health, but allowing students a quick orientation and correct the identification of microbial species, in the diagnosis, and prevention, healing or to combat pathogens macro.
COURSE CONTENTS: Objective and methods of investigation; Knowledge of the main groups of microorganisms and interrelationships with environmental implications; Knowledge of the circuits contribution biological organisms in nature, the various elements of the organic substances and their.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: CHEMESTRY I (INORGANIC AND ANALYTICAL)

CODE: D32CEPAL105
ECTS CREDITS: 4
TYPE OF COURSE: Main subject
COURSE OBJECTIVE(S): Familiarity with the concepts related to atomic structure and classification; Understanding the electronic configuration of the elements, their respective valence. Acquiring knowledge needed to understand the types of chemical bonds;
COURSE CONTENTS: Atoms; Atomic Structure; Clasificasion of elements; Molecules; Chemical bonds; Chemical thermodynamics; Chemical balances; Solutions; The ionic balance; Colloidal state of matter; Oxidation and reduction.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, answers at practical course during semester 30%).

COURSE TITLE: CHEMESTRY II (COLLIODAL PHYSIC AND CHEMISTRY)

CODE: D32CEPAL106
ECTS CREDITS: 4
TYPE OF COURSE: Main subject
COURSE OBJECTIVE(S): The course objective is the familiarization of students with basic notinunile colloid chemistry and chemical thermodynamics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, 15% continuous evaluation and 15% report/project).

COURSE TITLE: ENGLISH LANGUAGE

CODE: D32CEPAL107
ECTS CREDITS: 2
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English, using a reference material especially designed for students of the Faculty of Agriculture, but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think.Consolidation of skills to dialogue, describe and report. Emphasizing the practical nature of learning, the course is meant to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Focus on language: Present Tense Simple/ Continuous, Vocabulary: Agriculture is the branch of agriculture that deals with the art, science, technology, and business of growing plants. It also is the study of plants. It includes the cultivation of medicinal plants, fruits, vegetables, nuts, seeds, herbs, sprouts, mushrooms, algae, flowers, seaweeds and non-food crops such as grass and ornamental trees and plants.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: FRENCH LANGUAGE

CODE: D32CEPAL107
ECTS CREDITS: 2
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French, using a reference material especially designed for students of the Faculty of Agriculture, Agriculture Specialization, but also for those who want to learn vocabulary in context. Practice of important Agriculture vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Focus on language, Vocabulary: Landscape.Scale and heterogeneity (incorporating composition, structure, and function). Patch and mosaic. Boundary and edge. Ecotones, ecoclines, and ecotopes. Disturbance and fragmentation. Theory. Application. Research directions.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: PHYSICAL EDUCATION

CODE: D32CEPAL108
ECTS CREDITS: 1
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Discipline aims at forming

the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Gymnastics Aerobics/Fitness; Application trails combined with treadmills; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports game: football; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester

COURSE TITLE: PSYCHOLOGY OF HUMAN FOOD
CODE: D32CEPAL109
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Obtaining complex knowledge, stimulate thinking integrative and synthetic capacity of the students to integrate knowledge and theoretical knowledge transfer in the field of theory in practice. Knowledge of the factors and conditions that influenţeazăconsumul and food preferences of consumers.
COURSE CONTENTS: Upon completion of the subject the student (a) will be able (a): identify factors principles related food preferences of consumers, factors auun role hotator in generating food policies; to participate in discussions on key issues related to human nutrition; to can interpret the results of market studies and; can make recomdari privindtendintele market and consumer preferences.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (examination answers 50%, final answers for workshops 50%).

COURSE TITLE: ECOLOGY AND ENVIRONMENT PROTECTION
CODE: D32CEPAL110
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge of the structure, functions and relations of natural and anthropic ecosystems, knowledge of the impact of anthropogenic activities on the environment, knowledge of environmental protection
COURSE CONTENTS: Laws and ecological principles, ecosystem (structure, functions, dynamics), environmental degradation, nature protection
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (examination answers 50%, final answers for workshops 50%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS II
CODE: D32CEPAL208
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Determination of lengths, areas and volumes of geometric objects. Solving specific problems of linear programming, such as crop distribution, setting feed ration for animal feed and working technology, based on matrix computing techniques. Knowledge of the Fundamental concepts of probability theory, probabilistic computation rules, the main probability schemes, the notion of random variable.Knowledge of the main classical distribution laws.Statistical analysis of the phenomenon.Graphical representation of a statistical series.The distribution of statistical data and graphical representation, the synthesis of data with an indicator representing them, the determination of statistical indicators of populations and samples (for example, indi-cators of the variations and moments).
COURSE CONTENTS: Measurement of lengths, areas and volumes. Linear programming. The calculus of probabilities. Elements of mathematical statistics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answers to works and homework 30%).

COURSE TITLE: CHEMESTRY III (COLLIODAL PHYSIC AND CHEMISTRY)
CODE: D32EPAL209
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): students learning the basics of thr basic chemistry colloids and chemistr thermodynamics . Study allows familiarity with the nature of colloidal systems, characterization methods and properties of these systems. Superficial phenomena such as surface tension, rheology elements disperse systems and micellization phenomena are presented in the context of practical applications of colloidal systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, 15% continuous evaluation and 15% report/project).

COURSE TITLE: ENGLISH LANGUAGE
CODE: D32EPAL213
ECTS CREDITS: 2
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English; using a reference material especially designed for students of the Faculty of Agriculture, but also for those who want to learn ESP

vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is meant to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Plant conservation, landscape restoration, landscape and garden design, construction, and maintenance, and arboriculture. Inside agriculture, horticulture contrasts with extensive field farming as well as animal husbandry.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: FRENCH LANGUAGE

CODE: D32EPAL213
ECTS CREDITS: 2
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French; using a reference material especially designed for students of the Faculty of Agriculture, Agriculture Specialization, but also for those who want to learn vocabulary in context. Practice of important Agriculture vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practicalnature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Topological ecology Organism-centred. Analysis of social-ecological systems using the natural and social sciences and humanities. Ecology guided by cultural meanings of lifeworldly landscapes.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: SPECIAL MATHEMATICS I

CODE: D32CEPAL214
ECTS CREDITS: 1
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Gymnastics Aerobics/Fitness; Application trails combined with treadmills; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports game: football; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

COURSE TITLE: ELEMENTS OF ELECTRICAL ENGINEERING

CODE: D32CEPAL215
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Presenting concepts related to electric and magnetic phenomena: electrostatics;stationary power; the magnetic field of electricity; electromagnetic induction; alternating current.
COURSE CONTENTS: The electrostatic field; stationary power; the magnetic field of electricity; induction electromagnets; alternating current.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (examination answers 80%, final answers for workshops 20%).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: FOOD BIOCHEMISTRY I

CODE: D32CEPAL320
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The course aims to study the main classes of biochemical compounds and their properties; Identifying and studying biochemical indices and parameters of quality; Food products.
COURSE CONTENTS: Introduction. The composition of living matter. Carbohydrates: General. Monoglucidelor derivatives. Metabolic roles. Oligoglucide natural biochemical role. Poliglucide: classification, structure, biochemical role. Lipids: classification, structure, biochemical role. Complex lipids: classification, structure, biochemical role. Natural Amino Acids: classification structure. Aminoacii protein, biochemical role. Holoproteide: structure, classification, own, biochemical role.

Peptide.Heteroproteide: classification, structure, properties. Their role in metabolic processes. Vitamins: generalities. Fat-soluble vitamins: water-soluble structure biochimic.Vitamine role: classification, structure, biochemical role. Pesudovitamine. Nucleic acids: structure nitrogenous bases. Nucleoside and nucleotide structure, structure polynucleotide chain. Metabolic roles. Enzymes: structure, classification, general mechanisms of action.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Answers to exam 70%, active participation in courses, 20% written assessment (during the semester): project 10%

COURSE TITLE: BASIC MATERIALS PLANTS I

CODE: D32CEPAL321
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The proper application of technology framework for obtaining plant products aims: respect for environmental protection, maintaining the diversity of agricultural ecosystem farm unit must be in balance guarantees optimum, not maximum respect for consumers' health.
COURSE CONTENTS: Knowledge and explanation of biological, specifying the morpho-anatomical groups of plants. Assessment of the quality of plant products based upon the physical, chemical and technological. Using practical methods for establishing the parameters of elements of productivity and quality, technical plants studied.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam course 75% and answers to laboratory works 5%, checks 5%, colloquy 15%)

COURSE TITLE: ADDITIVES AND INGREDIENTS IN FOOD

CODE: D32CEPAL322
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge and use of additives in food.
COURSE CONTENTS: Terms of use of food additives. International regulations regarding the uses and doses maximum permitted food additives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination answers 70%, final answers for workshops 20%, testing practical skills along the semester 10%).

COURSE TITLE: BASIC MATERIALS ANIMALS I

CODE: D32CEPAL323
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The modern approach to technology growth of the main species of animals, whose productions are intended for human consumption.
COURSE CONTENTS: Knowledge of technology growth by age and destination of the production. Knowledge of the influence of biotic and abiotic factors have on the quality of marketed production obtained. How to establish technologies for obtaining animal raw materials to facilitate processing to the final product.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (exam answers 40%; test results for course 20%, test results for practical works 20%).

COURSE TITLE: SENSORY ANALYSIS

CODE: D32CEPAL324
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): The development of competence for the characterization of the relationship between physico-chemical and sensory properties of food. The development of the sensory analysis of the ability to use as a tool to evaluate the typical food naturalness.
COURSE CONTENTS: Recognizing the sensory characteristics that define the quality and naturalness of foodstuffs. Recognition of sensory defects affecting food quality. Knowledge of technology elements influence the sensory characteristics of food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (80% of the final grade represent the response to the written theoretical questions and 20% of the final grade the answers to laboratory tests).

COURSE TITLE: UNIT OPERATIONS IN FOOD INDUSTRY

CODE: D32CEPAL325
ECTS CREDITS: 2
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Students will learn the basics on unit operations, forming processes of the food industry. On the basis of theoretical knowledge in the course of practical work aimed at carrying out specific tests and measurements for determining and characterizing the technological performance of each type of unit operation.
COURSE CONTENTS: Unit operation is discipline which forms the theoretical basis of technology and technological equipment in the food industry. The laboratory are studied Fundamental aspects on: - transport of solids, liquids and gases; - separation of heterogeneous systems by sedimentation, filtration, centrifugation; - the processing of mixtures homogenous by evaporation, crystallization, pasteurisation, sterilization, distillation, rectification - the separation of useful components from vegetable products by solid-liquid extraction - to ensure preservation challenge final processing and drying of foodstuffs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Answers at the

exam 80%, final answers at practical laboratory works 20%).

COURSE TITLE: PHYSICAL EDUCATION III

CODE: D32CEPAL437
ECTS CREDITS: 1
TYPE OF COURSE: Main subject
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Fitness - optimization of physical condition; utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: FOOD BIOCHEMISTRY II

CODE: D32CEPAL427
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Knowledge and study of the main classes of biochemical compounds in foods • Identifying and studying biochemical indices and quality of food
COURSE CONTENTS: Introduction. Understanding the physical and chemical properties of different classes of biochemicals in food; Explain and correct interpretation of the theoretical knowledge acquired in the course and for individual study; Using modern methods of scientific investigation in biochemistry food; Use of methods and specific processes laboratory biochemistry for the qualitative and quantitative determination of biochemical compounds from food; Developing skills and experimental skills right on the approach and problem solving specialist.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Answers to exam 70%, Active participation in courses 20%).

COURSE TITLE: BASIC MATERIALS PLANTS II

CODE: D32CEPAL428
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Developing technologies vegetable crop species in Vedra obtain quality vegetable products.
COURSE CONTENTS: Setting differentiated technologies biological and technological peculiarities of vegetable species, emphasizing the concepts of fertilization, applying chemical treatments reoltare, sorting and storage in order to obtain quality vegetable products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam course 60% and project reference 40%).

COURSE TITLE: BASIC MATERIALS ANIMALS II

CODE: D32CEPAL429
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Deepening knowledge of the elements of final classification of each species breeds ; Deepening knowledge of morphology and physiology of animal breeds; Establishment of control, assessment and determination of livestock production and the principles of growth and exploitation of animals.
COURSE CONTENTS: Presentation of concepts relating to: - the breed and type of animal production; - preparing and checking of feed rations; - aleagerea a breed of species depending on the growth - drawing up a plan to operate an animal breeds; - choose a race from one species to a stable production type; - establishment of a farm breeding opportunities by area growth.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%; project reference 40%).

COURSE TITLE: PACKAGING AND DESIGN IN THE FOOD INDUSTRY

CODE: D32CEPAL430
ECTS CREDITS: 4
TYPE OF COURSE: from the field of activity
COURSE OBJECTIVE(S): Product design and packaging in the food industry, food industry packaging design, composition and physico-chemical control of packaging to avoid any risk of food spoilage, involvement in the development of new products design, reflection design activity in manufacturing costs.
COURSE CONTENTS: Designing packaging in the food industry; chemical composition and physical control of packaging to avoid any risk of food spoilage design; involvement in the development of new products; reflection design activity in manufacturing costs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, testing practical skills along the semester 10%, final answers at practical laboratory works 30%).

COURSE TITLE: CONSTRUCTION AND INSTALLATIONS IN FOOD INDUSTRY

CODE: D32CEPAL431
ECTS CREDITS: 2
TYPE OF COURSE: Speciaized discipline
COURSE OBJECTIVE(S): Acquiring knowledge about the types of construction and materials used in

construction of buildings; Identify specific requirements of the food industry construction systems.
COURSE CONTENTS: Knowledge of the functional composition of a building, determining the composition of the main elements associated with them and the causes of the state of mechanical stress; Highlighting ways of arrangement between the different types and categories of construction, the rational design of enclosures and determining the quality of construction; Presentation of the properties and types of building materials, structural parts, types of construction, sizing, constructive solutions, equipment used; Acquiring practical knowledge on technical-constructive and functional peculiarities of the main types of structures used in the food industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers at the course exam 80%, final answers at practical laboratory works 20%).

COURSE TITLE: PRINCIPLES OF HUMAN NUTRITION

CODE: D32CEPAL432
ECTS CREDITS: 2
TYPE OF COURSE: Domain discipline
ASSESSMENT METHOD(S): Exam

COURSE TITLE: GENERALE TECHNOLOGIES IN THE FOOD INDUSTRY

CODE: D32CEPAL433
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge of the main technological sequence, which makes the production and quality crops câmp.Cunoaşterea and explanation of biological, morphological and anatomical characteristics specification, the quality of plant products plante.Aprecierea groups based upon the physical, chemical and methods tehnologice.Utilizarea practical elements for setting the parameters of productivity and quality technical plants studiate.Proiectarea a seed production program for the main crops, in compliance with legislation. Developing a positive attitude towards the scientific community, promoting training teams in establishing various specific programs studied field.
COURSE CONTENTS: rotation, fertilizer, soil works, establishment of nursery box for the production of seedlings, planting seedlings, installation of the support, the establishment of the culture seed and the sowing, the material preparation for planting, planting, maintenance work, harvest, production in wheat, barley, barley, corn, beans, soybean, sunflower, canola, flax fiber, hemp, sugar beet, potato, tobacco, hops.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (exam answers 75% final answers to practical works 25%).

COURSE TITLE: PRACTICE

CODE: D32CEPAL434
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): The purpose of practical training is to develop skills and competences appropriate to the activities of the food science.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (the practice book and the exam answers 100%).

COURSE TITLE: POLICIES AND STRATEGIES IN GLOBAL FOOD SECURITY

CODE: D32CEPAL436
ECTS CREDITS: 2
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Understanding the processes underlying the development of agri-food sector, whose performance is reflected ultimately in the degree of food security of the population and its participation in the structuring and harmonization of national economic development.
COURSE CONTENTS: Understanding the processes underlying the development of agri-food sector, whose performance is reflected ultimately in the degree of food security of the population and its participation in the structuring and harmonization of national economic development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% written examination, 30% reference project).

COURSE TITLE: PHYSICAL EDUCATION IV

CODE: D32CEPAL438
ECTS CREDITS: 1
TYPE OF COURSE: Main subject
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Fitness - optimization of physical condition; utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

COURSE TITLE: UNIT OPERATIONS IN FOOD INDUSTRY

CODE: D32CEPAL325
ECTS CREDITS: 2
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Students will learn the

basics on unit operations, forming processes of the food industry. On the basis of theoretical knowledge in the course of practical work aimed at carrying out specific tests and measurements for determining and characterizing the technological performance of each type of unit operation.
COURSE CONTENTS: Unit operation is discipline which forms the theoretical basis of technology and technological equipment in the food industry. The laboratory are studied Fundamental aspects on: - transport of solids, liquids and gases; - separation of heterogeneous systems by sedimentation, filtration, centrifugation; - the processing of mixtures homogenous by evaporation, crystallization, pasteurisation, sterilization, distillation, rectification - the separation of useful components from vegetable products by solid-liquid extraction - to ensure preservation challenge final processing and drying of foodstuffs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Answers at the exam 80%, final answers at practical laboratory works 20%).

3RD YEAR, 1ST SEMESTER

COURSE TITLE: VETERINARY AND FOOD SAFETY CONTROL
CODE: D32CEPAL541
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Acquiring theoretical and practical knowledge regarding food safety, animal health, animal food sanitation, veterinary medicinal products, nutrition and residues in animal products.
COURSE CONTENTS: Food safety; Animal Health (diseases, identification and registration of animals, animal welfare and protection, veterinary medicinal products, animal nutrition, waste neutralization products of animal origin intended for human consumption); hygiene and veterinary public health.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, control paper 40%).

COURSE TITLE: HYGIENE AND BIOSECURITY FOOD
CODE: D32CEPAL542
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and understanding. The importance of knowing and understanding hygiene staff in food, controls being put staff in the food industry, the requirements for the location, construction and landscaping industry, food, hygiene industry, food, protection rules vicinal medium enterprises food industry.
COURSE CONTENTS: Training future engineers in the food industry on scientific basis of specific hygiene rules food companies and deepening knowledge and modern techniques and methods of cleaning personnel, equipment, plant and machinery used in the food industry. - Knowledge of the application of EU legislation on hygiene food business, food industry personnel and regulations relating to environmental protection in the food industry (new hygiene package, GHP).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (40% written examination, 60% periodic evaluation Laboratory works).

COURSE TITLE: QUALITY CONTROL FOOD PLANTS I
CODE: D32CEPAL543
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Acquiring knowledge on the quality of basic materials of plant origin.
COURSE CONTENTS: Understand the importance of factors influencing food quality vegetable food industry. To know the quality parameters of vegetable raw materials and food products and their influence on how the exploitation and marketing. Knowing devices and methods for determining the quality of plant food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to laboratory works 30%).

COURSE TITLE: PRINCIPLES AND METHODS FOR THE PRESERVATION OF FOOD I
CODE: D32CEPAL544
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Acquiring theoretical and practical knowledge for keeping fresh food of plant origin (vegetables, fruits and their derivatives) and methods of processing and preserving their.
COURSE CONTENTS: Storage and recovery technologies of food products of plant origin (fruit and vegetables) - semiconservare technologies and preservation of food products of plant origin (fruit and vegetables).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the exam answers, 40% of the final answers to workshops).

COURSE TITLE: PEST CONTROL
CODE: D32CEPAL560
ECTS CREDITS: 2
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Understand conduct health checks and documents.
COURSE CONTENTS: Carrying out an inspection of plant protection and release of certificate or the Passport protection as appropriate; Study of the principles and working methods of Phytopathology, the description of the diagnostic methods of the pathogens with the microscope, knowledge of the

main species of pathogens and pests of quarantine plant health of crop plants, the biology, ecology and etiology, assessment of losses caused by them and use laws to prevent their spread in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of answers to exam; 40% of involvement in practical activities).

COURSE TITLE: ZOOTECHNIC INSPECTION AND VETERINARY

CODE: D32CEPAL655
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Pollution and environmental damage. Animal welfare and protect the health of their livestock Heritage. Livestock buildings that are suitable for livestock. Registration, movement, and recovery of livestock ear tags. Organizing livestock inventory. Premiums sale, benefits and tax advantages product in accordance with legal regulations.
COURSE CONTENTS: Regulations on activities by livestock species. Develop and promote policies on growth and improvement of animals. Professional associations of livestock farmers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of answers to exam; 40% of involvement in practical activities).

3RD YEAR, 2ND SEMESTER

COURSE TITLE: BIOTECHNOLOGY IN FOOD INDUSTRY

CODE: D32CEPAL545
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): To acquire knowledge about food quality appearance of plants and animals obtained by biotechnological processes; Understand and acquire knowledge from existing food biotechnology industry at this time.
COURSE CONTENTS: To understand the role that it has enzymes and microorganisms in biotechnological processes processing of raw materials in the food industry and in the finished product; To know microorganisms of interest in obtaining food biotechnology; Know and understand the steps biotechnological processes for obtaining food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, periodical assessment through practical tests 30%).

COURSE TITLE: FOOD CONTROL MICROBIOLOGICAL METHODS

CODE: D32CEPAL546
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowing changes caused by microorganisms in food.
COURSE CONTENTS: Knowledge of the factors which influence the activity of microorganisms present in the food knowledge of techniques for isolating and identifying microbial germs in food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers at the exam 85%, answers at practical laboratory works 25%).

COURSE TITLE: QUALITY CONTROL FOOD PLANTS II

CODE: D32CEPAL647
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the subject and modern methods of quality control of food of plant origin.
COURSE CONTENTS: Presentation of the main groups of food products of vegetable origin; Presentation of the main applications in quality control of products; Tracking the qualitative aspects in the processes for the preparation of food products of vegetable origin.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, control paper 30%).

COURSE TITLE: KEEPING AND CONTROL PRIMARY PLANT MATERIALS

CODE: D32CEPAL649
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Presentation in a concise and accessible form students as course material and practical work on conditioning technologies, conservation, long-term storage of plant agricultural products and their quality control over preservation.
COURSE CONTENTS: Detailed presentation of the main technological measures on reception, analyzes physical, physiological and qualitative assessment of how agricultural products of plant origin.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% written examination, 40% periodic reference project).

COURSE TITLE: PROCESSING TECHNOLOGIES PRIMARY ANIMAL MATERIALS

CODE: D32CEPAL650
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Addressing modern processing technologies main products achieved in the area of livestock to customize and optimize production processes in order to adopt effective management approaches for profitable production.
COURSE CONTENTS: Knowledge processing technologies of animal products; Knowledge of the

influence of biotic and abiotic factors have on the quality of marketed production obtained; Know the importance of practical technologies teoreticeşi processing of animal products to ensure high quality commodity production under food safety and economic efficiency; How to establish technologies to obtain finished products after processing animal production according to the final product required.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of exam answers, 40% of final answers to workshops).

COURSE TITLE: PROCESSING ELECTROPHORETIC AND CHROMATOGRAPHIC METHODS ANALYSIS OF FOODS

CODE: D32CEPAL651
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and understanding of the concepts of chromatography and electrophoresis.
COURSE CONTENTS: Learning methods in the paper chromatographic analysis, thin-layer, gas chromatography, liquid chromatography and electrophoresis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloqui (exam answers 70%, final answers for workshops 30%).

COURSE TITLE: PROCESSING TECHNOLOGIES PRIMARY PLANT MATERIALS II

CODE: D32CEPAL652
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Learning technologies for processing different types of crops: cereals, oilseeds, industrial crops, vegetables and fruits, etc. promoting the principles and norms of sustainable agricultur.
COURSE CONTENTS: Knowledge of modern methods of production processing plant to ensure safety and food security; knowledge of screening methods processed plant product quality; knowledge of equipment and facilities processing plant production.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: TECHNOLOGICAL PROJECT

CODE: D32CEPAL653
ECTS CREDITS: 2
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Leguminous plants, meat products, fruit juices and vegetables, fish products, milk and fats.
COURSE CONTENTS: The nutritional value of cereals, dried leguminous vegetables nutritional value, nutritional value of vegetables and fruits, fruit juices and vegetables. Soft drinks, nutritional value of fish and fish products, nutritional value of milk and milk products, nutritional value: Fats food, sugar and eggs, Influence of technological processing on the nutritional value.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (80% of the final grade represent the response to the written theoretical questions and 20% of the final grade the answers to practical laboratory questions).

COURSE TITLE: PRACTICE

CODE: D32CEPAL654
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): The practical training aims to apply the theoretical knowledge acquired in specialized courses in the food Science.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Practical examination (examination practice - 90% and the drawing - completing the specification of the practice - 10%).

COURSE TITLE: COLD AND AIR CONDITIONING INSTALLATION

CODE: D32CEPAL657
ECTS CREDITS: 2
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Awareness about artificial cold in conservation and food processing; Knowledge and understanding consequences refrigeration processes irreversibility of these processes in the use of artificial cold with maximum efficiency.
COURSE CONTENTS: Knowledge of the construction and operating principle of refrigeration. Explain the process irreversible exergy refrigeration method; Explain the difference between ideal and actual cycle cycle of refrigeration; Explain procedures for obtaining artificial cold; Explaining how the choice of refrigeration or artificial ice depending on the technology requirements for quality preservation, transport and food processing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (90% of answers to exam; 10% of involvement in practical activities).

COURSE TITLE: SAMPLING AND PRELEVATION FOOD SAMPLES

CODE: D32CEPAL661
ECTS CREDITS: 1
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): General view of the notion of sampling and sampling food sampling methods for the official control of foodstuffs and legislative provisions, rules and standards in force.
COURSE CONTENTS: How to perform official controls on collection and sampling food and corrective measures in case of deviations.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Verification (60% of answers to exam; 40% of involvement in practical activities).

COURSE TITLE: PRINCIPLES AND METHODS FOR THE PRESERVATION OF FOOD II

CODE: D32CEPAL648
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Acquiring theoretical and practical knowledge for keeping fresh food of plant origin (vegetables, fruits and their derivatives) and methods of processing and preserving their.
COURSE CONTENTS: Storage and recovery technologies of food products of plant origin (fruit and vegetables) - semiconservare technologies and preservation of food products of plant origin (fruit and vegetables).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the exam answers, 40% of the final answers to workshops).

4TH YEAR, 1ST SEMESTER

COURSE TITLE: RHEOLOGICAL METHODS FOR FOOD CONTROL

CODE: D32CEPAL759
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowing main textural properties of the food and the types of tests to be performed to characterize them.
COURSE CONTENTS: Food rheology specific technical terms; Techniques for measuring the rheological and textural properties of foods, liquid and solid; General principles of operation of the machines used in rheological and textural measurements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers of test for practical laboratory work 30%).

COURSE TITLE: CHEMICAL AND DRUG CONTROL IN FOOD WASTE

CODE: D32CEPAL760
ECTS CREDITS: 4
TYPE OF COURSE: Specialied discipline
COURSE OBJECTIVE(S): Knowledge and understanding of concepts of chemical waste, determining their importance precisely harmful effects on health.
COURSE CONTENTS: Learning techniques work in the laboratory to determine residues in food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answears to practical laboratory work 40%).

COURSE TITLE: MARKETING

CODE: D32CEPAL761
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge of the concepts of market, product, price, distribution, advertising.
COURSE CONTENTS: Understand the organization of specific marketing activities, technically and organizationally specific marketing concepts; Explanation: the market, the consumer, individual variable, segment, economic, etc; Presentation of the report available on the market supply and demand, product, price, distribution, sales, communication, advertising, politics, marketing strategy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, answers to laboratory works 30%).

COURSE TITLE: GM FOOD

CODE: D32CEPAL762
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and use scientific concepts and terms of specialized acquire subject-specific research methods.
COURSE CONTENTS: Description and use of the concepts, theories and basic methods used in quality control and expertise of food on chemical compounds that determine the quality and traceability of food, the transformations which they undergo during processing, transport and storage, the apparatus and methods the determination and analysis of these compounds, and to the legislation in the field. Explanation and interpretation of the concepts, methods and models used in the control and research of foodstuffs using basic knowledge of the chemical compounds that determine the quality and traceability of food transformations which they undergo during processing, transport and storage, methods for the determination and analysis these compounds and legislation in the field. Applying basic principles and methods for solving problems related to quality control and food expertise.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade represent the response to the written theoretical questions and 30% of the final grade the answers to practical laboratory questions)

COURSE TITLE: CONSUMER LEGISLATION AND PROTECTION

CODE: D32CEPAL763
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Cunoaşterea detaliată a noţiunilor privind normele aplicabile în domeniul alimentar în România şi în spaţiul comunitar, precum şi privind protecţia consumatorului. Acquiring knowledge of the legal system in general, the main regulations applicable in the catering industry,

consumer protection in Romania and other EU countries, the National Authority for Consumer Protection, Food Safety Management System.
COURSE CONTENTS: Efficient use various ways and techniques of learning - training for acquiring information from bibliographic databases and electronic, both in Romanian and in a foreign language and to assess the need and utility incentives extrinsic and intrinsic continuing education.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final grade the answers to practical laboratory questions 30%).

COURSE TITLE: FOOD INDUSTRY PACKAGING CONTROL
CODE: D32CEPAL764
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge and application of basic engineering principles and methods to understand the structural and functional principles of packaging used in the food industry. Knowledge of operating principles and operation of specific equipment to achieve the most representative packaging and packaging used in the food industry. Knowing the principles for calculating the size of specific equipment design and packaging technology in the food industry.
COURSE CONTENTS: Used in the food packaging industry. Machinery used in food packaging. Transfer processes and phenomena that occur in food packaging. Influence of microorganisms on food packaging and packaged. Modern methods of packaging used in the food industry. Control techniques used in food packaging control. Modern trends in structuring packaging used in the food industry. Labeling - requirements, resources, and regulations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, final answers to laboratory works 50%).

COURSE TITLE: ENVIRONMENTAL RESOURCES FOR FOOD
CODE: D32CEPAL772
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Detailed knowledge resources for the main organic food, radiography surfaces and organic food market, both worldwide and in Romania; promoting the principles and rules of organic farming and sustainable agriculture. Acquiring knowledge on how the plant resource conservation and protection of natural environment, in terms of sustainable agriculture; EU Strategy pentruproduse organic food and food safety
COURSE CONTENTS: Supervision, management, analysis and design technologies to supply raw materials to the finished product - Description and use of concepts, theories and methods of basic food technologies. Explanation and interpretation of the principles and methods used in technological processes in the food chain. Efficient use various ways and techniques of learning - training for acquiring information from bibliographic databases and electronic, both in Romanian and in a foreign language and to assess the need and utility incentives extrinsic and intrinsic continuing education.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answwears to practical laboratory work 30%).

4TH YEAR, 2ND SEMESTER

COURSE TITLE: FOOD INDUSTRY PACKAGING CONTROL
CODE: D32CEPAL764
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge and application of basic engineering principles and methods to understand the structural and functional principles of packaging used in the food industry. Knowledge of operating principles and operation of specific equipment to achieve the most representative packaging and packaging used in the food industry. Knowing the principles for calculating the size of specific equipment design and packaging technology in the food industry.
COURSE CONTENTS: Used in the food packaging industry. Machinery used in food packaging. Transfer processes and phenomena that occur in food packaging. Influence of microorganisms on food packaging and packaged. Modern methods of packaging used in the food industry. Control techniques used in food packaging control. Modern trends in structuring packaging used in the food industry. Labeling - requirements, resources, and regulations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, final answers to laboratory works 50%).

COURSE TITLE: STATISTICAL CONTROL OF FOOD
CODE: D32CEPAL865
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Discipline study aims overview of statistical concepts and their use in food quality control winemaking; Knowledge of the main statistical methods used in quality control of foodstuffs.
COURSE CONTENTS: Description and use of concepts, theories and basic methods used in the design, implementation and monitoring of quality management systems and food safety. Explanation

and interpretation of concepts, methods and models based on the design and use of quality management systems and safety alimentare. Efficient use various ways and techniques of learning - training for acquiring information from bibliographic databases and electronic, both in Romanian and in a foreign language and to assess the need and utility incentives extrinsic and intrinsic continuing education.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answers to laboratory works and 40%).

COURSE TITLE: MANAGEMENT
CODE: D32CEPAL866
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge of the notions of the economic agent in terms of its organization, its functionality, the way of implementation of the modern management techniques and methods.
COURSE CONTENTS: The role of the food industry in the production of food for human consumption, Introductory management, Running management in modern management, Production capacity and optimal ways of use in the food industry, Creation and development of technical-material basis in the food industry, Organization and management of production Nutrition, Organization of food industry production by types of enterprises, Technical and economic forecasting in the food industry, Human resource management in the food industry, Labor normalization in the food industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to seminars 30%).

COURSE TITLE: PSYCHOLOGY OF HUMAN FOOD
CODE: D32CEPAL867
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Obtaining complex knowledge, stimulate thinking integrative and synthetic capacity of the students to integrate knowledge and theoretical knowledge transfer in the field of theory in practice. Knowledge of the factors and conditions that influenţeazăconsumul and food preferences of consumers.
COURSE CONTENTS: Upon completion of the subject the student (a) will be able (a): identify factors principles related food preferences of consumers, factors auun role hotator in generating food policies; to participate in discussions on key issues related to human nutrition; to can interpret the results of market studies and; can make recomdari privindtendintele market and consumer preferences.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (examination answers 50%, final answers for workshops 50%).

COURSE TITLE: RECYCLING BIOTECHNOLOGY OF THE PRODUCT WASTE
CODE: D32CEPAL868
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Acquiring knowledge aimed at theoretical and practical data on the impact of food waste deşeurilorşi on the environment; Study of importance in biotechnological processes waste and bioremediation biovalorisation.
COURSE CONTENTS: Supervision, management, analysis and design of food technology from raw materials to finished product. Developing activities of management and marketing food chain. Efficient use various ways and learning techniques for acquiring information, training and electronic bibliographic debaze indulged in Romanian and in a foreign language and to assess the need and usefulness of extrinsic and intrinsic motivation of lifelong learning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answers to laboratory works 40%).

COURSE TITLE: RADIOMETRIC METHODS OF CONTROL AND EXPERTISE OF FOOD
CODE: D32CEPAL869
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Food preservation methods, evaluation of food and food detection of counterfeit. Knowing and understanding the notion of radioactivity, radiation protection and dosimetry, and contamination of food irradiation. - knowledge of methods for analyzing the content of the food radioactive.
COURSE CONTENTS: The identification, description and specific concepts appropriate use of the food science and food safety. Description and use of concepts, theories and basic methods of food science (defined in terms multidisciplinary) related to the structure, properties and transformations components and food contaminants throughout the food supply chain. Application strategies perseverance, accuracy, efficiency and accountability in the work, punctuality and personal accountability for business results, creativity, good sense, sicritica analytical thinking, problem solving, etc., based on principles, norms and values code of ethics in food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: COUNTERFEIT AN PREVENTION CONTROL IN FOOD INDUSTRY
CODE: D32CEPAL870
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Study subject aims overview of the concept of food packaging, presentation legislatine provisions, rules and standards on the

packaging, labeling and marketing of food products.
COURSE CONTENTS: Application strategies perseverance, accuracy, efficiency and accountability in the work, punctuality and personal accountability for its performance, creativity, common sense, analytical and critical thinking, problem solving, etc., based on principles, norms and values of professional ethics code in food. Efficient use various ways and techniques of learning - training for acquiring information from bibliographic databases and electronic, both LanguageEnglish, and in a foreign language and to assess the need and utility incentives extrinsic and intrinsic continuing education. How to perform official controls on food packaging and labeling during packaging and/or bottling, handling, transport, storage and sale.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, final answers of test for practical laboratory work and activities such as projects 40%).

COURSE TITLE: QUALITY CONTROL SYSTEMS DESIGN

CODE: D32CEPAL874
ECTS CREDITS: 2
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Applying the principles and requirements of the management system calitatiipentru solving technological problems and Engineering. Providing and implementation techniques, methods and tools of quality management.
COURSE CONTENTS: Designing, implementing and monitoring quality management systems and food safety; design, implementation and monitoring of quality management systems and food safety.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 50%, Project 50%).

COURSE TITLE: PRACTICE FOR THE PREPARATION OF DIPLOMA PROJECT

CODE: D32CEPAL871
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Performance of scientific multidisciplinary/interdisciplinary research projects using innovative methods with significant impact on the development of food and food sector; Ability of drawing conclusions and suggesting solutions/recommendations for academic research and practice in food and expertise food sectors, based on the research studies performed.
COURSE CONTENTS: Finalisation of thesis plan and REFERENCES; Specialty literature reviews based on academic specialty resources recommended by the research supervisor or other sources considered as being relevant by the student; Finalisation and implementation of the research methodology intended for the achievement of objectives ; Preparation and drafting of the Licence's thesis; Presentation of results and conclusions of the research studies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Thesis presentation and defense 100%.

FIELD: GEODETIC ENGINEERING
PROGRAMME TITLE: LAND MEASUREMENTS AND CADASTRAL SURVEY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ALGEBRA

CODE: D31MTCL101
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Understanding how to approach algebra problems
COURSE CONTENTS: Crowds; Functions; Matrix calculation; Determinants; Vector spaces. Addiction and linear independence; Euclidean spaces. Orthogonal bases; Linear applications. Matrix of linear application; Canonical forms of endomorphism; Biliary forms. Pattern shapes
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to seminar works 30%).

COURSE TITLE: APPLIED MATHEMATICS I

CODE: D31MTCL102
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Understanding students of the basic notions of linear programming and how to approach linear programming problems; Acquiring the notions of analytical geometry.
COURSE CONTENTS:Linear Programming Elements: Economic problems that lead to linear programming problems; Forms of linear programming problems; Theorems of duality in linear programming; Fundamental theorems of the simplex method; Optimization in transport and distribution; Reduce the transfer problem to a classic transport problem; Balanced transport problem; Adapting the simplex method to the balanced transport problem; Unbalanced transport issues; Straight: forms of the equations of a straight line; Angles and distances in plan; Angle between two planes; Forms of the Equations of a straight in space; The angle between two straight lines in space.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answers to seminar works 30%).

COURSE TITLE: DESCRIPTIVE GEOMETRY I

CODE: D31MTCL103
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): The discipline aims at preparing students for the purpose of learningthe basic notions of descriptive geometry useful forthe subsequent understanding of the concepts of technical drawing.
Descriptive geometry familiarizes students with the notions ofpoint, straight, plan, with their purges in space, as well as withrepresentations of geometric bodies in space, being the basis subsequent subjects such as Technical Drawing.
COURSE CONTENTS: The point. Sharing space. Purge point. Triple Orthogonal Projection. Particular positions; The straight. Representation of the straight into the purge.The traces of the straight.The particular positions of a straight to the projection planes. Positions relative to two straight lines; The plan. Representing the plan in the purge.Elements contained in the plan; Determining the plan. Particular straightsof a plan.The relative positions of the two planes. The position of a straight ahead of a plan.Visibility in the process. Intersection of flatfigures; Methods of transforming projections:The method of changing planesprojection. The rotation method. Method
the projection plan defects. Liftingfrom rebate.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 50%, final answers at practical works 50%).

COURSE TITLE: PROGRAMMING OF CALCULATORS AND PROGRAMMING LANGUAGES

CODE: D31MTCL104
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Knowledge of electronic computing systems and computer programs for the building of databanks, knowledge of the way of elaboration of algorithms for automatic processing of cadastral information of text or numerical type, acquainting students with building different types of tables corresponding to the data banks, working with tables and making tabular calculations
COURSE CONTENTS: Components of a computing system. Windows operating system.Windows operating system command interpreter. Present command and file commands. Memory management with Windows Explorer. Microsof Word computerized word processing application, menus and work commands. Drawing tables, choosing table properties and sorting them. Tabular calculation.Developing algorithms to solve programming problems. Block schemes. Objects with which algorithms work.Applications in the pseudocode.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, final answers to laboratory works 50%).

COURSE TITLE: GEODETIC INSTRUMENTS AND MEASUREMENT METHODS

CODE: D31MTCL105
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Classification of geodetic

and topographic equipment;the use of the device;-measurement methods used in topography and geodesy.
COURSE CONTENTS: Introductory notions; Instruments for direct distance measurement; Verification, calibration and comparison of ribbons and roulettes; Direct distance measurement technique; Errors in direct distance measurement; Angle measuring instruments and apparatus: Angle measurement principle; Classification of Angle Meters; Cylinders: component parts, working mode, field operations, precision; Simple goniometers; Theodolite; Parts components; Description of some tachymeters - theodolites; Stacking of theodolites; Angle measurement methods; Indirect measurement of distances; Total stations. Component parts; GNSS receivers; Instruments for measuring level differences; Methods for determining level differences
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answers to Laboratory works 40%).

COURSE TITLE: TECHNICAL DRAWING

CODE: D31MTCL106
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S):Using basic knowledge to explain and interpret various types of concepts, situations, processes, projects, etc. associated with the domain; Appropriate use of standard criteria and methods of assessment to assess the quality, merits and limits of processes, programs, projects, concepts, methods and theories; Elaboration of professional projects using the established principles and methods in the field.
COURSE CONTENTS:Technical drawing: Object. Scope. Definitions. Means of execution of technical drawings. Norms, conventions and prescriptions used in the technical drawing.Classification of technical drawings; Geometrical constructions:Construction of perpendicular lines. Construction of parallel straights.Sharing a straight segment.Construction and angle division.Construction of flat geometric figures.Construction of regular polygons. Connections; Representations in the technical drawing:The projective drawing. Projection systems.Representation in orthogonal projection.Layout of the projections in the drawing.Symmetry notions; General rules for drawing up technical drawings:Formats of technical drawings. Folding technical drawings.Lines used in the technical drawing. Writing in the technical drawing.Representation ladders; Representation and designation of construction and construction:Representation of constructive forms in view. Representation of structural forms in the section.Hatching representation.Representation of ruptures.Representation and marking of roughness.Quoting technical drawings.Drawing up technical drawings.Overall drawing.Signs and symbols for schematic representations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: ENGLISH LANGUAGE I

CODE: D31MTCL107
ECTS CREDITS: 2
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Understanding some written and oral messages in English.Extraction into the relevant formation from a studied material.Identifying attitudes, opinions in an audited message.Initiating and participating in conversations on everyday and professional topics. Clear and fluent, oral and written reporting of real or imaginary encounters, everyday situations, personal experiences.Adapting speech to the particularities of the audience/interlocutor (formal/informal style).Writing messages of different types, notes, letters, reports.Summarizing in writing the information read or heard.Communicate effectively in an engineering environment where a modern language is required.
COURSE CONTENTS: 1.Focus on language: Present Tense Simple/ Continuous ESP, specific vocabulary: Cadastral survey or cadastral map. 2.Focus on language: Past Tense Simple/ Continuous ESP, specific vocabulary: The production of documents, diagrams, sketches, plans. 3.Focus on language: Present Perfect Simple/ Continuous ESP, specific vocabulary: Track long-term changes over time for geological or ecological studies . 4.Focus on language: Past Perfect Simple/ ContinuousESP, specific vocabulary: Outstanding explorations of design concepts, principles.5.Focus on language: Means of expressing future ESP, specific vocabulary: Land (economics). 6. Focus on language: -ing formESP, specific vocabulary: The cadastral ID-code.7. Focus on language:Modal verbs IESP, specific vocabulary: Land productivity and assessment database;8. Focus on language: Modal verbs IIESP, specific vocabulary:Mineral resources database. 9. Focus on language: NounsESP, specific vocabulary: Reallotment of units;10. Focus on language: Plural of NounsESP, specific vocabulary: Cadastral data on immovable thing;11. Focus on language:AdjectiveESP, specific vocabulary: Contour or axial lines of engineering structures (linear objects)12. Focus on language:AdverbESP, specific vocabulary: Land area with irrigation equipment: drained land; irrigated land;13. Focus on language: Revision Exercisess ESP, specific vocabulary: The forces that influence land design.
14. Focus on language: Grammar tests ESP,

specific vocabulary: The ownership, the tenure, the precise location
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (answers to exam 70%, ongoing evaluation 30%).

COURSE TITLE: PHYSICAL EDUCATION AND SPORT I

CODE: D31MTCL108
ECTS CREDITS: 1
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): aims to increase the level of physical training of the future specialist to be master of his body, giving him maximum flexibility and agility.
COURSE CONTENTS: Presentation of the activity (requirements, samples, control rules). Samples and control rules (initial assessment). Exercises of the front and bands.Action on the spot and on the move. Free exercise for different body segments by overcoming the weight of your body. Free balance exercises: retained positions and crossings from one position to another. Passing from one position to another: lowering the base; increasing the support base by unbalance. Rotation movements of the body around its vertical axis - swings (turns, pirouettes).Exercises for the development of static and dynamic muscle strength. Movements using inertia obtained from an impulse - Balances. Exercises for the development of muscle elasticity and joint mobility.Exercises for developing relaxation. Exercises with balls using different handling techniques - balances, throws and catches, strokes and swings, running on the ground or on different body segments; Spins on the ground and in the air. Exercises for forming the right outfit.Exercises with individual walking stick and pairs.Practical exercises for walking and running. Circuits comprising 4-6 stations, to which are executed driving acts aimed at speed manifestation forms, as well as skill circuits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Admitted/Rejected (assessment through practical tests 80%, continuous assessment 20%).

COURSE TITLE: GENERAL ECONOMY

CODE: D31MTCL116
ECTS CREDITS: 4
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Knowledge of the notion of economic structure, property, capital, human resource, investment, etc. Understanding how to organize market-specific activities
COURSE CONTENTS: The economic activity: 1.1. Components of the national economy, 1.2.The structure of the national economy1.3.Economic agents and enterprise1.4.Business Activity Indicators; 2. Types of economy:2.1. Natural economy2.2.Market economy2.3.The features of the market economy2.4. Market functions; Production factors and their use; Exchange and exchange mechanism; Demand and supply; Competition; Price; Monetary and financial market; Salary and profit; Interest and rent; Income, consumption, investments; Balance and economic imbalances.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, essay 40%).

COURSE TITLE: MAPPING AND SOIL EVALUATION MARKS

CODE: D31MTCL117
ECTS CREDITS: 4
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Knowledge of land resources in terms of their productive capacity and their technological attributes. The Romanian Soil Taxonomy System - 2003, the characterization of the main soil types in Romania and the determination of their suitability for different cultures and uses.
COURSE CONTENTS: Definitions and concepts in land grading and land grading. Soil - natural body, fertility. Factors of pedogenesis.Formation and composition of the mineral part and the organic soil part. Horizons and diagnostic properties used in soil classification. Classification and description of Romania's soils.Methodology of pedological studies.Stages of mapping studies.Impairment of agricultural land.Purpose and objectives of bonuses.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, ongoing evaluation 30%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: APPLIED MATHEMATICS II

CODE: D31MTCL209
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Students acquire some notions of trigonometry, vector algebra and applications of vectorial calculations in geometry, spherical trigonometry and astronomy.
COURSE CONTENTS:Trigonometry elements: trigonometric functions, conditional identities; Methods of Solving Trigonometric Equations and Inquiries; Theorems in any triangle; Applications of trigonometry in geometry; Vector vector algebra: vectors, vector operations, the scalar product of two vectors, the vector product; Applications of vectorial calculus in geometry; Applications of geometry in topography: determinationdistances between inaccessible points and angles between different directions; Extreme geometry problems. Geometric transformations; Spherical trigonometry: relationships and formulas between the elements of a spherical triangle, Gauss formulas, Borda

formulas, Neper formulas, Delambre's formulas, Simon L'Huilier's formula; Elements of astronomy: Celestial bolt, horizontal coordinates, time coordinates, equatorial coordinates, ecliptic coordinates; Coordinate changes; Earth: Precession and nuance of the axis of the world and the celestial poles, the motion of the celestial poles on the Earth's surface, the determination of the longitude difference; Distance measurement methods in astronomy: parallax; Planetary Movements
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to seminar works 30%).

COURSE TITLE: APPLIED COMPUTER SCIENCE
CODE: D31MTCL210
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): The discipline aims at acquiring students in the use of graphic design software, by knowing the AutoCAD application that is used in designing and drawing on a computer.
COURSE CONTENTS: Presentation of the AutoCAD assisted design application. Initiating new projects with AutoCAD. Launch of orders. Building drawings with AutoCAD.Inserting the coordinates of a drawing.Building elementary objects.Presentation of information orders and graphic aids. Creating and using polylines, splines, blocks and their attributes. Editing commands in AutoCAD. Editing by gripping.Choosing text styles from a drawing.Presentation of graphical screen management methods for viewing a drawing.Building applications in AutoCAD.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, final answers to Laboratory works 50%).

COURSE TITLE: GENERAL TOPOGRAPHY I
CODE: D31MTCL211
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Carrying out specific topographic surveys necessary for the elaboration of topographical, situational, execution and cadastral plans in compliance with the technical norms in the field.
COURSE CONTENTS: Basic general and topographic notions: The object and definition of the topography. The evolution of the topography.The importance of topography for the economy; Plans and maps: Classification of plans and maps. Content elements of plans and maps. Scale of plans and maps. Using plans and maps; Conventions on measurement units, guidelines and coordinate axes:Errors in Topography: General Terms. Error Classification.The true conventional value.The possibility of errors. Evaluation of accuracy of measurements; Planimetry Elements: Topographic Elements of the Ground. Marking and signaling points. Fix the alignments. The principle of planimetric elevations; Support networks: Local triangulation networks. Preliminary operations. Field operations; Calculations (angular meshing, edge calculation, side orientation, calculus of local triangulation peaks); Triangulation Network Excavation: Intersection Principles. The intersection forward; Reverse intersection (Delambré Process, Hansen Process, Cassini-Martinian Process, Kästner Process, Generalized Intersection Process Back. The side intersection.Linear intersection.Precision of intersections. Errors and tolerances allowed.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, ongoing assessment 50%).

COURSE TITLE: DESCRIPTIVE GEOMETRY II
CODE: D31MTCL212
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): The discipline aims at preparing students for the purpose of learningthe basic notions of descriptive geometry useful forthe subsequent understanding of the concepts of technical drawing. Descriptive geometry familiarizes students with the notions ofpoint, straight, plan, with their purges in space, as well as withrepresentations of geometric bodies in space, being the basis subsequent subjects such as Technical Drawing.
COURSE CONTENTS: Representation of geometric bodies; Flat sections in polyhedra (with planar planes, with any planes); Flat sections in cylindrical-conical bodies (planar planes, with any planes); Conducting surfaces of geometric bodies. The development of polyhedra.Conducting surfaces of cylindrical-conical bodies; Intersection of geometric bodies.The general method of determining the intersection line.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 50%, final answers at practical works 50%).

COURSE TITLE: GEODESY I
CODE: D31MTCL213
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Design and construction of support networks for topographic elevations, cadastral elevations and other engineering works.Appropriate use in the professional communication of concepts to determine the shape and size of the Earth
COURSE CONTENTS: The internal and external structure of the Earth. The theory of continent derivation.Reference and coordinate systems.Gravity, centrifugal force, gravity and potentials of this force.Free fall of bodies.The pendulum, the gravitational pendulum.Potential theory (the potential of attraction of simple bodies, harmonic functions, polynomials Legendre developments of

gravity potential - in spherical harmonic functions, normal potential, disruptive, potential development in rectangular and spherical coordinates). Level surfaces, power lines. Curvature of level surfaces. Normal gravity. Bruns spheroid. The Clairaut theorem. Variation of normal gravity (on and above the equipotential ellipsoid). Conclusions on the shape and dimensions of the Earth (bodies that approximate the physical Earth). Verticality deviation (interpolation of vertical deviation based on gravity gradient).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, ongoing assessment 30%).

COURSE TITLE: ENGLISH LANGUAGE II

CODE: D31MTCL214
ECTS CREDITS: 2
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Developing and developing the skills needed to use modern language in general and for professional purposes by developing the following skills: linguistic, discursive, strategic and socio-cultural.
COURSE CONTENTS: 1.Focus on language: Infinitive ESP, specific vocabulary: The metes and bounds method 2.Focus on language: ParticipleESP, specific vocabulary: Redistribution, land consolidation3.Focus on language: Gerund ESP, specific vocabulary: Title (property) 4.Focus on language: Grammar tests ESP, specific vocabulary: Boundary dispute and DigitalCadastral DataBase5.Focus on language: Grammar testsESP, specific vocabulary: Land administration6.Focus on language: Grammar tests ESP, specific vocabulary: Surveying7. Focus on language: Grammar testsESP, specific vocabulary: A new GIS system for the water management administration
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (answers to exam 70%, ongoing evaluation 30%).

COURSE TITLE: PHYSICAL EDUCATION AND SPORT II

CODE: D31MTCL215
ECTS CREDITS: 1
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Aims to increase the level of physical training of the future specialist to be master of his body, giving him maximum flexibility and agility.
COURSE CONTENTS: Presentation of the activity (requirements, samples, control rules). Samples and control rules (initial assessment). Exercises of the front and bands. Action on the spot and on the move. Free exercise for different body segments by overcoming the weight of your body. Free balance exercises: retained positions and crossings from one position to another. Passing from one position to another: lowering the base; increasing the support base by unbalance. Rotation movements of the body around its vertical axis - swings (turns, pirouettes).Exercises for the development of static and dynamic muscle strength. Movements using inertia obtained from an impulse - Balances. Exercises for the development of muscle elasticity and joint mobility. Exercises for developing relaxation. Exercises with balls using different handling techniques - balances, throws and catches, strokes and swings, running on the ground or on different body segments; Spins on the ground and in the air. Exercises for forming the right outfit.Exercises with individual walking stick and pairs.Practical exercises for walking and running. Circuits comprising 4-6 stations, to which are executed driving acts aimed at speed manifestation forms, as well as skill circuits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Admitted/Rejected (assessment through practical tests 80%, continuous assessment 20%).

COURSE TITLE: ENVIRONMENT PROTECTION

CODE: D31MTCL219
ECTS CREDITS: 4
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): Awareness of the rational use of the soil as it is inextensible is the physical support for life and its activities. An important role is to protect it in order to maintain its natural fertility.
COURSE CONTENTS: Soil erosion. Forms of erosion. Consequences of the erosion process.Anti-erosion agrotechnics.Soil pollution.Prevention of soil pollution.Physical methods of soil polluting.Chemical Soil Deposition Methods.Thermal Soil Deposition Methods.Biological methods of soil decontamination.Specific legislation on soil protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, ongoing evaluation 30%).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: GEODESY II

CODE: D31MTCL 323
ECTS CREDITS: 7
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Design and construction of support networks for topographic elevations, cadastral elevations and other engineering works.Appropriate use in the professional communication of concepts to determine the shape and size of the Earth
COURSE CONTENTS: Geodetic and positioning date (date definition, multiple datum problems, positioning).Performing horizontal angular observations in geodetic networks (complete series

method, Schreiber method. Processing of measurements made in planimetric geodetic networks, using the indirect observation method. Geodetic network frames (altimetric, planimetric, three-dimensional). Geodetic geometric level.Geodetic trigonometric level.Vertical date (fundamental zero point), Altitude systems (ellipsoidal altitudes, geopotential number, dynamic system, spherical orthometric, normal).Free geodetic networks (general case, degree of freedom, generalized inverse, processing methods: S transformation, Hansen-Helmert-Wolf method, Mittermayer method, Factoring by rank).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam, project (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: GENERAL TOPOGRAPHY II

CODE: D31MTCL 324
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowing how the triangulation points are transmitted to the ground. Know how to realize the planimetric routing networks; Knowing the specific methods of lifting the planimetric details;
COURSE CONTENTS: Transmitting triangulation points to the ground. Transcalculate coordinates. Planimetric lift networks. Planimetric traverses. Planimetric elevation of topographic details.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, ongoing assessment 50%).

COURSE TITLE: CADASTRE I

CODE: D31MTCL 325
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Theoretical and practical training of students in order to acquire the knowledge and methods for obtaining technical documents of the general cadastre.
COURSE CONTENTS: Introductory general notions. Short history. Definition, characteristics, role, purpose, importance, functions.Cadastre institutions.Role, attributions.Types of cadastre.Administrative-territorial division of Romania.Basic units in cadastre.Cadastral delimitation of administrative-territorial.General Provisions.Delimitation operations.Delimitation of intravilanes.The dossier of the territorial administrative unit delimitation.Land categories. Usage of landCategories of land use. General cadastre introduction works. Overall technical project.Technical project execution.Cadastre works by using plans and old maps. General cadastral work on orthophotomaps. Graphics database.Content of the basic cadastral plan.Accuracy.Content of the overall cadastral plan.Methods of obtaining cadastral plans.Accuracy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: CARTOGRPHY

CODE: D31MTCL 326
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Explaining and interpreting some terms in the field of geodesy, cartography discipline by reasoned use of the fundamental principles of mathematics, physics, topography, computer science.
COURSE CONTENTS: 1. Definition of mapping, branches, object, methods, connection with other sciences, importance of cartography and short history; 2. Formulas and notions used in cartography; 3. Cartography-map, plan, atlases, elements of plans and maps; 4. Mathematical mapping - mathematical elements of the Earth's ellipsoid, general notions of projections; 5. Mathematical mapping - Classification of cartographic projections; 6. Drawing up maps - the classic methods of drawing up. 7. Drawing up of maps - general mapping methods, planimetry elements and leveling/representation of the relief;8. Drawing up maps - methods of mapping on special maps. 9. Map drawing - cartographic representation methods, use phildigit and Philcarto, Cartes etDonnées, GIS open sources, Quantum GIS/gvSIG; 10. Map Making - Methods Modern Mapping Methods: Webmapping; 11. Mapping and Geographic Information Systems, from ancient maps to Google Earth and WorldWind (NASA); 12. Cartoreproduction - classic and digital map editing methods; 13. Cartometry - surveys on topographic maps
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: PHYSICS

CODE: D31MTCL 327
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Knowledge of notions, concepts, laws and specific principlesphysics.Knowledge of methods, techniques of investigation and exploration ofliving systems.
COURSE CONTENTS: Introduction in physics. Physical characters specific to biofysics.Atomic and nuclear physics.Direct sunlight.Broadcast Radiation.Reflection capacity.Terrestrial and terrestrial radioactivity.Atmospheric radiation.Actual radiation.Greenhouse effect.Surface radiation.Radiation balance of the atmosphere.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: INFORMATION SYSTEMS IN GEODESY

CODE: D31MTCL 439
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Have general knowledge about Information Systems, data flow, and spatial analysis.To use GIS software, to acquire geodetic data, integrate and verify them, spatial analysis.Integrate and analyze geodetic data using GIS software.Capture, update and integrate geodetic data using GIS in accordance with information technology requirements.
COURSE CONTENTS: 1. Introduction to GIS. 2. Map (analog map and digital map). 3. Accuracy of digital data. 4. GIS applications. 5. Geo-relational data model. 6. Platforms used by GIS. 7. Getting databases. 8. Projection transformations. 9. Implementation of geographic information systems. 10. Acquisition of data. 11. The stages of realization of the specific information system. Real estate in localities - intravilan. 12. Valorisation of topographical measurements. 13. Geo-spatial data. 14. GIS between benefits and risks.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: CIVIL BUILDINGS

CODE: D31MTCL 428
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): It refers to the knowledge, understanding and acquisition of the aspects related to: - the notions of the construction technique; - construction stages: - building materials, - building physics elements; - dimensioning of the infrastructure and superstructure elements; - on-site application of civil and industrial construction projects, communication and artworks, hydro-technical constructions and land improvements; - the description of the project as a whole, specifying the topographical elements necessary for plotting it on the ground.
COURSE CONTENTS: Concepts of construction techniques and construction stages. Building Materials.Elements of building physics. Construction infrastructure. Construction superstructure. Calculation of Resistance Elements. Structural strength structures. Non-structural elements and finishing in construction.Installations and specific elements of construction technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: GENERAL TOPOGRAPHY III

CODE: D31MTCL 429
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Presentation of the methods of thickening the projected support networks.Presentation of the digital model of a macro surface.Presentation and argumentation of the chosen solutions for designing a geodetic network to track the behavior of a dam by reporting to the quality, safety and security standards.Presentation of the final results obtained after the spatial geodesic network processing - the precision.
COURSE CONTENTS: Leveling elevations; General level and definition definitions; Classification of the level; Leveling support networks; Geometric level; geometrical leveling tools; Leveling devices; Determination of level differences through geometric leveling and geometric leveling types; Geometric end cap; . Geometric middle plane; Methods of geometric leveling, Closed leveling; Supported leveling of the drummers; Double leveling; the leveling with the nodal point; the leveling; the leveling combined with the leveling; Level crossing combined with transverse alignments (transverse profiles); Trigonometric level; Surface level; Representation of the relief.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, ongoing assessment 50%).

COURSE TITLE: CADASTRE II

CODE: D31MTCL 430
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge of the land stock and the need for its rational use; Explaining the ways of field research on real estate; Preparation of cadastral form and registry according to the legal situation; Creating with sense of responsibility the observance of the legislation of all cadastral documents.
COURSE CONTENTS: Conventional signs and writing rules in cadastral plans; Reconstruction of cadastral plans. Land registration of cadastral data. Technical project of rebuilding works; Rebuilding methods; Cadastral numbering; Calculation of surfaces; Correction of boundaries; Cadastral registers; Control, approval and reception of cadastral works; Detachment and plots; Forms of property existing today in Romania; Real estate advertising; Land Registry. Definition and parts; Real estate rights.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam, project (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D31MTCL 432
ECTS CREDITS: 4

TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Assimilating ways to approach mathematical models through the theory of dynamic systems.
COURSE CONTENTS: Functions of several variables: function limits, continuity; Partial derivatives, differentiability; Gradient, Taylor's formula for several functions; Extreme for more variable functions; Full calculation: double integer; Triple Integral; Surface integrals; Elements of Field Theory; Differential equations: fundamental notions, solutions, initial conditions, differential equations of the first order; Equations with separable variables. Orthogonal trajectories; Homogeneous equations. Linear equations. Bernoulli's equations; Exact total differential equations. Factor integrant; Lagrange and Clairaut's equations; Systems of differential equations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: NATIONAL AND LOCAL GEODETIC NETWORKS

CODE: D31MTCL 433
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Design and construction of support networks for topographic elevations, cadastral elevations and other engineering works.
COURSE CONTENTS: Introduction. Basic knowledge of national and local networks.Coordinate systems (rectangular, spherical, geodetic) used in national and local networks; Elaboration of the project of national and local geodetic networks of triangulation-trilateration, leveling, gravimetric and determined with GNSS technology.The materialization of the points of the national and local geodetic network of traing-trilateration, leveling, gravimetry and determined by GNSS technology. The optimal form of network development for a triangulation base of the national and local networks.Optimization of the national and local geodetic network of triagulation-trilateration.The use of GNSS technology to optimize the triangulation network and the beneficial contribution of this technology.Geometry of the triangulation-trilatelation network using the new GNSS technology. Optimization of the national and local geodetic network through trilateration, triangulation and GNSS.Comparative study on geodetic network optimization through trilateration, triangulation and GNSS technology in various combinations. Project overloading a national and local geodetic network of triangulation-trilatelation, GNSS and of leveling and gravimetry.Geodesic Earth Observation Network project taking into account GNSS space technology. Compensation of national and local networks by indirect measurement method and determination of the accuracy of their determination.Compensation of national and local networks by means of conditional measurements and determination of the precision of their determination.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: ELIPSOIDAL GEODETICS

CODE: D31MTCL 434
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Design and construction of support networks for topographic elevations, cadastral elevations and other engineering works.
COURSE CONTENTS: Introduction. Earth Figure (topography, sphere, ellipsoid, geoid, relative position of the geoid, ellipsoid and terrestrial surface, reference ellipsoid). Coordinate systems (rectangular, spherical, surveying). The rotation ellipsoid (parameters, parametric equations, main curve radii). Determination of rotation ellipsoid parameters from parallel and meridian arc measurements.Curves on the surface of the rotation ellipsoid (the linear element of a curve, the angle formed by the coordinate lines, the element of the array, the azimuth of a curve). Curvature curves. The Meusnier theorem.The radius of curvature of a normal section.Average Gauss radius.Normal cross sections.Geodetic line (differential equations, Clairaut equations, parametric equations, Puiseaux-Weingarten-Gauss transformations).Problems solved on the rotation ellipsoid (spherical excess of a small ellipsoid triangle, solving small ellipsoidal triangles, direct and reverse geodetic problem, differential formulas). Reduce horizontal angular observations to the reference surface.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: DOMAIN PRACTICE

CODE: D31MTCL 435
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Practical training of students in order to acquaint and acquire the methods specific to: topography; geodesy; surveying; GPS; photogrammetry; automation of topo-geodesic works.Knowledge of the measuring equipment specific to geodetic works of planimetry and levelment.
COURSE CONTENTS: 1. Topographic points, marking and signaling points. 2. Benchmarking

works. 3. Instruments for direct measurement of distances. 4. Topographical operations with panglica and poles. 5. Istruments and apparatus for measuring angles. 6. Angle measurements. 7. Indirect measurement of distances. 8. Using plans and halls. 9. Local triangulation relationships. 10. Description of triangular networks. 11. Planimetrical guidelines. 12. Planimetric reduction of topographic details. 13. Geometric and trigonomerical living. 14. Geometric level instruments. 15. Geometric leveling traverses.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: PHYSICS II

CODE: D31MTCL 437
ECTS CREDITS: 3
TYPE OF COURSE: Fundamental discipline
COURSE OBJECTIVE(S): Knowledge and understanding of the main notions of modern physics structured on chapters: electrodynamics and electromagnetic waves, modern optics, spectroscopy and lasers, solid physics. Knowledge of modern notions of optics, physics of dielectric materials, different optical and optoelectronic devices and instruments with their main characteristics. Explanation, understanding and interpretation of the main theoretical and practical notions of the subject.Formation of technical and applicative skills for the use of laboratory apparatus and devices. Interpretation and processing of experimental data using the computer;
COURSE CONTENTS: Electrodynamics, electromagnetic waves, Maxwell's equations, dual nature, spectral classification. The main phenomena resulting from the wave-like wavelength: light dispersion and absorption, light polarization and applications, light interference and interference devices, light diffraction and diffraction. Photonic optics, photoelectric effect, Compton effect, radiation laws. Consistent optics and lasers, construction principles, different types of lasers, their use. Nonlinear optics. Optical fibers, description, properties, their use. Different types of materials and their properties: solid and semiconductor, dielectric and ferroelectric, superconductivity. Superconducting materials, applications of superconductivity, Optoelectronic devices. Plasma physics, some applications of plasma obtained by electrical discharge into gases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

3RD YEAR, 1ST SEMESTER

COURSE TITLE: INFORMATION SYSTEMS IN CADASTRE

CODE: D31MTCL 544
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Theoretical and practical training of students in acquiring the knowledge and methods related to the introduction of specialized cadastres.
COURSE CONTENTS: Cadastre of the agricultural fund. Cadastre of the real estate fund. Water cadastre. Cadastre of the forest fund. Cadastre of land with special destination.Industrial cadastres.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: GEODESIC GRAVIMETRY

CODE: D31MTCL 545
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Design and construction of support networks for topographic surveys, cadastral elevations and other engineering works.
COURSE CONTENTS: Definitions. Historic. Link to other disciplines. Geodetic gravity. Gravity. Centrifugal force.gravity; Potential of gravity field. Level surfaces.Lines of force.Subject of gravimetric determinations.Reductions and anomalies of the gravity field.Anomaly (reduction) in the open air (Faye); intermediate layer reduction; Relief reduction. Reduce Bouguer; Vertical deviations. Geoid corrugations.Astronomy-geodetic determination of the vertical deviation; Reduction of astronomical-geodetic measurements on conventional surfaces.Modern methods of geoid determination.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: SPACE GEODESY TECHNOLOGIES

CODE: D31MTCL 546
ECTS CREDITS: 5
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Appropriate use in the professional communication of global positioning concepts. Argumental use of mathematics, physics and specialty concepts, principles and techniques for explaining and interpreting GPS positioning issues.Acquiring skills to interpret measured data using GPS technology. Using computational programs for data processing measured with GPS technology. Assessment of the quality of some methods and procedures in the field of geodetic engineering regarding GPS positioning.

COURSE CONTENTS: Overview of GPS. The principle of positioning in the GPS system.The main errors in GPS positioning.Coordinate systems used in GPS technology.GPS measurement methods.Planning and preparing a GPS campaign.GPS receivers.Geodetic networks created by GPS measurements.Coordinate systems used in satellite geodesy.Processing of GPS observations.Romanian Positioning System ROMPOS.European EUREF Reference System.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: COMPENSATION OF MEASUREMENTS

CODE: D31MTCL 547
ECTS CREDITS: 4
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): The way to process measured data to get the most probable values.The ability to detect errors before processing, the ability to calculate the accuracy of the determinations.
COURSE CONTENTS: Classification of measurement errors. Basic notions of probability theory and statistics. Processing of direct measurements. Processing of Indirect Measurements.Correction equations. Normal equations. Estimation of accuracy. Processing of geodetic measurements in planimetric networks. The variation of the pitch depends on the variation of the x and y coordinates. The variation of the distance D according to the variation of the x and y coordinates. Calculating error ellipse. Processing conditional measurements. Examples of using statistics for geodetic measurements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 50%, ongoing assessment 50%).

COURSE TITLE: ORGANIZATION OF TERRITORY AND ECOLOGY I

CODE: D31MTCL 548
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge, understanding of the concepts, theories and basic methods of the domain and of the specialization area; their proper use in professional communication.
COURSE CONTENTS: Organization, land/land/geographic spatial planning. The rural area. General problems in the organization and arrangement of the territory.Regionalization as a way of organizing the territory.Sustainable development and development of the territory. Land Fund of Romania. Land cadastre and land organization. Romanian rural space.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 80%, ongoing assessment 20%).

COURSE TITLE: GEODETIC ASTRONOMY

CODE: D31MTCL 549
ECTS CREDITS: 5
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Appropriate use in the professional communication of concepts to determine the shape and size of the Earth.Explaining and interpreting geodetic engineering issues by using well-grounded techniques, concepts and fundamental principles of mathematics, physics as well as those of specialty in astronomy, topography, geodesy, photogrammetry, remote sensing, cadastre.
COURSE CONTENTS: Spherical trigonometry. Introduction to Geodesic Astronomy. The infinite universe; Solar system.Earth Revolutionary Movement.The rotation movement of the Earth around its axis (Diurnal Movement). Celestial sphere and apparent daytime motion of the celestial sphere: The apparent daytime and annual movement of the Sun. Astronomy coordinate systems. Celestial reference systems. Astronomical phenomena. Time and time measurements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, ongoing assessment 30%).

COURSE TITLE: ELEMENTS OF ARCHITECTURE AND LANDSCAPING

CODE: D31MTCL 557
ECTS CREDITS: 3
TYPE OF COURSE: Complementary discipline
COURSE OBJECTIVE(S): It is directly related to ensuring the environmental balance of the environment, the lndscape architecture is concerned with the preservation and development of landscapes and associated values, for the benefit of current and future generations. Forests and free-range areas have an essential ecological role: they produce the oxygen necessary for life, reduce the physical, chemical and microbial pollution of the atmosphere, create a favorable microclimate, provide shelter to birds and other living creatures and, where appropriate, protect flora, soil, improves and capitalizes degraded lands.
COURSE CONTENTS: Introduction; Relationships of trees and ornamental shrubs with the factors of the environment; Relations with climatic factors: edatical factors, orographic factors, urban environment factors; Zoning of ornamental wood species; Multiplication of ornamental wood species, dendrological nursery; Production of sexually and vegetatively propagating material; The importance and role of green spaces.The evolution of landscape architecture.The importance and role of green spaces, their distribution and their systematization.General principles of composition of parks and gardens.Constructive elements of green spaces.The roads in parks and gardens. Draw roads and alleys. Vegetation and its components.Designing

green spaces.Establishing their green spaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

3RD YEAR, 2ND SEMESTER

COURSE TITLE: SATELLITE GEODESY
CODE: D31MTCL 650
ECTS CREDITS: 4
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Appropriate use in the professional communication of satellite geodetic concepts. The use of the fundamental concepts, principles and techniques in mathematics, physics and specialty to explain and interpret some problems in the field of satellite geodesy.
COURSE CONTENTS: Gettings started in geodesy with satellites. Orbit and orbital motion of satellites. Satellite signals. Electromagnetic waves and their propagation into the atmosphere. Doppler Effect. Generation and structure of satellite signals. Content and Structure of GPS Signals. Receiving satellite signals. Technique for receiving satellite signals. Processing of satellite signals. Coordinate systems used in satellite geodesy. Coordinate transformations in satellite geodesy.Reference systems used in Satellite Geodesy. Time systems used in Satellite Geodesy. Methods of measurement and determination of point positions. Types of observations used in Spatial Geodesy. Using GNSS systems (GPS, GLONASS, and GALILEO) in Geodesy. Interpretation and transformation of satellite observations results.GNSS networks and integration possibilities with classical networks (terrestrial).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam, project (answers to exam 70%, ongoing assessment 30%).

COURSE TITLE: CARTOGRAPHIC PROJECTIONS
CODE: D31MTCL 651
ECTS CREDITS: 4
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Knowledge, understanding of the concepts, theories and basic methods of the field and of the specialization area: Knowing the terms used in CARTOGRAPHY and understanding their relationships; Knowing the methods used in Cartography; explaining the calculation formulas and interpreting the results; the formation of skills for map-based scientific research and the ground-map relationship.
COURSE CONTENTS: Azimuth projections, classification and description of azimuth projections; Stereographic projection 1930, stereographic projection 1970; Cylindrical projections, classification; Straight cylindrical projections. Mercator projection; Oblique and transverse cylindrical projections; GAUSS-KRUGER projection, geometrical elements, deformations; Coordinate transformations in the Gauss-Kruger projection, meridian convergence angle, reduction of direction and distances to the projection plan; UTM projection, geometrical elements, deformations; Nomenclature of maps in the TUM projection; Conical projections; Conventional projections and derived projections.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, ongoing assessment 30%).

COURSE TITLE: ORGANIZATION OF TERRITORY AND ECOLOGY II
CODE: D31MTCL 652
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Using basic knowledge to explain and interpret various types of concepts, situations, processes, projects, etc. associated with the domain. Appropriate use of standard criteria and methods of assessment to assess the quality, merits and limits of processes, programs, projects, concepts, methods and theories.Developing professional projects with the use of established principles and methods in the field.
COURSE CONTENTS: Organizing the Romanian geographic space. Organizing and arranging agricultural land. Organizing and arranging green space. Hydraulic engineering; Transport arrangements. Organization and spatial planning of the territory.Organization and arrangement of tourist space.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 80%, ongoing assessment 20%).

COURSE TITLE: CARTOGRAPHICDRAWING
CODE: D31MTCL 653
ECTS CREDITS: 3
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Knowledge, understanding of the concepts, theories and basic methods of the domain and of the specialization area; their proper use in professional communication.
COURSE CONTENTS: Carried out the cartographic drawing. Cartographic projection systems.Representation of the land surface.Using computers to represent cartographic information. Map orientation. Study maps. Maps map operations.Analysis and interpretation of maps.Maps and digital mapping.Geographic and Territorial Information Systems used to manage Urban-Rural resources. Using maps to represent geographic features. Drawing and editing techniques with AutoCAD.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam

70%, ongoing assessment 30%).

COURSE TITLE: TOPOGRAPHY ENGINEERING

CODE: D31MTCL 654
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): The use of topographic devices; Drawing of connection curves; Topographical measurements made for land improvement works;-drawing works for the reservoir lake; Measurement of level differences and calculation of points quotas; Drawing up the quoted plans and drawing the level curves; Making longitudinal and transversal profiles for land improvement works; Drawing terraces and leveling the surfaces; Plotting of characteristic building points; Tracing and execution of civil, industrial and agricultural constructions; Tracking the route of a communication route on the ground; Drawing and opening of the lines in the forest; Tracking bridges and viaducts on the ground.
COURSE CONTENTS: 1. The object and definition of engineering topography. 2. Planimetric and multiple cutting networks. 3. Spatial support networks for transportation of engineering constructions and works. 4. Topographic preparation of projects for engineering and construction works - establishing the necessary documentation. 5. Topographic preparation of projects for engineering and construction works. 6. Tracking simple topographic elements. 7. The use of engineering topography in the design, execution and exploitation of engineering and construction works. 8. Cutting curves. 9. Methods for tracking and pichetation of intermediate points of circular curves. 10. Topographic measurements and plans following designing functional improvement works and technical-edilitary networks. 11. Water levelling. 12. The main topographic measurements carried out at the transit of functional, engineering and construction works. 13. Gabaritation of deble and ramble. Storage of recovery, design and irigation works.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, ongoing assessment 50%).

COURSE TITLE: PHOTOGRAMMETRY I

CODE: D31MTCL 655
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge, understanding of the concepts, theories and basic methods of the field and of the specialization area: Knowing the terms used in photogrammetry and understanding the relationships between them; Knowledge of instruments used in photogrammetry; Explaining the formulas and interpreting the results.
COURSE CONTENTS: Introduction (definition, purpose and development of photogrammetry). Terms and terms used in photogrammetry.Optics used in photogrammetry; Characteristics and constant of the objective;Aberrations of Objectives; shutter; Diaphragm; Light filters.Photochemical process in photographic techniques; Photographic emulsion; Preparation of photographic emulsions; Structure of silver bromide crystals; The chemical nature of the latent image; Spectral sensitization of photographic emulsions.Photographic processing of black and white photographic materials; Photographic processing of color photographic materials; Photographic materials; The physical properties of the image developed.Aerofotografierea; Air photography; Technical conditions to be met by aerofootogrammetric airplanes; Airplane types; Technical specifications.Aerofotogrammetric chambers; Technical conditions to be met by aerofootogrammetric chambers; Criteria ofPhotogrammetric camera attachments; Verification and calibration of aerofotogrammetric chambers; Calibration methods.Aerophotography project; Meteorological and optical-atmospheric conditions of aerophotography; Selection of films and filters for aerial photography.Calculations required for the aerophotography project; Calculation of heights; Calculation of photogram coverage.Calculating the number of bands and the number of photograms; Calculation of band inputs; Calculation of fuel consumption.Laboratory processing of aerial photography results; Conditions to be met by aerial photography. Verification of aerial photography results; Overall assessment of the quality of aerial photography results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, ongoing assessment 30%).

COURSE TITLE: SPECIALTY PRACTICE

CODE: D31MTCL 656
ECTS CREDITS: 4
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Practical training of students in order to acquaint and acquire the methods specific to: topography; geodesy; surveying; GPS; photogrammetry; automation of topo-geodesic works.
COURSE CONTENTS: 1. Trigonometric traverses. 2. Shift directions (horizontal angles). 3. Trimming the directions (horizontal angles). 4. The surface of a quote or a difference of level. 5.T reated leaving of the projected speed lines. 6. Tracking of the coupling curves. 7. Deble and ramble gabaration. 8. Methods of planning the characteristics of the constructions. 9. Transmission of proposed floors and foundations. 10. Determination of construction hearing and

vericity. 11. Loss of support network by gps measuring - static method with dual frequency gps equipment. 12. Processing gps observations. 13. Transformation of wgs 84 coordinates in stereo coordonate 1970. 14. Creating a road drive. 15. Achiving of a situation plan.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 50%, ongoing assessment 50%).

COURSE TITLE: PHYSICAL GEOGRAPHY
CODE: D31MTCL 659
ECTS CREDITS: 3
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Interpretation of relations between the geosystem and the neighboring systems (cosmic space and the terrestrial internal system) and the formation of a synthesis image of the Earth's shells (the lithosphere, the reliefosphere, the atmosphere, the hydrosphere, the biosphere, the anthroposphere) and the relations between them.
COURSE CONTENTS: Geography: object, principles, methods. Geographic cover, geographic environment, geosystem and its characteristics. Geographical environment laws. Global laws: the law of zoning, the law of inter-consistency, the law of patrolling, the law of azonality. Specific laws. Characteristics of the Universe. The Structures of the Universe.Coordinates of the heavenly sphere.Solar system. Sun: characteristics, internal structure, solar activity and influences on the terrestrial surface. The Earth - Moon - Sun system. Phenomena resulting from the relationship Earth - Moon - Sun. The shape and dimensions of the Earth. Geographical coordinates. Rotating ellipsoid and geoid. The importance of Earth's shape and dimensions for space applications.The Movements of the Earth.Earth's rotation movement and its consequences. The Revolutionary Movement of the Earth and Its Consequences. Precession and forced labor. The internal structure of the Earth.Characterization of the Earth's inner shells. Composition of the Earth's crust and bark types. Geophysical properties: Earth density, Earth's thermality, gravity, terrestrial magnetism, magnetosphere and its importance, internal radioactivity. Litosfera and its structure in plates. Mechanism and causes of plate movement. Theory of global tectonics. The phenomenon of subduction. Phenomena associated with the dynamics of the bark: formation of mountain units in the view of global tectonics; volcanism and the spread of volcanoes on the Globe, their earthquakes and geographical area. Land Relief. Planetary Relief: Continents and Oceans. Major Relief.Relief of ocean basins.Medium and minor relief.The Atmosphere and its Importance for Earth.Evolution of the atmosphere.Limits, composition and structure of the atmosphere. The general circulation of the atmosphere. Hydrosphere.The characteristics of the hydrofoil and its units.General Circulation of Ocean Waters. Ocean - Atmosphere Relationship.The laws of the water envelope.Biosphere.Factors influencing the distribution of living organisms.Pedosphere.Biosphere.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

4TH YEAR, 1ST SEMESTER

COURSE TITLE: TRADITIONAL AND MODERN MATERIALS FOR CONSTRUCTION AND LAND IMPROVEMENT E
CODE: D31MTCL 765
ECTS CREDITS: 5
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Illustration of the traditional and modern materials used in the execution of the elements and structures of the constructions. The characteristics and fields of use of the materials presented constitute the basis for the sizing and Verification of constructions, for the technological and economical design of the execution, exploitation and maintenance works.
COURSE CONTENTS: General properties of building materials (types of traditional and modern building materials, physical and mechanical properties of building materials).Natural stone and building materials made of natural stone. Mineral aggregates for mortars and concrete. Non-hydraulic mineral binders. Mineral hydraulic binders. Composite materials. Mortars. Concrete. Concrete with mineral binders. Metallic materials. Ceramic materials.Wood and wood-based materials.Bituminous materials.Thermal and thermoplastic materials. Composite materials.Insulating materials. Protective and finishing materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: PHOTOGRAMMETRY II
CODE: D31MTCL 766
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Explanation and interpretation of some problems related to the coordinate system used in photogrammetry, photogrammetry scale, photoplaning methods.
COURSE CONTENTS: Planimetric photogrammetry; Coordinate system used in photogrammetry; Photographic orientation elements; Elements of the central projection. Photo ladder; Deformations on the photogram. Recovery of photograms;

Classification of recovery methods; The general properties of recovery; Graphical Recovery Procedures; Grapho - mechanical method of recovery; Optical-graphic methods of recovery. Fotoredresarea; Fotoredresatorul; Classification of photoreceptors; Construction of photovoltaic panels.Types of photoreceptors; Optical-mechanical recovery in the photoreceptor.Makefotoplane; Drawing photoplan; Fotoschema and photo assemblage. Stereofotogrammetria; Direct stereoscopic view; Indirect stereoscopic view; Stereoscopic measurements; Stereoscoapele. External orientation of photograms; The general case of the double spatial retrointersection; Relative orientation; Absolute orientation. Terrestrial photogrammetry; General; Cases for taking photograms in terrestrial photogrammetry; Exploitation of terrestrial terrestrial alarms.Precision in terrestrial photogrammetry; Terrestrial photogrammetric cameras. Photogrammetric; Number of support points required; Photogrammetric screening cases; Conditions to be met by a photogrammetric marker; Photogrammetric surveying technique. Radial plane phototriangulation; Principles and types of planar radiographic phototriangulation; Planar radiographic phototriangulation; Planar-numerical phototriangulation. Aerotriangulaţia; Definition, classification; Coordinate systems; The principle of aerotriangulation; Design of aerotriangulation works; Data collection. Photo interpretation; Definitions; Advantages and limits of photo interpretation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: ENGINEERING MEASUREMENTS

CODE: D31MTCL 767
ECTS CREDITS: 5
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): The use of topographic devices; drawing of connection curves; topographical measurements made for land improvement works; drawing works for the reservoir lake; measurement of level differences and calculation of points quotas; drawing up the quoted plans and drawing the level curves; making longitudinal and transversal profiles for land improvement works; drawing terraces and leveling the surfaces; plotting of characteristic building points; tracing and execution of civil, industrial and agricultural constructions; tracking the route of a communication route on the ground; drawing and opening of the lines in the forest; tracking bridges and viaducts on the ground.
COURSE CONTENTS: Transportation of the terraces and roads of loads. Transportation of way loads.Topography of construction methods of planning in the plan of characteristics of construction.Method of polar coordination.Method of rectangular coordination.The method of pregnancy inconsection.Repeated intersection method. Topographical works concerning the transposition and execution of civil, industrial and agricultural constructions.Transmission of proposed floors and foundations.Determination of the heat of constructions. Road tracking of the route of a communication route.Floor transportation of floors and floor projects.Trace and opening lines in the weaknesses.Measurement and analysis of knowledge.Measurement and analysis of horizontal leaves and land areas.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: TERRITORY PLANNING AND URBAN PLANNING

CODE: D31MTCL 769
ECTS CREDITS: 4
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Using the methods to draw up the situational plans; Use of framework content to develop PUD;Use of the Territorial Balance Sheet calculation methods;Graphical execution of situation plans and PUDsby classical and modern methods, according to the required situation.
COURSE CONTENTS: 1. The historical evolution of urbanism. 2. Urban structure of the territory. 3. Landscaping. 4. Land use planning documentation andurbanism. 5. Land occupation and location of buildings. 6. Urban planning. 7. Urban transport and traffic problems. 8. Equipment and technical and town planning. 9. Urban dwelling. 10. Powers of public administration in the field of spatial planning and urban planning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: AUTOMATIC DATA PROCESSING OF GEODETIC DATA

CODE: D31MTCL 770
ECTS CREDITS: 5
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): The field of "Automatic Topo Geodetic Data Processing (P.A.D.TG.)" provides students with the theoretical and practical support of taking, processing and reporting measured topographic data.It offers the acquisition of the fumamental notions of the automatic processing of topogeodic data creating the applicative concepts for the specialized works by using and assembling the basic knowledge of geodesy, topography and cartography assimilated to the specialized courses and the use of the advanced computing technique in order to optimize the specialized works.
COURSE CONTENTS: Aspects regarding the automation of the topo-geodetic data acquisition

process measured in the field. Description of the transfer software measured from the device to the computer - GPS measured data. Automatic processing of GPS data. Description of the transfer software of the measured data from the device to the computer - Data measured with the total station. Automatic processing of measured data with the total station. Description of the transfer software of the measured data from the device to the computer Data measured with the digital level. Automatic processing of measured data by levelment.Program models used for computerized calculation of topo-geodetic measurements.Using AUTOCAD to graphically process data from measurements. Carry out the situation plan in AUTOCAD. Editing topo-cadastral plans with TOPOLT program.Using the TOPOSYS program in the automatic processing of topogeoidal data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: SPECIAL TOPO ELEVATIONS

CODE: D31MTCL 778
ECTS CREDITS: 5
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Correct use of geodetic engineering concepts and tools for the development of topographical, site, cadastral plans. Explanation of the way of drawing up the topographic plans of the situation, execution, cadastre and the peculiarities of each of them.
COURSE CONTENTS: Solving triangulation networks for special topo racks. Topographic works in mining exploitation to date. Creation of support network. Topographic works in mining exploitations to the day. Determination of excavated volumes. Calculation of the volume in terraces.T he volume of dykes and embankments.Underground support networks. Supporting network features. Design of supporting framework.Geodetic and topographic networks for tunnels and bridges.Topographic elevation of river valleys, basin and lakes. Topographical works necessary for hydrological studies. Lifting of technical and public underground networks in localities. Topographical surveys required for airport design and construction. Topographic elevations at road design and construction. Topographic elevations in rail transport. Topographic works on water cadastre and communication paths.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

4TH YEAR, 2ND SEMESTER

COURSE TITLE: BEHAVIOR MONITORING LAND AND BUILDINGS

CODE: D31MTCL 871
ECTS CREDITS: 3
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): The role of structural monitoring in building health care.Legislation in the field of structural monitoring.Classification of land and building behavior tracking.Static and cinematic methods.Topographic Tracking Networks.Design of tracking works.General methods of static tracking.General methods of kinematic, quasistatic, quasidinamic, dynamic tracking.Tolerances and precision of structural monitoring methods.
COURSE CONTENTS: General notions on land and building behavior tracking. Methods of measuring deformations and displacements of constructions. Tracking of deformations of constructions by topo-geodesic methods. Using models to study and track construction deformations. Static and kinematic models for the determination of deformations.Topo-geodetic methods for measuring displacements and deformations.Using high precision geometric and trigonometric method.Using static and cinematic GPS methods to monitor landslides.Using modern measuring equipment to track the behavior of buildings and land.General notions on land and building behavior tracking.Classification of tracking activity over time of land and buildings. Categories of movements of geometrically monitored constructions in static regime: compaction of foundation ground, variation of groundwater level. Categories of motion movements of geometrically monitored constructions in static regime: compactions, horizontal displacements of buildings, landslides, diving, permanent inclinations of high structures. Description of the tracking network for land and construction behavior.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: ORGANIZATION OF TOPO-GEODETIC WORKS

CODE: D31MTCL 872
ECTS CREDITS: 4
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): General notions of the enterprise. Company law.Classification of works in the field of land measurements.The importance of managerial activity in organizing and conducting geodetic works.Production, productivity, efficiency and efficiency of geodetic works.Driving styles and leadership.Human resources management.Norms and norms in the activity of land measurements.Normalization of work in terrestrial

measurements.The antecedence and the cost of geodesic works.
COURSE CONTENTS: Processes and management relationships. Business management functions. Human resource management. Driving and control. Principles and management system. The entrepreneur, the firm and the environment. Types of companies.Company strategy and management.Decision-making and information systems of the firm.Managers relationship – subordinates. The company's internal rules of order.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam, project (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: WORKS OF ART, HYDRO-TECHNICAL CONSTRUCTIONS, TECHNICAL-MUNICIPAL NETWORKS AND LAND IMPROVEMENT

CODE: D31MTCL 873
ECTS CREDITS: 3
TYPE OF COURSE: Domain discipline
COURSE OBJECTIVE(S): Knowledge and understanding of the particularities of the hydro-technical constructions and works, art works, land improvement and technical-urban networks.
COURSE CONTENTS: River basins. Hydraulic engineering and construction. General. Classifications. Hydrotechnical transversal works in hydrographic basins. Debt clearing works. Dams for water accumulation.Irrigation systems. Water inlets. Inverse. Channels and pipes. Hydraulic extractors. Power dissipators. Longitudinal hydrotechnical works in river basins. Works to regulate the bed. Damming. General. Dikes. Drainage and Drainage Systems and Works. Works of art. Works to prevent and combat soil erosion. Technical and hydro technical works on the slopes. Technical and municipal networks. Exploitation and maintenance of constructions, hydro-technical and art works.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%)

COURSE TITLE: REMOTE SENSING

CODE: D31MTCL 874
ECTS CREDITS: 3
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Deepen knowledge of the teledetection-specific terms and associated sciences.Knowledge of remote sensing applications and recording and research equipment of importance in the field and with applications in agriculture.Knowing the phenomena of remote sensing.Recognition of satellite equipment.Studying the remote sensing device.Acquiring the characteristics of solar and non-solar sources.Knowledge of remote sensing data processing systems.Studying remote sensing data interpretation systems.
COURSE CONTENTS: Introduction and fundamental components of a remote sensing system. Electromagnetic radiation.Electromagnetic spectrum.Phenomena of interaction of radiation with the atmosphere.Phenomena of interaction of target radiation.Description and operation of passive sensors and active sensors.Characteristics of remote sensing images.Types of resolutions.Spatial resolution, scale and pixel size.Spectral resolution, radiometric resolution, temporal resolution.Multi-Spectral Scanning.Characteristics of thermal imaging.Geometrical distortions of images.Description of digital cameras and aerial photography. Microwave Radiation. Radar Radar, Interaction with Target. Radar image distortions.Radar image properties.Airborne radar systems and space systems.The orbits of the satellites.Satellite capture tools. Ground transmission and preprocessing of remote sensing data. Classification of images .Spectral classification. Satellite programs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, ongoing assessment 40%)

COURSE TITLE: LAW AND LAND-CADASTRAL LEGISLATION

CODE: D31MTCL 876
ECTS CREDITS: 3
TYPE OF COURSE: Speciality discipline
COURSE OBJECTIVE(S): Acquiring essential notions regarding the legal regime of land in Romania as well as on real estate advertising.
COURSE CONTENTS: Introduction to the legal system and its divisions. Sources of law. Legal rule. The notion, object and sources of land-cadastral law. The legal regime of the land categories from the land fund of Romania. Land ownership right.Characteristics and forms of ownership. Public property and private ownership of land. Obligations of landowners. Legal liability in the land area. Legal regulation of the general cadastre system. Making real estate publicity through land books. Organization and operation of the National Agency for Cadastre and Real Estate Advertising.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

COURSE TITLE: ASSESSMENT OF IMMOVABLE PROPERTY

CODE: D31MTCL 880
ECTS CREDITS: 2
TYPE OF COURSE: Speciality discipline

COURSE OBJECTIVE(S): Theoretical and practical training of students in order to acquire the knowledge and methods for obtaining the technical documents of the real estate valuation reports.

COURSE CONTENTS: Evaluation activity, basic concepts in evaluation, conceptual field and ownership concept; Real estate market - characteristics of real estate markets, their types, real estate market analysis, value of real estate properties - value types;Types of evaluation. Land valuation, land valuation methods:-Commercial Sales Technique; -the technology of plots and development; -assignment method; -the extraction technique; -the residual technology; -capitalization of land rent. Organizing and conducting evaluation activities. Specific evaluation principles. Structure of the evaluation report. Diagnosis of real estate - the stage preceding the evaluation. Evaluation methods.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Verification (answers to exam 60%, ongoing assessment 40%).

FIELD: AGRONOMY
PROGRAMME TITLE: CONSULTING SERVICES AND MANAGEMENT IN AGRICULTURE
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MODERN SYSTEMS OF AGRICULTURE

CODE: D31CMAM101
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Familiarizing of students with the main farming systems; Development of skills in terms of sustainability of agricultural systems.
COURSE CONTENTS: Introduction, definition and attributes of the agricultural system; Agriculture system with alternate rotation; Conventional culture system; No tillage farming system (not till); Sustainable farming system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answers to Laboratory works 30%)
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 50%, Periodic testing through control work 10%, Testing continues throughout the semester 10%, Tests during the semester - themes of control 10%, Solving themes 10%).

COURSE TITLE: AGROTURISM AND AGRO-TOURIST SERVICES

CODE: D31CMAM102
ECTS CREDITS:
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Identification of the tourist potential of a hillside / mountain area and the elaboration of a database necessary for the design of a farm / agro-tourism enterprise; Analysis and characterization of agricultural production systems and policies in Romania and effective implementation of CAP measures for sustainable rural development.
COURSE CONTENTS: Acquiring European concepts: agro-tourism, ecotourism, rural tourism; Knowing the specific problems of agro-tourism and rural tourism in Romania and the European Union; Identifying measures and methods for preserving the natural and cultural heritage; The technical aspects of the implementation of agro-tourism projects

COURSE TITLE: AGRICULTURAL ECONOMIC CONJUNCTES AND RELATIONS

CODE: D31CMAM103
ECTS CREDITS: 6
TYPE OF COURSE: Discipline
COURSE OBJECTIVE(S): Knowledge of the essential elements of the food economic conjuncture, issues related to the globalization of the world economy, protocol-related elements and commercial negotiation, etc.; Understanding how to organize specific activities in the market economy.
COURSE CONTENTS: Explaining the concepts related to the problems of institutionalization of economic relations, ecological equilibrium, labor resources and their use in rural spaces, use of capital elements, economic aspect of exchange relations, rural space, etc.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, reference 40%).

COURSE TITLE: SPECIAL TECHNOLOGY FOR OBTAINING AGRICULTURAL PRODUCTS I

CODE: D31CMAM104
ECTS CREDITS: 6
TYPE OF COURSE: DO
COURSE OBJECTIVE(S): Presenting in a concise and accessible way the course material and practical works on the technologies of efficient plant cultivation and knowledge of the influence of the pedoclimatic conditions in the cultivation areas on the technological measures applied to the crops.
COURSE CONTENTS: Detailed presentation of the main technological measures for the plants grown in accordance with the climate and soil requirements according to their stage of development and the measures that can be applied to achieve high and economically profitable productions at the same time.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, reference 50%).

COURSE TITLE: FARM MANAGEMENT

CODE: D31CMAM105
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Knowing the notions of the economic agent in terms of its organization, its functionality, the way of implementing the modern techniques and methods of management, etc.
COURSE CONTENTS: Explanation of management-specific concepts: economic agent, resource and production factor, decision, strategy, economic analysis, etc; Presentation of the existing market relationship between resources and factors of production, conjuncture and decision, policy and strategy, degree of development and resources (financial, human, material), etc.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, Reference 40%)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ORGANIC FARMING

CODE: D31CMAM206

ECTS CREDITS: 5
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Knowledge of the legal regulations, principles and elements of organic farming, of different organic farming systems, as well as of the methods and means of obtaining organic produce.
COURSE CONTENTS: Use of specialized vocabulary and appropriate communication methods to describe the underlying principles of using modern organic farming technologies; Acquiring the concepts of organic farming, organic farming systems, methods and means of obtaining organic farming.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (exam answers 40%, reference 60%).

COURSE TITLE: SPECIAL TECHNOLOGIES FOR OBTAINING AGRO-ZOOTECHNICAL PRODUCTIONS II

CODE: D31CMAM207
ECTS CREDITS: 7
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Studying and acquiring the newest principles and methods of reproduction, growth, amelioration and nutrition of domestic animals of economic interest in strict accordance with the specific technologies of breeding and maintenance of each animal species, specific to the zoo technical sector.
COURSE CONTENTS: Classification of the best agro-zoo technical techniques; Legislation on quality and sanitation parameters for animal products; legislation on the monitoring and control of animal welfare.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, reference 50%).

COURSE TITLE: DISTRIBUTION AND SALE OF AGRICULTURAL PRODUCTS

CODE: D31CMAM208
ECTS CREDITS: 6
TYPE OF COURSE: Discipline
COURSE OBJECTIVE(S): Knowledge of market, product, price, distribution, advertising, etc.; Understand how to organize specific marketing activities in technical and organizational terms.
COURSE CONTENTS: Explanation of specific marketing concepts: market, consumer, individual variable, segment, economic life, quality, etc.; Presenting the existing market-to-market ratio between supply and demand, product-price, distribution-sale, communication-advertising, policy-marketing strategy, etc.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (exam answers 60%, reference 40%).

COURSE TITLE: AGRICULTURAL EXPERTISE AND ASSESSMENT CONSULTANCY I

CODE: D31CMAM209
ECTS CREDITS: 8
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): To acquire and use the specialized vocabulary and the appropriate communication methods specific to the agricultural expertise / appraisals with applicability in agribusiness, to deepen the methods and the characteristics of each of them and to concretely exemplify the relations and the specific aspects of the expertise / evaluation activity.
COURSE CONTENTS: It is intended to acquire the knowledge delivered at the course and the seminar / laboratory and to deepen the specialized knowledge, the development of the synthesis capacity, the efficient use of the existing information in the field.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, reference 50%).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: AGRICULTURAL EXPERTISE AND ASSESSMENT CONSULTANCY II

CODE: D31CMAM311
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): To acquire and use the specialized vocabulary and appropriate communication methods specific to the agricultural consultancy with applicability in agribusiness, to deepen the consultancy methods and the characteristics of each of them and to concretely exemplify the relations in the consulting environment and the concrete aspects of the consultancy activity.
COURSE CONTENTS: To learn the knowledge of the course and seminar / laboratory and to deepen specialized knowledge, to develop the synthesis capacity, to make efficient use of existing information in the field of agricultural consultancy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, reference 50%).

COURSE TITLE: USING OF INFORMATION SYSTEMS IN AGRICULTURAL CONSULTANCY AND DOCUMENTARY RESEARCH

CODE: D31CMAM313
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): To acquire and use appropriate methods and sources of documentary research specific to agricultural consultancy with applicability in agribusiness, to deepen the methods of documentary research and the characteristics of the sources of documentation and to concretely

exemplify the aspects of using information systems in the consultancy activity
COURSE CONTENTS: It is intended to acquire the knowledge delivered at the course and the seminar / laboratory and to deepen the specialized knowledge, the development of the synthesis capacity, the efficient use of the existing information; Carrying out a specialized documentary research project for use in agricultural advisory work.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam answers 70%, project 30%.

COURSE TITLE: AGRICULTURAL AUDIT

CODE: D31CMCM 312
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Diagnostic audit of the economic and financial activity of commercial companies is an important means of internal management of each firm or enterprise, regardless of the form of ownership, profile or size, which allows the substantiation of the decisions regarding the development strategy and the efficient use of the material, human and financial resources, in order to increase the market value, the profitability and the competitiveness of the enterprises.
COURSE CONTENTS: It is addressed to the students of the Master, second year and aims to present the general and specific methods used in the diagnostic audit of the economic and financial activity of the commercial companies in general and with the agricultural profile in particular and their way of application in studying the obtained economic and financial performances by each economic agent.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, control work 10%, oral checks 10%, control work 10%).

COURSE TITLE: PROJECT FINANCING SOURCES AND MANAGEMENT

CODE: D31CMAM314
ECTS CREDITS: 9
TYPE OF COURSE: Discipline
COURSE OBJECTIVE(S): Knowing how to fund agricultural activities as a starting point in going through technologies without which the current activity cannot be carried out, regardless of the form of ownership, profile or size of the enterprise.
COURSE CONTENTS: Awareness of the benefits of financing and project management; Ability to identify sufficient and sustainable funding sources; Ability to design, track, and evaluate projects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Answers to exam 40%, assessment along the way 40%, final examination 20%.

FIELD: AGRONOMY
PROGRAMME TITLE: MANAGEMENT IN AGRO-TOURISM AND THE QUALITY OF AGRO-ALIMENTARY PRODUCTS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: PROJECT FINANCING SOURCES AND MANAGEMENT
CODE: D31MAPM101
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Knowing how to fund agricultural activities as a starting point in exploring the technologies without which the current activity cannot be carried out, regardless of the form of ownership, profile or size of the enterprise. Knowledge of the way, steps and documents needed to access grant sources by designing projects addressed to organizations / organizations that offer this opportunity.
COURSE CONTENTS: Internal funding schemes. State support measures for agriculture. National Rural Development Program (NRDP). Agricultural credit. Guarantee funds. EU funding schemes. Common. Agricultural Policy (CAP).European Social Fund (ESF).European Fund for Agriculture and Rural Development (EAFRD). European Regional Development Fund (ERDF). Financial Instrument for Fisheries Guidance (FIFG).European Union financial assistance.The PHARE program.Other sources of funding.Project Definitions.Types of projects.Project management definition.Project Management Functions.Choice of investment projects.Management of logistical, financial, human and time resources in projects. Techniques used in project planning. Identifying the purpose and objectives of the project.Project Planning.Establishment of the task plan and activities.Management of risks, uncertainties and conflicts.Control and monitoring.Reports.The life cycle of the project.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answers to laborat ory works 30%).

COURSE TITLE: MANAGEMENT OF EQUIPMENT, MACHINERY AND APPLIANCES USED IN THE AGRO-FOOD INDUSTRY
CODE: D31MAPM102
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Address issues related to the management of the main types of machinery and equipment for the food industry, providing the specialist with the necessary knowledge in the field.
COURSE CONTENTS: Management of equipment and installations used for raw materials flushing, solids fractionation, sorting, calibration, sifting, material transport, grinding, sedimentation, filtration, mixing, drying, refrigeration and freezing of food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (final theoretical exam 60%, reports during the semester 40%).

COURSE TITLE: MANAGEMENT OF QUALITY CONTROL OF FOOD PRODUCTS OF PLANT ORIGIN
CODE: D31MAPM103
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): The modern approach to the processing technologies of the main agricultural products obtained in the private agricultural sector. The issues addressed are related to the management of quality control, bread, beer, alcohol, canned vegetables, sugar, tobacco, following the application of modern world-wide processing technologies. The subject of the course makes special reference to the quality control of finished products for human nutrition according to the standards agreed at European level.
COURSE CONTENTS: Management of quality control of cereals and cereal products; Management of bread quality control; Management of physical and chemical control of beer; Management of food fat control; Management of quality control of oil raw materials; Management of quality control of oils; Management of oily products control in food diet; quality of finished products; Management of vegetal stimulant food control.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam answers 50%, reports during the semester 50%.

COURSE TITLE: OBTAINING QUALITY ORGANIC PRODUCTS IN FARMS AND AGRO-TOURISM HOUSEHOLDS I
CODE: D31MAPM104
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Promoting the principles of organic farming in the context of sustainable agriculture; Acquiring knowledge about the development and potential of agritourism in Romania; Knowledge of rural tourism and agro-tourism systems in Romania; Acquiring knowledge of the main organic products and their way of obtaining in farms and agro-tourism households.
COURSE CONTENTS: Conceptual aspects regarding the relationship between environment, ecology and economy. Organic food and food security.Theoretical and practical strategies for obtaining organic food.Aspects regarding the premise of the emergence and development of rural

tourism and agritourism.Issues related to rural space and related policy, with reference to the potential of rural tourism and agritourism.Systems of practicing agritourism in Romania.Strategic guidelines for the development of rural tourism and agritourism.High-quality organic food obtained in farms and agro-tourism households.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 50%, reports during the semester 50%

COURSE TITLE: AGROTOURISM AND RURAL TOURISM NATIONAL AND INTERNATIONAL

CODE: D31MAPM105
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Formation of the basic notions regarding the basic concepts of tourism; Knowledge of the specific problems of agrotourism and of the Romanian and international rural tourism; Identifying measures to reduce the pollution of the natural and built environment and the preservation of cultural traditions.
COURSE CONTENTS: General considerations on tourism, agritourism, rural tourism and ecotourism; Rural countryside and rural tourism; Agrotourism and national rural tourism; Village and real possibilities in the field of agritourism and rural tourism; National agrotourism offer.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answersto exam 50%, ongoing assessment 50%.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: OBTAINING QUALITY ORGANIC PRODUCTS IN FARMS AND AGRO-TOURISM HOUSEHOLDS II

CODE: D31MAPM206
ECTS CREDITS: 5
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Knowledge of the principles of valorisation of the natural environment and promotion of agro-tourism services at the level of the peasant households, a particular form of rural tourism; Detailed knowledge of the resources, methods and means of obtaining quality organic food in farms and agro-tourism households. Also, acquiring knowledge on how to conserve herbal resources and protect the natural environment while practicing sustainable agro-tourism.
COURSE CONTENTS: Principles of promoting rural tourism and agritourism in Romania. Resources for obtaining organic products in farms and agro-tourism households. Organic quality meat products obtained in farms and agro-tourism households.Dairy products and quality organic cheeses obtained in farms and agro-tourism households.Organic quality vegetables obtained in farms and agro-tourism households.Quality organic fruits obtained in farms and agro-tourism households.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 50%, reports during the semester 50%).

COURSE TITLE: AGROTOURISM AND GASTRONOMY

CODE: D31MAPM207
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Knowledge of raw and auxiliary materials used in culinary production and methods of primary and thermal processing of food; Acquisition of the methodology for preserving and preserving food; Knowledge of EU consumer law.
COURSE CONTENTS: Raw and auxiliary materials used in culinary production; Food processing; Production and hygiene; Types of culinary production units; Organization of production facilities; Types of serving units; Product offer and business policies; General principles and consumer protection objectives in the EU; Security, warranty, liability and standardization.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 50%, reports during the semester 50%.

COURSE TITLE: MANAGEMENT OF ZOONOSES CONTROL AND ZOOTECHNICAL INSPECTION

CODE: D31MAPM208
ECTS CREDITS: 5
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): The discipline aims at studying and elaborating the general principles and methods of zoonosis classification, types of zoonoses and their nomenclature. At the same time, the discipline makes distinct reference to the anatomopathological and laboratory surveillance processes in the respective animal species. Animal diseases are not included in zoonoses, but can be transmitted by animals as a single carrier, as well as disease-bearing diseases, arthropods, even if the pathogen remains in their body and is transmitted to transovarian and transphase descendants. The course also addresses legislation on animal nutrition, manufacture and marketing of compound feed, breeding, breeding and protection of domestic animals of economic interest. The responsibilities and sanctions provided by the legislation in force, animal husbandry terms, laws and methodological norms for the application of zootechnical laws are elaborated.
COURSE CONTENTS: Course objective: Definitions, classification of zoonoses, disease nomenclature, trends in zoonoses; Bacterial

zoonoses: anthrax, brucellosis, compylobacteriosis, clamidiosis, corynebacterial diseases, telaremia, Escherichia coli strains infections, mumps, leptospirosis, listiosis, mycobacterial diseases, pasteurellosis, Q fever, streptococcal salmonellosis, typhus, Viral zoonoses: foot-and-mouth disease, vesicular stomatitis, New Castle disease, RIFT cow fever, flu, encephalitis, rabies, Crimea Congo disease, Carra disease, Lyne disease, West Nile encephalitis, Japanese encephalitis, Venezuelan equine encephalomyelitis, rotavirus, encopatia; Parasitic zoonoses: geardiosis, toxoplasmosis, sarcocytosis, cysticercosis, hymenopause, echinocosis, hydatidosis, fasciolosis, strongylosis, trichinosis, mesiases, zoonotic anchilostomosis, cochilomahominivoras, dermatoses, thelaziosis, pneumocistosis, chisomyabezziana; Animal breeding and exploitation; Animal Nutrition; Animal breeding; Reproduction of animals; Animal protection. Responsibilities and sanctions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 70%, reports during the semester 30%).

COURSE TITLE: ELEMENTS OF DRAWING, CONSTRUCTION AND AGROTOURISM IMPROVEMENTS I

CODE: D31MAPM209
ECTS CREDITS: 8
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Identifying and describing ecological, economic and tourist heritage characteristics that characterize a specific perimeter in hill and mountain areas; Explaining the particularities of the organization and operation of a farm / agro-tourist enterprise in hill and mountain areas; Developing and implementing an agro-tourist production and management plan; Assessment of the functionality and dysfunctions of the techniques and measures adopted within an agro-tourist management plan; Achieving a project to set up a farm / agro-tourist enterprise in hill and mountain areas.
COURSE CONTENTS: Use of topographic apparatus; Drawing of connection curves; - topographic surveys carried out to design land improvement works; -training works for the reservoir; Measurement of level differences and calculation of points quotas; - drawing up the quoted plans and drawing the level curves; Developing longitudinal and transversal profiles for land improvement works; Trading terraces and leveling surfaces; Travel drawing of characteristic building points; -training and execution of civil, industrial and agricultural constructions; -training the route of a communication route on the ground; Training and opening of the lines in the woods; Training of bridges and viaducts on the ground.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 70%, reports during the semester 30%.

COURSE TITLE: MANAGEMENT AND MARKETING IN AGRO-TOURISM AND AGRO-FOOD INDUSTRY I

CODE: D31MAPM210
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Knowledge of market, product, price, distribution, advertising, etc., in the field of agro-tourism; Understanding the way of organizing specific marketing activities in technical and organizational terms in the field of agrotourism; its functionality, how to implement modern management techniques and methods, etc. in agritourism.
COURSE CONTENTS: Tourism and agritourism; Organization of rural tourism in Romania; Organizational structures in agritourism; Managerial problems of agro-tourism activity; Human aspects. Time management; Legal and fiscal aspects; Financial aspects; Qualitative aspects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 70%, final ans wers to works and homework 30%.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ELEMENTS OF DRAWING, CONSTRUCTION AND AGROTOURISM IMPROVEMENTS II

CODE: D31MAPM311
ECTS CREDITS: 8
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Identifying and describing ecological, economic and tourist heritage characteristics that characterize a specific perimeter in hill and mountain areas; Explaining the particularities of the organization and operation of a farm / agro-tourist enterprise in hill and mountain areas; Developing and implementing an agro-tourist production and management plan; Assessment of the functionality and dysfunctions of the techniques and measures adopted within an agro-tourist management plan; Achieving a project to set up a farm / agro-tourist enterprise in hill and mountain areas.
COURSE CONTENTS: Physical-geographic characteristics of the Carpathians and evolution of human habitation in Romanian mountain areas; Traditional construction materials and their influence on local architecture; Typology of settlements, households and architecture in the Romanian rural area; Household annexes - peculiarities and functions; Analyzes, criteria and studies to be carried out when implementing agri-tourism projects;

Developing development plans; Components of a complete agri-tourism building project and its endorsement; Conceiving and dimensioning the main agro-tourist facilities; Presenting and analyzing the criteria for the classification of pensions and national agrotourism; Presentation and analysis of the criteria for the classification of pensions and of the agrotourism - Eurogites; Land surveying of agro-touristic structures and facilities; Agro-tourism of the territory; Impact of industrialization and pollution on agro-tourist areas; Measures to protect tourist traffic.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 50%, reports during the semester 50%.

COURSE TITLE: MANAGEMENT AND MARKETING IN AGRO-TOURISM AND AGRO-FOOD INDUSTRY II

CODE: D31MAPM312
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Knowledge of market, product, price, food advertising, Understanding how to organize specific marketing activities in technical and organizational terms in the food field.
COURSE CONTENTS: The role of the food industry in the national economy, production capacity and optimal ways of use in the food industry, Creation and development of the technical material base in the food industry, Organization of food industry production by types of enterprises.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 60%, final ans wers to works and homework 40%.

COURSE TITLE: MANAGEMENT OF SANITARY VETERINARY CONTROL AND FOOD SAFETY

CODE: D31MAPM313
ECTS CREDITS: 5
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): The discipline aims at studying community and national legislation: animal health (diseases, identification and registration of animals, animal welfare and protection, veterinary medicinal products, animal nutrition, residues, neutralization of non-human animal products); hygiene and veterinary public health; food safety. The thematic content of the course highlights the importance, role and necessity of observing the quality of the food products placed on the market. It presents new methods for determining the quality of food, new opinions about the concept of "quality" and "self-control", current limits of the parameters for food marketing, modern guidelines for the inspector profession. It also presents methods for laboratory determination of harmful elements and the establishment of new, efficient and fast techniques.
COURSE CONTENTS: Course object: Definition. The role and importance of the course; Community and national legislation: animal health (diseases, identification and registration of animals, animal welfare and protection, veterinary medicinal products, animal nutrition, residues, neutralization of products of animal origin not for human consumption); hygiene and veterinary public health; food safety; Inspection of cattle, pig, sheep, poultry and herring farms; Inspection of public catering establishments, cold stores and collection and processing centers for by-products; Inspection of incineration and neutralization units.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 60%,
final answers to works and homework 40%.

COURSE TITLE: ADDITIVES MANAGEMENT IN AGRI-FOOD PRODUCTS AND TECHNOLOGICAL PROJECT

CODE: D31MAPM314
ECTS CREDITS: 5
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Knowledge of human system relationships - food with altered or modified nutritional characteristics, health effects, measures to prevent and combat them; Knowing the nutritional needs of healthy people and the necessary measures for adopting and promoting the right nutritional behavior; Knowledge of the nutritional value and toxicity of the main food additives, potential risks and means of ensuring food innocuity; Knowledge of the research methodology of the main toxicological risk factors caused by inappropriate use of additives in agro-food products; Knowledge of the national and EU legislation in the field of food additives authorized and used in the production of agro-food products.
COURSE CONTENTS: Nutrition, Health; Human-food relations; Body requirements in proteins, lipids, carbohydrates, nutrients and minerals, vitamins; Presentation of the classes of food additives and the effects these products produce in agri-food products; Presentation of fingerprint concepts of the non-additive product - product architecture;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 50%, final ans wers to works and homework 50%.

COURSE TITLE: APPLIED COLD AND CLIMATIC EQUIPMENT AND INSTALLATIONS USED IN THE AGRO-FOOD INDUSTRY

CODE: D31MAPM315
ECTS CREDITS: 6
TYPE OF COURSE: Oblgatory
COURSE OBJECTIVE(S): Aims at addressing the issues related to the presentation of the main types of efficient cold and air conditioning plants for the

food industry, providing the specialist with the necessary knowledge in the field.

COURSE CONTENTS: Thermodynamic analysis of irreversible processes in refrigeration installations; Procedures for obtaining the artificial cold; Refrigerator work agents; Automation of refrigeration; Cold food processing technologies; The cooling rate of the products and the duration of the technological process.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Verification (answers to exam 50%, reports during the semester 50%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE:
PRACTICE FOR THE PREPARATION OF DISSER TATION PROJECT

CODE: D31MAPM416

ECTS CREDITS: 30

FIELD: AGRONOMY
PROGRAMME TITLE: ENVIRONMENTAL CONSERVATION IN AGRIULTURE
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MODERN SYSTEMS OF AGRICULTURE
CODE: D32PMAM101
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Familiarizing of students with the main farming systems; Development of skills in terms of sustainability of agricultural systems.
COURSE CONTENTS: Introduction, definition and attributes of the agricultural system; Agriculture system with alternate rotation; Conventional culture system; No tillage farming system (not till); Sustainable farming system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 70%, final answers to laborat ory works 30%.

COURSE TITLE: MACHINING SYSTEMS FOR MINIMAL WORK OF THE SOIL
CODE: D32PMAM102
ECTS CREDITS: 7
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Establishment of soil work systems according to the agro-technical requirements imposed on the works to be performed by the agricultural machines and equipment and on the diversity of the physical and mechanical properties of the materials.
COURSE CONTENTS: Studying the trends in the construction of agricultural tractors and agricultural machinery, their control and regulation systems; Study of modern systems for tracking the working parameters used in the construction of sowing machines; Methods and means of exploiting agricultural aggregates with minimal noxes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam
(final theoretical exam 40%, reports during the semester 60%).

COURSE TITLE: BIOENGINEERING AND BIOTECHNOLOGIES APPLIED IN AGRICULTURE I
CODE: D32PMAM103
ECTS CREDITS: 7
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Knowledge of processes of initiation of plant cultures in vitro; Knowledge of the processes of obtaining and using somaclonal variability as a new source of valuable characters for the modern improvement of agricultural plants; Acquiring knowledge about the main types of in vitro cultures and their practical applications in agriculture.
COURSE CONTENTS: Recent Achievements and Prospects for Engaging Bioengineering and Biotechnologies in Agriculture; In vitro superior plant culture; Types of in vitro cultures; The culture of meristems; Classification and practical applications in agriculture.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Exam answers 50%, reports during the semester 50%.

COURSE TITLE: THE BASIS OF ORGANIC FARMING I
CODE: D32PMAM104
ECTS CREDITS: 5
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Knowledge of the theoretical and practical peculiarities of ecological agriculture and the ecological methods of plant protection against weeds, diseases and pests; Radiography of organic farming worldwide, in European Union and Romania.
COURSE CONTENTS: The scientific basis of organic farming; Theoretical and practical features; The advantages and disadvantages of organic farming; Organic production rules in the plant, livestock and beekeeping system; The basis of organic farming in different types of agroecosystems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 50%, reports during the semester 50%).

COURSE TITLE: THE INTEGRATED CROP PROTECTION
CODE: D32 PMAM 105
ECTS CREDITS: 5
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Knowledge and study of pathogens and harmful species, monitoring the evolution of attack levels and damage rates, and the use of preventive and control methods to keep them under the PED, the use of forecast and warning and phytosanitary quarantine
COURSE CONTENTS: Integrated control-definition, object, importance to the agricultural practice and Food Safety; Methods of combating diseases and pests and their interaction; Developmental equations of various pathogens and pests and their use in plant protection practice; General information about the epidemiology of plant parasitic diseases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answersto exam 80%, final answer s to laboratory works 20%.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: BIOENGINEERING AND BIOTECHNOLOGIES APPLIED IN AGRICULTURE II

CODE: D32PMAM206
ECTS CREDITS: 5
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Acquiring knowledge on the role of transgenesis in agriculture to ensure food security; Knowing the direct and indirect methods of gene transfer to plants and animals; Acquiring knowledge about the main transgenic plants and animals with improved agronomic qualities.
COURSE CONTENTS: Implications of bioengineering and agricultural biotechnologies in ensuring food security. Perspectives; Molecular basis of transgenesis or recombinant DNA technology; Transgenic organisms and their role in ensuring sustainable food security.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 50%, reports during the semester 50%).

COURSE TITLE: THE BASIS OF ORGANIC FARMING II

CODE: D32PMAM207
ECTS CREDITS: 7
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Familiarization with specific national and European legislation; Conversion to organic farming: stages, Certification Organisms and specific requirements.
COURSE CONTENTS: Conservation of water in the soil and its rational use in organic farming; National and international legislative framework; Standards and organisms in organic farming; IFOAM, NOP and JAS standards; Control and certification organismsodies; Certification of organic farms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 50%, reports during the semester 50%.

COURSE TITLE: ECOLOGICAL RECONSTRUCTION OF SOILS AND DEGRADED LANDS

CODE: D32PMAM208
ECTS CREDITS: 5
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): The importance of soil, a component of the ecological system, the living environment for plants, the main means of production in agriculture and the tasks of specialists, whose purpose is the soil;Identification and delimitation of sources of natural and anthropogenic pollution of soils and lands and measures to prevent, mitigate and eliminate the causes.
COURSE CONTENTS: Concept of degradation and limiting factors of soil fertility;The concept of ecological reconstruction and ecological reconstruction of degraded soils and lands; Soil and land improvement where the fertility limiting factor is anthropogenic (secondary) compaction; Preserving and raising the humus content of soils.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 70%, reports during the semester 30%).

COURSE TITLE: NUTRIENT MANAGEMENT AND ENVIRONMENTAL QUALITY

CODE: D32PMAM209
ECTS CREDITS: 4 (Course) and 3 (Project)
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Students gain knowledge about the role of nutrients in plant life and nutrient needs, as well as optimizing and optimizing fertilization systems for the main plant species to obtain superior agricultural and horticultural production qualitatively and quantitatively while maintaining and increasing soil fertility; Students should know the main characteristics of natural organic and mineral agrochemical resources used in agricultural practice;
COURSE CONTENTS: The role of nutrients in the process of growing and developing crop plants; Role of nitrogen, phosphorus, potassium, magnesium, calcium, iron, manganese, zinc, molybdenum; Principles, methods (techniques) for the rational use of fertilizers in agriculture.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam + project

COURSE TITLE: SPECIAL TECHNOLOGY FOR OBTAINING AGRICULTURAL PRODUCTS

CODE: D32 PMAM 310
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): The quality of the products is appreciated taking into account more characteristics: physical, chemical and technological. Emphasis is on hygienic, ecological and biological quality. Production systems are optimized in such a way that they are viable from the point of view economical, reproducible, capable of ensuring use of the territory with a minimum of consumption.
COURSE CONTENTS: The main biological, ecological and technological factors that make organic farming more productive; Organic farming framework technology: cropping, fertilization, soil work, seed and sowing, care, harvesting, conditioning, certification, storage of cereal crops.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT
METHOD(S): Answers to exam 70%, final ans wers to works and homework 30%

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL TECHNOLOGY FOR OBTAINING ECOLOGICAL HORTICULTURAL PRODUCTS

CODE: D32PMAM311
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Assimilating the most appropriate methods to minimize pollutants; Development of differentiated technologies for ecological vegetables.
COURSE CONTENTS: Ecotechnologies of vegetable species; Description and knowledge of organic cultivation of certified vegetable crops; Organic production of vegetable seedlings: preparation of the substrate; methods of sowing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Answers to exam 50%, reports during the semester 50%.

COURSE TITLE: THE INTEGRATED CONTROL OF ENVIRONMENTAL POLLUTION IN AGRICULTURE

CODE: D32 PMAM 312
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Identifying of measures and methods to reduce the pollution of the environment with nitrates and pesticides and maintaining a cleaner environment;Use of modern methods of scientific investigation in the field of environmental protection
COURSE CONTENTS: Water pollution, wastewater; Classification of water pollution; Waste water and their components. Biological wastewater treatment; Physical and chemical treatment of waste water; Sediment treatment; Waste management resulting from agricultural activities.Recycling.Recycling of organic waste and fractions.Recycling of plastics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Answers to exam 60%, final answers to works and homework 4 0%.

COURSE TITLE: THE USE OF AGROFORESTRY PRACTICES FOR THE PROTECTION OF AGRICULTURAL ECOSYSTEMS

CODE: D32PMAM313
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Student's knowledge of the biological, ecological, technical and economic bases of agro-forestry systems; Design and management of agro-forestry systems.
COURSE CONTENTS: The biological, ecological, technical and economical bases of agro-forestry systems; The management of agro-forestry systems; Economic efficiency of agro-forestry systems; Elaborate a feasibility study to establish an agro-forestry system
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Answers to exam 60%, presentation feasibility study report 40%.

COURSE TITLE: THE NON-POLLUTION EXPLOATATION OF AGROTURISTICS RESOURCES

CODE: D32PMAM314
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Identify the tourist potential of a hillside / mountain area and develop a database to design a farm / agro-tourism enterprise that complies with all environmental protection standards; Acquiring European concepts: agrotourism, ecotourism, rural tourism.
COURSE CONTENTS: Agroturism and rural tourism in Romania; Legislation, tourist application in the rural area; Actions and measures improved for the development of rural tourism; The village and real opportunities in the field of agriculture and rural tourism.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 50%, final answers to works and homework 50%).

COURSE TITLE: AGROECOLOGY

CODE: D32PMAM315
ECTS CREDITS: 6
TYPE OF COURSE: Obligatory
COURSE OBJECTIVE(S): Acquiring knowledge about the main types of agroecosystems and their productivity; Knowledge of the particularities and ecological principles used in the management of natural resources and the preservation of the environment.
COURSE CONTENTS: Agricultural Ecosystem (Agroecosystem); The concept of agroecosystem. Origin and evolution of agroecosystems; Environmental concepts and principles in managing natural resources and preserving the environment; ECODEvelopment (Sustainable Development - Sustainable Development).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification
(answers to exam 50%, reports during the semester 50%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE:
PRACTICE FOR THE PREPARATION OF DISSER TATION PROJECT

CODE: D32PMAM310
ECTS CREDITS: 30

Faculty of Automation, Computers and Electronics

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Faculty of Automation, Computers and Electronics

Bachelor's Degree

Duration: 4 years
No. of credit points: 240

Field: *System Engineering*
Programme title:
Applied Automation and Information Technology
Multimedia System Engineering

Field: *Computer Science and Information Technology*
Programme title:
Computer Science
Computer Science (English-taught programme)

Field: *Electronic Engineering, Telecommunications and Information Technologies*
Programme title: Applied Electronics

Field: *Mechatronics and Robotics*
Programme title:
Mechatronics
Robotics

Master's Degree

Duration: 2 years
No. of credit points: 120

Field: System Engineering
Programme title:
Embedded Control Systems
Information Technologies in System Engineering

Field: *Computers and Information Technology*
Programme title:
Software Engineering
Information Systems for e-Business
Computer and Communications Engineering

Field: *Mechatronics and Robotics*
Programme title: Management Systems in Robotics

FIELD: COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
PROGRAMME TITLE: COMPUTER SCIENCE (ENGLISH-TAUGHT PROGRAMME)
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course focuses on the introduction of fundamental notions on differential and integral calculus.
COURSE CONTENTS: Introduction to differential calculus (Fundamental streams; complete metric spaces; Contraction principle; Numerical series; Series of powers, developments in series; Limits and continuity for functions with several variables; Partial derivatives and differentiability; Local extremes for functions with several variables; Implicit defined functions; Conditioned extremes). Introduction to integral calculus (Right Riemann integral; improper integrals; Integrals with parameters; Curve-linear integrals; Double and triple integrals; Surface integrals).
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: LINEAR ALGEBRA, ANALYTIC AND DIFFERENTIAL GEOMETRY
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The aim of the course is the introduction of the fundamental notions of linear algebra, analytic and differential geometry: vector spaces, linear mappings, quadratic forms, Euclidian spaces, geometric vectors, the straight line, the plane, conics and quadric surfaces, curves and surfaces. Tutorial classes allow to fix theoretical knowledge and to create calculus control by applications.
COURSE CONTENTS: Vector Spaces; Linear Mappings; Bilinear Forms. Quadratic Forms; Euclidian Spaces; Geometric Vectors; Geometric Vectors; Straight Line and Plane; Conics and Quadric Surfaces; Curves in Plane and in Space; Surfaces
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written part, final written exam)

COURSE TITLE: COMPUTER PROGRAMMING
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course overall objective is to provide the students with the knowledge required and to develop elementary programming skills using modern computer programming languages, C-like, such as C, C++, Java.
COURSE CONTENTS: Introduction; Algorithmic Design; Data Structures; Language Issues; Programming in C.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (Final written + oral exam, Periodic Quizzes)

COURSE TITLE: LOGICAL DESIGN I
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): An introductory course on logical design methodology, forming the basis for future stream of hardware disciplines. It is treated extensively the mathematical foundation linked to analysis and synthesis of digital devices – Boolean algebra; Switching functions and forms; Minimization procedures; Canonical forms of representation.
COURSE CONTENTS: Fundamental concepts related to Logical Design of Digital Computers (LDDC); Boolean Algebra; Switching functions; Boolean forms; Classes of Boolean functions; Complete functional systems; Canonical representation of Switching functions; Minimisation of Switching functions.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written paper exam)

COURSE TITLE: PHYSICS I – GENERAL PHYSICS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course focuses on the review of fundamental knowledge in general physics and applications.
COURSE CONTENTS: Classical Mechanics; Analytical Mechanics; Electrodynamics Elements of Quantum Physics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exam

COURSE TITLE: INTRODUCTION TO COMPUTERS AND INFORMATION TECHNOLOGY
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): Acquiring basic knowledge on fundaments of computer systems and information technology and developing primary skills on operating with the basic commands from Linux and writing simple scripts; Acquiring knowledge on basic notions used in computer science, information technology and information; Understanding basic concepts on data, data

codification, enumeration systems used in IT, arithmetic operations in basis other than 10; Getting first notions on systems and signals, computer systems, information systems and operating systems; Developing primary skills on operating with the basic commands from Linux and writing simple scripts.
COURSE CONTENTS: The courses are presented by using the videoprojector, with Power Point. The strategies used for transmitting and acquiring knowledge: Presentation; Interrogation; Deduction.
Chapter 1. Engineering: Definitions, classifications. Computer science. Computers and Engineering. Software Engineering. Data Communication Engineering. Informatics, Cybernetics. Information technology. Chapter 2. Information and data: Information. Data. Data processing cycle. Measuring units for information. Data codification. Data exploitation cycle. Chapter 3. Numerical representation of information: Enumeration systems. General conversion methods. Enumeration systems used in computer systems. The octal enumeration system. The hexadecimal enumeration system. Arithmetical operations in non-decimal basis. Binarydecimal codes. Representation of signed binary numbers. Alphanumeric codes. Chapter 4. Aspects of information protection, capturing and storage: Information and communication (Shannon model for communication). Protecting the binary-decimal coded information. Protection through parity bit. Aspects of information capturing. General and particular aspects of information storage. Chapter 5. Introduction to the Arithmetic of Integers: General matters. Shift of signed binary combinations. Adding and subtracting in direct code. Adding and subtracting in complementary code. Binary multiplication (multiplication in direct and complementary code, using 3 methods). Chapter 6. Systems and signals: Systems. Definitions and classifications. Signals. The concept of "mathematic model". Definitions for signals. Digital systems. Chapter 7. Introduction to organization and structure of digital computer systems: Definition and historic of digital computer systems. Main hardware components. The processor. Organization of a Computer System. Buses. Main memory. ROM, PROM, EPROM, EEPROM and flash memory. Secondary memory. Storage hierarchy. I/O ports and cables. Chapter 8. I/O Devices: Overview. Monitors. Mice. Plotters. Printers. Chapter 9. Introductory notions about operating systems: Definitions. Operating systems goals and functions. Components of an operating system. Functionality of an operating system. Chapter 10. Primary notions on files management: Basic concepts. Files. File attributes and operations with files. Types of files. Internal structure of files. Access methods.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (written exam under the form of sets of questions)

COURSE TITLE: ENGLISH I

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Acquiring specialized knowledge in the English language and using it in technical contexts; Acquiring general theoretical knowledge of English morphology and syntax; Acquiring technical terminology which is specific to the field of computers and using it in relevant contexts; Developing the autonomy of speech in English.
COURSE CONTENTS: 1. Introduction; The bibliography – Course Resources; 2. Grammar: The Numeral; 3. Grammar: Verbs not Normally Used in the Continuous Aspect; The Place of Frequency Adverbs; 4. Technical vocabulary: *GCCQ-Backed Competition Names Cyber Security Champion,* Grammar: The Present Simple vs. The Present Continuous. Spelling Features of the ING-form; 5. Technical vocabulary: *Raspberry Pi Computer Review: 'A Great Step Forward'*; 6. Grammar: The Past Simple Tense. Irregular Verbs. Spelling features of the Past Participle ("*-ed" Form);* 7. Grammar: The Past Simple Tense vs. The Past Continuous Tense; 8. Grammar: The Present Perfect Simple Tense vs. The Past Simple Tense; 9. Technical vocabulary: *MinecraftMaker Reveals New 'Hard ScienceFiction ' Game; 10.* Technical vocabulary: *Health and Safety. Computer ergonomics. Electronic Rubbish; 11.* Grammar: The Present Perfect Simple Tense vs. The Present Perfect Continuous Tense; 12. Technical vocabulary: *Facebook's Free Anti-Virus Marketplace Targets Malware,* Grammar: The Past Perfect Simple Tense vs. The Past Perfect Continuous Tense; 13. *Revision; 14. Evaluation*
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (written exam)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL METHODS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course is designed to present the main numerical methods and numerical algorithms. It also aims to enhance the ability of analysing different mathematical models in the engineering field, using the numerical techniques and to solve specific problems by turning the numerical methods into programming languages.
COURSE CONTENTS: 1. Numerical methods in algebra; 2. Function approximation; 3. Numerical methods for integral approximation; 4. Numerical

methods for differential equations and partial differential equations.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: COMPUTER PROGRAMMING – PROGRAMMING TECHNIQUES

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The aim of this course is to introduce students to basic algorithms and techniques of their systematic implementation and evaluation using usual programming languages (eg. C).
COURSE CONTENTS: 1. Introduction to algorithms and programming techniques; 2. Basic algorithms analysis. Testing and correctness; 3. Sorting algorithms; 4. Data types. Lists; 5. Stacks and queues. Dynamic memory allocation; 6. Graphs and trees; 7. Dynamic programming; 8. Greedy algorithms; 9. Graph algorithms; 10. Backtracking; 11. Combinatorial algorithms; 12. Special algorithms.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: LOGICAL DESIGN II

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The fundamental mechanisms of designing and implementing digital devices at MSI level: ULMs, extension methods, structured realization of digital networks, programmable logic devices, sequential machines and networks, specification of sequential machines, state reduction, flip-flops, general synthesis procedure, analysis procedure, ASM charts, implementation of ASMs.
COURSE CONTENTS: 1. Combinational Logic Networks (CLN); 2. CLN implementation with Programmable Logic Device (PLD); 3. Introduction to Sequential logic Networks; 4. Simplification of Sequential Logic Networks; 5. Sequential Logic Networks with PLDs; 6. Design of digital systems
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (oral and practical examination)

COURSE TITLE: ELECTROTECHNICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The main objective of this discipline is to provide the students with the most important notions on electromagnetic fields and electric circuits (the most important laws and theorems and techniques to solve common problems in various operating regimes). The lab has the role to help students to get practical abilities correlated to the theoretical notions presented at the course.
COURSE CONTENTS: 1. Electric circuits in permanent sinusoidal periodic regime (A.C. regime); 2. Electric circuits in D.C. regime; 3. Linear electric circuits in periodic non-sinusoidal permanent regime (PNSR) ("distorting regime"); 4. Electric circuits in transient regime; 5. Two-port networks and filters; 6. Three-phase power systems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written and oral examination)

COURSE TITLE: PHYSICS II – ELEMENTS OF MECHANICS

CODE:
NUMAR DE CREDITE : 4
TYPE OF COURSE : fundamental
COURSE OBJECTIVE(S): It is one of fundamental disciplines. The course foccuses on the introduction of basic concepts with respect to the problematics of methods used to build mathematic models for the movement of mechanical systems with constant mass and a finite number of freedom degrees. Their analysis is accompanied by calculation examples and applications that reveal the studied methods.
COURSE CONTENTS: 1. Slipping vectors' theory; 2. Geometry of masses; 3. The Kinematics of material points; 4. The Kinematics of rigid solid bodies and of rigid systems; 5. Dynamics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final exam

COURSE TITLE: PRINCIPLES OF ACCOUNTING AND GENERAL ECONOMICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The appropriation, by the students of the fundamental notions in the field of accountancy, the knowledge and the understanding of the procedures specific to the accountancy method; The understanding of the terminology specific to the financial-accounting field; The formation of a logical thinking in what concerns the transposition in accounting language of the main economical-financial operations that generates the activity developed by the economical agents; The understanding of the methodology and the work technique specific to accountancy.
COURSE CONTENTS: 1. The object and the method of accountancy; 2. The accounting representation of the patrimony and of the financial results; 3. The accounting evaluation of the patrimonial structures; 4. Justificative documents and accounting bookkeepings; 5. The account and the double registering in accountancy; 6. The

inventory of the patrimony; 7. The verification balance; 8. The annual financial statement.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: ENGLISH II
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Acquiring specialized knowledge in the English language and using it in technical contexts; Acquiring general theoretical knowledge of English morphology and syntax; Acquiring technical terminology which is specific to the field of computers and using it in relevant contexts; Developing the autonomy of speech in English.
COURSE CONTENTS: 1. Technical vocabulary: Microsoft Offers Sneak Preview of Windows 8 Grammar: Means of Expressing Futurity: The Present Continuous; The *be going to* Form; The Future Simple Tense; 2. Grammar: Means of Expressing Futurity: Will + *infinitive* versus The *be going to* Form; The Future Continuous Tense; 3. Grammar: Means of Expressing Futurity: *Will + infinitive* versus The Future Continuous Tense; *Won't + infinitive* versus The Future Continuous Negative; Second Person Interrogative: *will you* and Other Forms; *Shall* and *Will; 4.* Grammar: Time Clauses; The Future Perfect Tense; The Future in the Past; 5. Writing: Informal Letters/ Emails; 6.Technical vocabulary: *Swiftkey, a Scientific Start-up* Grammar: The *-ING* Participle; 7. Technical vocabulary: *Learning to Code* Grammar: The Gerund; 8. Grammar: The Infinitive; 9. Writing: The CV; 10. Grammar: The Passive Voice; 11. Technical vocabulary: *Student Scholarship; 12.* Writing: The Covering Letter; 13. *Revision; 14. Evaluation.*
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SPORT I
CODE:
ECTS CREDITS:
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Executarea corecta a exercitiilor de educatie fizica. Perfecţionarea abilitaţilor in jocurile de echipa.
COURSE (SEMINAR) CONTENTS: 1. Cunoasterea si organizarea colectivului de studenti. Prezentarea cerintelor catedrei de Educatie Fizica si Sport; 2. Perfectionarea elementelor din scoala alergarii; Perfectionarea elementelor de miscare in teren la jocul de baschet. Joc bilateral: baschet, volei, fotbal, tenis de masa, aerobic – fete; 3. Perfectionarea prinderii si pasarii mingii cu doua maini – baschet. Perfectionarea pasului lansat in tempo moderat. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 4. Perfectionarea iesirii la minge si opririle intr-un timp si doi timpi. Perfectionarea simtului in alergare in tempo moderat. Joc bilateral: baschet, volei, fotbal, tenis de masa, aerobic – fete; 5. Alergarea in viteza – perfectionarea pasului alergator de accelerare si a pasului lansat de viteza. Perfecţionarea opririlor si pivotării in jocul de baschet. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 6. Perfecţionarea startului de jos si lansarea de la start. Perfectionarea dibringului in jocul de baschet. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 7. Perfectionarea finisului si trecerea liniei de sosire. Perfectionarea aruncarii la cos de pe loc si din saritura. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 8. Alergarea in viteza 30-50 metri cu start de jos. Perfectionarea elementelor invatate – complex de exercitii – baschet. Joc bilateral: baschet, volei, fotabal, tenis de masa, aerobic – fete; 9. Repetarea si consolidarea sariturii in lungime fara elan, cu accent pe desprindere si aterizare. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete. Dezvoltarea fortei: abdomen, spate, flotari, mobilitate; 10. Perfectionarea sariturii in lungime fara elan – global. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete. Dezvoltarea fortei: abdomen, spate, flotari, mobilitate; 11. Proba de control – saritura in lungime fara elan, verificarea progresului. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 12. Probe de control: forta; din culcat dorsal – flexii ale trunchiului (numar de repetari in 30 sec); - din culcat facial – extensii ale trunchiului (numar de repetari in 30 sec.); - flotari (numar de repetari – pentru fete sprijin pe genunchi).
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

COURSE TITLE: SPORT II
CODE:
ECTS CREDITS:
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Executarea corecta a exercitiilor de educatie fizica. Perfecţionarea abilitaţilor in jocurile de echipa.
COURSE (SEMINAR) CONTENTS: 1. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 2. Alergare in viteza – starturi din diferite pozitii. Reacomodarea cu mingea de basket. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 3. Repetarea si consolidarea elementelor de gimnastica exersate in semestrul I. Repetarea si consolidarea conducerii mingii, oprirea, aruncarea la cos. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 4. Repetarea si consolidarea elementelor de gimnastica exersate in semestrul I. Complexe tehnice compuse din dribling, opriri, aruncari la cos din diferite pozitii. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 5. Repetarea si consolidarea elementelor de

gimnastica exersate in semestrul I. Complexe tehnice – joc bilateral: basket; 6. Repatarea si consolidarea sariturii in lungime de pe loc, cu accent pe desprindere. Repetarea si consolidarea driblingului, aruncarii la cos de la distanta. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 7. Repatarea si consolidarea sariturii in lungime de pe loc, cu accent pe aterizare. Pase in 2-3 jucatori cu aruncare la cos din alergare, dribling si saritura. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 8. Alergare de viteza – repetarea pasului alergator de accelerare. Aruncari la cos de penalitate – accent pe corectitudinea executiei. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 9. Alergare de viteza – repetarea pasului lansat de viteza. Repetarea patrunderilor si demarcajul – basket. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 10. Alergare de viteza – repetarea stratului de jos si lansarea de la start. Complexe tehnice cu elementele invatate – basket. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 11. Alergare de viteza – repetarea sosirii si a finisului. Complexe rehnice cu elementele invatate – basket. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 12. Proba de control: alergare de viteza pe 50 metri. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 13. Proba de control: saritura in lungime fara elan. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete; 14. Proba de control: alergare de rezistenta – 800 metri fete si 1.000 metri baieti. Joc bilateral: baschet, volei, fotabl, tenis de masa, aerobic – fete.
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

OPTIONAL COURSES

COURSE TITLE: LABOUR LEGISLATION
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Competencies on knowing, using and applying of labor legislation; Acquiring the required knowledge for: applying the national, European and international labor legislation and social security; elaborating strategies, politics and procedures requried for the application of labor legislation and social security; writing official papers for labor legislation and social security; approval of documents specific to labor legislation and social security; reconciling conflicting situations; analysis of disciplinary offenses; providing specialty consultancy for labor legislation and social security.
COURSE CONTENTS: 1. Consultancy in problems of HR; 2. Labor jurisdiction. Conflicts of rights. Material and territorial conflict resolution work. Deadlines for initiating court; 3. Judicial practice in labor litigations; 4. Presenting relevant shoulders of the settled by the courts, related conclusion, modification, suspension and termination of individual employment contract, individual and collective dismissal; 5. Internal regulations. Mandatory and optional clauses. Analysis of some clauses of the regulation and internal procedures; 6. The procedure for employment and labor detachment of foreign citizens in Romania; 7. Analysis of the terms of a collective bargaining agreement at the unit level, in accordance with the actual legal provisions; 8. Remuneration and payment related policies for performance of staff, staff salaries expenditure efficiency, and performance-oriented efficiency and motivation and retention of talented employees by introducing variable bonuses; 9. Usefulness of wage studies in building a competitive salary system. Presentation of case studies from those encountered in practice in payroll activity; 10. Evaluation of employees performance and variable pay. The necessity of implementing a performance appraisal process in the current economic context, in accordance with the new provisions of the "Labor code". Method for performance evaluation; 11. Improving employees. Identify training needs. Training of employees; 12. Conflicts of interest. Triggering and resolving conflicts of interest. Strike. Conditions for triggering the strike. Obligations of the party during the course of the strike. Methods of termination of the strike. Jurisprudence.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: ENTREPRENEURSHIP
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Competencies on knowing, using and applying of methods and techniques of management within some teams working on business evaluation, of business opportunities and of entrepreneurship initiatives; Knowing the mechanisms for conducting and correct management of business. Correct delimitation of notions on entrepreneurship and management; Creating decisional abilities specific to business starting and running; Acquiring the required knowledge for business analysis, diagnosis, control evaluation; Developing capacities to elaborate business strategies; Developing abilities for correct management of risks in business; Developing components for business planning.
COURSE CONTENTS: 1. Entrepreneurship and spirit of entrepreneur people. Examples on entrepreneurship activities, characteristics and typology of entrepreneurs; 2. Entrepreneurship and business initiative. Examples on entrepreneurship situations; 3. Economic opportunities. Examples on

size, categories of sources and major challenges of business opportunities; 4. The business plan – tool to emphasize the entrepreneurship goals. Case study (business plan, feasibility study); 5. Business establishment and starting. Case study for providing resources for assests in order to start business; 6. Entrepreneurial management. Particular features of management within SME and business administration; 7. Entrepreneurial strategies at business level. Case studies. Entrepreneurial training. Evaluating the entrepreneurial potential of entrepreneurs. evaluation questionnaires. Entrepreneurial consultancy. Examples of externalization of consulting services.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

2ND YEAR, 1ST SEMESTER

COURSE TITLE: DATA STRUCTURES

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The main goal of the discipline is the development of skills regarding the design and implementation of various data structures that allow writing performing programs, improving the skills regarding the representation of static objects as well as working with dynamic objects. Another goal is learning how to control the performance of the program against to the ratio of consumed memory/execution Speed.
COURSE CONTENTS: 1. Tree structures; 2. Search trees; 3. Optimal search trees; 4. Height balanced trees; 5. Multiway trees; 6. B trees; 7. Graf structures.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exam

COURSE TITLE: SPECIAL CHAPTERS IN MATHEMATICS I – DISCRETE MATHEMATICS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course represents several chapters of mathematics in respect to their utility as instruments of investigation in engineering and specific language of the specific matter. The seminar follows the topics of the course.
COURSE CONTENTS: 1. Elements of complex analysis; 2. Ordinary Differential Equations; 3. Elements of Fourier Analysis.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written and oral examination)

COURSE TITLE: COMPUTER SYSTEMS ARCHITECTURE

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): A discipline aiming at presentation of basic concepts related to computer architecture: forms of information representation in digital computers, Von Neumann's principles and model, Instruction cycle, General organisation of the CPU, Elementary Educational Computer Classification of digital computers, Machine level language, System bus, Bus arbitration, Stacks, Interrupts, Memory addressing techniques.
COURSE CONTENTS: 1. Number representation in digital computers; 2. Architecture – organisation correlation; 3. Von Neumann's principle, Instruction Cycle, CPU ; 4. Elementary Educational Computing; 5. Input/ Ouput; 6. Memory hierarchy and Addressing Techniques; 7. Conventional machine level.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (oral examination)

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The objectives of the course are to introduce the main concepts of the object-oriented paradigm, and also to introduce the main characteristics and principles of the C++ language. The objectives for the applications are to allow students to write software programs using C++ as the first object-oriented language, and also to allow students to use the Visual C++ integrated framework in order to write small and medium software applications.
COURSE CONTENTS: A. Introduction to Object Oriented Design: 1. Programming Paradigms; 2. The C Language Extensions in the C++ Language; 3. Defining and Using Classes; 4. Constructors and Destructors; 5. Namespaces; B. Basic Elements of Object Oriented Design: 6. Object Composition; 7. Classes Hierarchies; 8. Nested Classes. Friend Functions and Friend Classes; 9. Operator Overloading; C. Advanced Elements of Object Oriented Design: 10. Polymorphism and Virtual Functions; 11. Parameterized Functions and Classes. The Template Mechanism; 12. Exceptions; D. Standard Libraries of the C++ Language: 13. IOstreams; 14. Generic Programming. The STL Library.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written exam + homework)

COURSE TITLE: SYSTEM THEORY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain

COURSE OBJECTIVE(S): This course deals with the fundamental problems of systems theory, both continuous-time and discrete-time. There are presented theoretical and practical methods regarding analysis, design and implementation of control systems.
COURSE CONTENTS: 1. Description and general properties of systems. Introduction; Abstract systems; Oriented systems; 2. Linear time-invariant systems (LTIS); 3. Discrete time systems (DTS); 4. Nonlinear dynamical systems; 5. Control systems; 6. Special topics on systems theory. Time variable linear systems. Distributed parameters systems. Optimal control systems. Stochastic control systems. Intelligent control systems. Fuzzy logic and neural network based control.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exam

COURSE TITLE: ELECTRONICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course covers introduction to analysis, design and simulates building blocks and different analogue IC applications. This course involves laboratory practices and home works on experiment modules and extensive use of industry-standard CAD tools, such as Analog Workbench. Using the knowledge gained through Electronics, students will learn how to measure the characteristics of devices and circuits and the building of basic electronic circuits.
COURSE CONTENTS: 1. Semiconductor diodes; 2. Junction Bipolar Transistors; 3. Field-Effect Transistors; 4. Amplifiers; 5. Signal generators; 6. Voltage regulators.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exam

COURSE TITLE: ENGLISH III
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): To optimize the ability to express oneself verbally and in writing while considering the specificity of the group and individuals. Improving English competence and performance aims to improve students' perception and understanding of specialized technical literature, to increase students' interest for participation in technical debates, negotiations and science conferences, to write and deliver academic presentations in their field of specialty. Students will be better equipped to manage academic information delivered in English (in written or verbal form); Students will better cope with the challenges of working in an English dominate environment (either in Romania or in another country). Students learn to emphasize their personal and professional skills in CVs and Cover letters and increase their performance at job interviews in the fiels of computer technology.
COURSE CONTENTS: 1. The science of computing. Reading comprehension and extension based on scientific papers: Specialized text analysis with a special view on the rhetorical devices for impersonality and objectivity in scientific texts (impersonal constructions, passive structures etc.); 2. Tabletop computing and other modern technologies: Listening comprehension, listening to lectures on scientific subjects. Summarizing the content, formulating opinions, debating ideas, pairwork; 3. Attending a technology convention. Listening comprehension, listening to verbal communication in post-conference debates, summing up the debate, expressing critical views, role play; 4. Technology: friend or foe? Reading comprehension: scientific text analysis of the structural caracteristics of neative and positive adjective constructions, adverbs. Oral skills: visualization of a scientific debate presenting a controversial problem thematically close to the written text studied before. Debate on the visualized document; 5. What makes a good website? Writing skills: making a review; understanding conventions of colloquial vs. standard English texts with special interest to identify and use nominal phrases, verbal phrases, adjective constructions. Developing academic speaking skills; making informal and formal presentations; 6. Neural networks and artificial intelligence. Reading comprehension: text analysis of grammatical elements used to classify and evaluate content. Oral skills: visualization of a scientific debate presenting advantages and disadvantages. Debate on the topic; 7. Programming languages: man inside the machine Writing and speaking skills: conversion from colloquial standard English into scientific style. Oral skills: expressing opinions about writing with power in academic computing; 8. What's in a dot?: Analysis of the use of coordination and punctuation in scientific texts and in programming to avoid ambiguities. Oral skills: pair work debates, arguing one side of the story; 9. What can one do with a good computer? Reading comprehension: Analysis of the usage of scientific nominal structures in describing computer performance; 10. Writing skills: Exercises to practice premodifiers of adjectives in scientific texts Oral skills visualization of a scientific debate presenting a controversial problem thematically close to the written text studied before. Debate on the visualized element; 11. A good job in computing Writing skills: Describing professional skills and personal qualities in cover letters. Oral skills: Discussions and debates during job interviews; 12. Writing skills: Drawing up Curriculum Vitae in Europass format for the field of computing; Oral skills: discussing International

professional requirements for computing jobs. 13. Revision and exam preparation; 14. Evaluation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COMPULSORY COURSES

COURSE TITLE: SPORT III

CODE:
ECTS CREDITS:
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Executarea corecta a exercitiilor de eduacatie fizica. Perfecţionarea abilitaţilor in jocurile de echipa.
COURSE CONTENTS: 1. Dezvoltare fizică armonioasă – program de gimnastică aerobică (fete); Joc bilateral: tenis de masă, baschet şi fotbal; 2. Alergare de viteză pe 30-50 m, cu start din diferite poziţii; Perfecţionarea elementelor tehnice din volei: poziţia fundamentală, pasa de sus cu două mâini, serviciul de jos cu o mână; 3. Dezvoltare fizică armonioasă – program de gimnastică aerobică (fete); Joc bilateral: tenis de masă, baschet şi fotbal; 4. Perfecţionarea săriturii în lungime de pe loc; Complex de dezvoltare a principalelor grupe musculare; 5. Dezvoltare fizică armonioasă – program de gimnastică aerobică (fete). Joc bilateral: tenis de masă, baschet şi fotbal; 6. Verificare: Probe si norme de control.
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

2ND YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICS II – PROBABILITY AND STATISTICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of the basic notions and technics in the probability and statistics theory (Bayes theory); Teaching of the main probabilistic and statistic models used in informatics, computer engineering and communications; Understanding of the main theoretical aspects by simulations: building of the probabilistic model (corresponding to some real problems) and its simulation; Acquiring theoretical knowledge and skills of calculation for: using basic elements of probability theory (discrete random variables, keep the main probability distributions); simulating random variables; using random patterns based on stochastic processes (Markov chains, queue systems); estimating parameters in statistical models; using statistical models in artificial intelligence.
COURSE CONTENTS: 1. Events and probabilities, heuristic introduction to Probability Theory; 2. Random variables and distribution functions; 3. Continuous random variables, Markov inequality, Chebyshev inequality, Law of large numbers; 4. The main continuous probability distributions; 5. Simulation of random variables; 6. The notion of stochastic process. Markov property. Applications and examples; 7. Application of probability theory to study the queue systems; 8. Introduction in statistics for engineering and inferential statistics; 9. Estimators of parameters of statistical models (mean, variance, covariance, veridicity maximum); 10. Central limit Theorem; 11. Estimating confidence intervals; 12. Statistical models in artificial intelligence. Bayesian statistics bases; 13. Regression in statistics and machine; 14. Bayesian networks.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: COMPUTER STRUCTURE AND ORGANIZATION

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is envisaged to familiarize students with fundamentals of computer arithmetic, computer organisation, memory and input-output systems, computer system quality evaluation.
COURSE CONTENTS: 1. Fundamentals of computer arithmetic; 2. Organization and structure of a RISC processor; 3. Hierarchical structure of the computer memory; 4. Input/ Output blocks; 5. Computer system performance analysis.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: ARTIFICIAL INTELLIGENCE

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The aim of this course is to introduce students to the concepts and methods of artificial intelligence with a focus on representation and reasoning in classical logic. The cover will also cover an introduction to logic programming with Prolog.
COURSE CONTENTS: 1. Introduction to artificial intelligence; 2. Representation and reasoning using definite clauses; 3. Proof with definite clauses; 4. Utilizing the representation and reasoning system of definite clauses; 5. Problem solving using state-space search; 6. Heuristic search; 7. Constraint satisfaction problems; 8. Knowledge representation; 9. Uncertainty in knowledge and reasoning; 10. Planning; 11. Machine learning.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: COMPUTER GRAPHICS

CODE:
ECTS CREDITS: 4

TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course will introduce the basic concepts regarding computer graphics, fundamental transformations, and the structure of a graphics engine and the operations that take place in this engine. The laboratory has the purpose of putting into practice the studied information and implement them in C++.
COURSE CONTENTS: 1. Mathematical Aspects for Computer Graphics; 2. Geometrical Models; 3. Geometrical Transformatios; 4. Modeling and Simulation Transformation Chain; 5. Visualization Transformation Chain.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: OBJECT ORIENTED DESIGN

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The main objective is to train future computer engineers how to develop software applications which are easy to mantain and extend. Introduction in the basic principles of object oriented programming and design. The students will learn how to minimize complexity, how to apply and respect encapsulation and abstractions, to implement methods and classes with the right cohesion, how to reduce coupling and increase reusability, the importance of names, proper use of exceptions, proper use of comments. They will start learning to make code reviews, recognize “code smells” and methods of refactoring. Also, the most important architectural and design patterns will be introduced. The students will learn Java language in order to practice during laboratory hours the skills acquired through this discipline.
COURSE CONTENTS: 1. Introduction in Object Oriented Design: 1.1 Objectives (reducing complexity); 1.2. KISS; 1.3. YAGNI; 1.4. DRY; 1.5. Open Close Principle; 2. Classes and objects; 2.1. Encapsulation (bundling and information hiding, accessors, smells for broken encapsulation, how to refactor); 2.2. Defining classes in Java; 2.3. Creating objects; 2.4. Object references and garbage collector; 3. Rules about Class Methods; 3.1. Method cohesion (Definitions and classification, identification, how to refactor); 3.2. Cyclomatic Complexity; 3.3. Rules about parameters; 4. Class cohesion; 4.1. Single Responsability Principle; 4.2. LCOM4; 4.3. How to refactor in order to obtain class cohesion; 5. Class Coupling; 5.1. Abstractions and OCP; 5.2. Dependency Inversion Principle; 5.3. Defining, implementing and extending interfaces in Java; 5.4. Interface Segregation Principle; 5.5. Law of Demeter (one accepted form, two smells, how to refactor); 5.6. Dependency Injection Frameworks; 6. Ottinger's Rules; 7. Inheritance; 7.1. Inheritance in Java; 7.2. Extending behaviour; 7.3. Favor composition over inheritance (justification, implementation, Composite, Decorator Design Pattern. Adapter Design Pattern. Facade Design Pattern); 7.4. Polymorphism and OCP; 7.5. Liskov Substitution Principles; 7.6. Abstract Classes in Java 7.7; Polymorphism Smells (how to refactor, Template Design Pattern, State Pattern); 7.8. Strategy Pattern (definition, implementation, when to use); 7.9. Visitor Design Pattern and alternatives to this design pattern; 8. Exception in Java. Use of exceptions; 9. GUI Architectures; 9.1. Introduction in Swing; 9.2. Observator/ Observable Design Pattern; 9.3. Command Pattern; 9.4. Model-View-Controller; 9.5. Model-View-Presenter; 10. Object-Relational Patterns; 10.1. Repository Design Pattern; 10.2. Data Mapper; 10.3. Unit of Work; 10.4. Identity Map; 10.5. Lazy Load (Proxy); 10.6. Abstract Factory; 10.7. ORM; 11. Comments; 12. Improving performace vs. Design.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: ELECTRONIC MEASUREMENTS, SENSORS AND TRANSDUCERS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future engineers specialized in computers and information technology, ensuring their basic knowledge and practical skills in the field of electronic measurements, sensors and transducers. It is based on the use of theories and specific tools (algorithms, charts, models, protocols, etc.) to explain the operation and structure of hardware, software and communication systems Theoretical foundation of the features for the designed systems. It describes the structure and operation of hardware, software and communication components. It focuses on explaining the role, interaction and operation of hardware, software and communication system components. It focuses on the implementation of hardware, software and communication system components. It uses the interdisciplinary knowledge, solution patterns and tools to conduct experiments and interpret their results. It applies solutions by means of engineering tools and methods. Benchmarking, including experimental evaluation of solving alternatives for performance optimization. It develops and implements computer-based solutions for specific problems. It identifies and describes defining elements of the performance of hardware, software and communication systems. It explains the interaction of factors determining the performance of hardware, software and communication systems. It applies the methods and underlying principles for increasing the performance of hardware, software and

communication systems. It develops professional solutions for hardware, software and communication systems based on increasing of performance. It uses interdisciplinary knowledge to adapt the computer system against the requirements of application domain. It uses life cycle management, integration and integrity of hardware, software and communication systems. Doing a project including problem identification and analysis, design and development, demonstrating understanding of the need for quality.

COURSE CONTENTS: Chapter 1. Introduction: Elements of measurement techniques. Measurement errors. Characteristics of measurement devices and systems. Specific digital measurement operations; Chapter 2. Signal conditioning circuits: Instrumentation amplifiers; Instrumentation Amplifiers; Isolation Amplifiers; Voltage comparators; Sampling circuits; Analog to digital and digital to analog converters; Chapter 3. Sensors, transducers and multisensory systems: Sensors and transducers classifications; Operating principles of sensors and transducers; Intelligent sensors and transducers; Multisensory systems; Chapter 4. Electronic devices for measurement and visualization: Principles of measurement of electrical current, resistance and temperature using the multimeter; Analog ammeters, voltmeters, ohmmeters; Digital voltmeters; Digital multimeters; Oscilloscopes; Chapter 5. Intelligent measurement systems: The structure of an intelligent measurement system; Intelligent measurement system with incremental rotary encoder; Intelligent system for measuring the force; Intelligent system for monitoring electrical parameters.

LANGUAGE OF INSTRUCTION: English

ASSESSMENT METHOD(S): Verification (partial written examination, final written examination)

COURSE TITLE: English IV

CODE:

ECTS CREDITS: 2

TYPE OF COURSE: complementary

COURSE OBJECTIVE(S): To optimize the ability to express oneself verbally and in writing while considering the specificity of the group and individuals; Improving English competence and performance aims to improve students' perception and understanding of specialized technical literature, to increase students' interest for participation in technical debates, negotiations and science conferences, to write and deliver academic presentations in their field of specialty. Students will be better equipped to manage academic information delivered in English (in written or verbal form). Students will better cope with the challenges of working in an English dominate environment (either in Romania or in another country). Students learn to emphasize their personal and professional skills in CVs and Cover letters and increase their performance at job interviews in the fiels of computer technology.

COURSE CONTENTS:
1. The National Science Foundation: Relative pronouns in scientific writing; Using technical dictionaries for scientific research and translation; Expressing opinion-arguing for/ against; 2. Measuring and Comparing Research and Development in Computers: Listening: R&D Indicators, Present tenses, Interpreting statistics, Reading for gist & rephrasing; 3. Input Devices: Working out a Logical Sequence: Using abbreviations and acronyms, Past tenses, Phrasal Verbs; Using Diagrams and tables-Writing and interpreting; 4. Developing a New IT Product: Listening: Generating Ideas, techniques, Future tenses, Role-play – coordinating an R&D team, Presenting/ reviewing a new product – Oral presentations; 5. Testing an IT Product: Managing a debate; If clauses; Building a questionnaire; Role-play: interviews and team work; 6. Expert Knowledge in IT Related Fields: Taking notes and expanding on them – writing a review; Science and Technology Conferences – Making a scientific presentation; Comparing and contrasting, arguing for and against; 7. Coordinating a Computer System: Fishing for a software engineering job – job interviews; Speaking about oneself: Professional skills vs. personal interests; Organizing a debate; 8. Computerization and Its Role: Speaking about future trends-means of expressing future actions – Making generalizations and exemplifying – Writing research articles; 9. Monologue for Windows: Writing faxes and memos; Expressing appreciation/ discontent regarding operating systems; Creative writing/ speaking: metaphors and idioms in scientific language; 10. Digital Research Bounces Back: Tools of the past reinvented; Comparing and contrasting; Definitions and exemplification; 11. Robotics: Modal verbs and adverbs 1; Rediscovering shades of meaning; Expressing knowledge and lack of it; 12. The World Wide Web: Time clauses; Information transfer; Evaluating; Giving advice on technical issues; 13. Revision and exam preparation; 14. Evaluation.

LANGUAGE OF INSTRUCTION: English

ASSESSMENT METHOD(S): Written exam

COURSE TITLE: PRACTICAL STAGE

CODE:

ECTS CREDITS: 4

TYPE OF COURSE: domain

COURSE OBJECTIVE(S): The purpose of the discipline is practicing computer programming skills (computer programming, object oriented programming, algorithms and data structures, programming techniques). The goal is to understand the theoretical concepts by apllying them în practical applications.

COURSE CONTENTS: 1. Algorithms and Data Structures: Binary Search Trees, AVL Trees, Splay Trees, B/B+ Trees, Trie Trees, Graphs; 2. Programming techniques: Recursion, Arrays, Searching, Files, BackTracking, Dynamic Programming, Greedy, Lists, Trees; 3. Object Oriented Programming: C++ Programming, Classes, Nested Classes, Inheritance and Class Hierarchy, Overloading methods and operators, Polimorphism and virtual functions, I/O in C++.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

OPTIONAL COURSES

COURSE TITLE: KNOWLEDGE AND COMMUNICATION
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is addressed to the first year students and intent to present an introduction to human knowledge, as a concept and application tools in the real life: reading efficiently, writing correctly, intelligent searching information on the Internet; making different documents, etc.
COURSE CONTENTS: The course is a study-tour of communication; Internet and Web Searching; FORUM: Community Standards-General Rules; Efficient Reading; Writing Guidelines for Engineering and Science Students.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: GENERAL PEDAGOGY
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COMPULSORY COURSES

COURSE TITLE: SPORT IV
CODE:
ECTS CREDITS:
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Executarea corecta a exercitiilor de eduacatie fizica. Perfecţionarea abilitaţilor in jocurile de echipa.
COURSE CONTENTS: 1. Perfecţionarea alergării de rezistenţă; Perfecţionarea elementelor tehnice din volei: lovitura de atac, blocajul, serviciul de sus; 2. Dezvoltare fizică armonioasă – program de gimnastică aerobică (fete); Joc bilateral: tenis de masă, baschet şi fotbal; 3. Pregătirea probelor de control: alergare viteză – 50m, săritura în lungime de pe loc, alergare re rezistenţă; Joc bilateral de volei; 4. Dezvoltare fizică armonioasă – program de gimnastică aerobică (fete); Joc bilateral: tenis de masă, baschet şi fotbal; 5. Verificare: Probe si norme de control: alergare viteză – 50m, săritura în lungime de pe loc, alergare de rezistenţă – 800m (f) şi 1000m (b).
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

3RD YEAR, 1ST SEMESTER

COURSE TITLE: DIGITAL INTEGRATED CIRCUITS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the domain disciplines in the study schedule. The aim of the course is the knowledge assimilation that students need in understanding the operation of the basic types of digital integrated circuits as well as the analysis and synthesis of logical combinational and sequential circuits methods. The laboratory hours allow the consolidation of the theoretical notions and the achievement within the practice concerning digital circuits designing and using.
COURSE CONTENTS: 1. Commutation drive for semiconductor devices; 2. Basic logical circuits; 3. Combinational logical circuits; 4. Sequential logical circuits.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DATABASES
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course introduces fundamental topics in the field of databases: users, data models, entity-relationship model, relational model, relational algebra, file and index organization, distributed databases concepts. The labs consolidate the theoretical concepts and create working skills in MS Access 2000 and MS SQL Server 2000.
COURSE CONTENTS: 1. Databases and Database Users; 2. Database System Concepts and Architecture; 3. Data Modelling Using the Entity-Relationship Model; 4. Record Storage and Primary File Organisation; 5. Index Structures for Files; 6. The Relational Data Model and Relational Algebra; 7. SQL – A Relational Database Language; 8. Distributed Databases.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: OPEARATING SYSTEMS
CODE:
ECTS CREDITS: 5

TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the so called "disciplines in domain" from the curricula corresponding to this license domain. In the first Chapters one presents the primary notions and the classifications of operating systems along with the describing of the main architectural types. Afterward one introduces the most important concepts corresponding to the processes and threads management. Then one treats the problematic of memory management and of the most important aspects of the input-output operations. In the end one presents the fundamental notions corresponding to files' management. The laboratory is meant to help the understanding of knowledge on operating with Linux and on working with threads/processes and pipes in Linux. In the second part the students will study some aspects concerning the work with the memory manager, with the I/O system, with file systems and files and with the registry in Windows. At the seminar one toggles with the case studies Windows/Linux corresponding to the notions presented at the course classes.
COURSE CONTENTS: 1. Primary notions; 2. Operating systems classification. Types of OS; 3. Operating Systems' Architecture; 4. Notions about processes management; 5. Memory management; 6. I/o devices management; 7. Files management.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exams

COURSE TITLE: COMPUTER NETWORKS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The main goal of the course „Computer Networks" is to introduce the basic terminology and concepts in networking: these range from simple, limited streams of bits used to ferry data from a sender to a receiver, to various schemes for identifying, addressing, routing, and handling messages as they travel across various types of networking media. Likewise, protocols also play a crucial role in data transmission across a network. The laboratory activities give to the students the real feeling of the network applications.
COURSE CONTENTS: 1. Data Communications; 2. Communications Networks; 3. Network Technologies; 4. Multiple Access; 5. Switching; 6. Naming and Addressing; 7. Routing; 8. Services and Applications; 9. Security.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DISTRIBUTED SYSTEMS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The aim of this course is to introduce students to the basic elements for creation of distributed applications in computer networks, with a special focus on the middleware layer in Internet-based distributed systems.
COURSE CONTENTS: 1. Distributed systems. Definitions and features; 2. Arhitectures, models and networks of distributed systems; 3. Concurrent programming. Threads; 4. Inter-process communication in distributed systems; 5. Communication protocols for distributed systems; 6. Name and directory services; 7. Object-oriented distributed systems and remote method invocation. Java RMI; 8. Agent-oriented middleware. FIPA standards. Examples in JADE; 9. Service-oriented middleware. SOA and Web services; 10. Transactions and replication in distributed systems; 11. Distributed algorithms.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: MODELLING AND SIMULATION
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): 1. Introducing the basic concepts for modeling and discrete simulation; 2. Learning the analytical methods for modeling systems with waiting queues and networks of queues; 3. Introducing of techniques for the modeling, simulation and performances analysis at systems with complex discrete events; 4. Identification of possibilities and limits of mathematic models, their extension through simulation; 5. Using of packages and libraries of specialized programs for modeling and simulation; 6. Developing the abilities for the modeling/ simulation of a system through exercises and problems, realization of a small project; 7. Students familiarization with the traditional and modern working practices; 8. Establishing of the required abilities directly related to other specialty disciplines.
COURSE CONTENTS: 1. Introduction. Dynamic discrete systems (with events); 2. Systemic models for dynamic discrete systems (with events); 3. Operational models for dynamic discrete systems (with events); 4. Simulation of dynamic discrete systems (with events); 5. Specialized instruments (systems of programs) for discrete modeling and simulation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written verification

COURSE TITLE: PROJECT I – COMPUTER SYSTEMS
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The general objective of the course is to follow the correct application of the theoretical knowledge aquired by the studet in

order to correctly design a computer system. Specific objectives consist of learning, by the student, of the main issues underlying the design of a computer system. Course contents are in conjunction with the expectations of the epistemic community representatives, professional associations and employee representatives in the programming domain.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

3RD YEAR, 2ND SEMESTER

COURSE TITLE: PARALLEL AND DISTRIBUTED ALGORITHMS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Basic objectives of this course include, but are not limited, to the following: 1. To introduce the basic models of parallel computing; 2. To enable the student to apply a systematic methodology for designing parallel algorithms; 3. To provide the student basic knowledge for the analysis of parallel algorithms; 4. To enable the student to efficiently use the parallel constructs of parallel programming languages.
COURSE CONTENTS: 1. The Architecture of Parallel Systems; 2. Parallel Computing Models; 3. Brief Introduction to Parallel Programming of Multiprocessors; 4. The General Theory of Parallel Algorithms; 5. Basic Numerical and Non-numerical Parallel Algorithms; 6. Parallel Languages.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written verification, quizzes and homework

COURSE TITLE: SOFTWARE ENGINEERING
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The main objective of the course is to introduce students to the concepts and techniques required to build large software systems. The main objective for applications is to provide an opportunity to obtain practical experience applying the techniques on an actual development effort.
COURSE CONTENTS: 1. Introduction to Software Engineering; 2. Requirements engineering; 3. Development of software systems; 4. Verification and validation of software systems; 5. Evolution of software systems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam + homework)

COURSE TITLE: WEB APPLICATION DESIGN
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The course covers aspects related to Web application architecture, Web application modelling, Web engineering, semantic and participative Web. The laboratory sessions and the project themes deal with Java-based Web technologies and frameworks.
COURSE CONTENTS: 1. Introduction to Web applications' design; 2. Requirements engineering for Web applications; 3. Modelling Web applications; 4. Web application architectures; 5. Technologies for Web applications; 6. Testing Web applications; 7. Operation and maintenance of Web applications; 8. Web project management; 9. The Web application development process; 10. Usability of Web applications; 11. Performance of Web application; 12. Security for Web applications; 13. Semantic Web; 14. Participative Web (Web 2.0)
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DATA COMMUNICATION
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the specialty disciplines. The course focuses on the introduction of basic concepts concerning data communication matters. One presents the communications environment, serial interfaces, and communication protocols at the level Data Link. The course presents the necessary basic skills for the upcoming courses of Computer Networks and Computer Networks Management. The laboratory is meant to consolidate the theoretical knowledge and to create abilities in what is concerning the serial interfaces programming through practical applications, exercises and problems.
COURSE CONTENTS: 1. Distributed systems architecture; 2. Electrical interface; 3. Data transmission; 4. Communication protocols at the level at data link; 5. Ieee 802.3 csma/cd.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S):

COURSE TITLE: MICROPROCESSORS DESIGN
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course develops the students' skills necessary to work with microprocessors and microcontrollers.
COURSE CONTENTS: 1. VLSI Modules; 2. 8051 Microcontroller; 3. Dialog level; 4. Data transfer level.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: FORMAL LANGUAGES AND AUTOMATA

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The main objective of the course is to introduce the students the principles and the basic notions concerning formal languages and automata. The objective of applications is to enable the students to use the properties of regular languages and context-free languages in the area of computers.
COURSE CONTENTS: 1. Abstract language representation; 2. Regular sets and right linear grammars; 3. Finite state automata; 4. Properties of finite state automata and regular sets; 5. Context-free languages; 6. Push-down automata.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam + homework

COURSE TITLE: PROJECT II INFORMATION SYSTEMS

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Design and development of a stand-alone aplication in a multimedia environment.
COURSE CONTENTS: Course contents are in conjunction with the expectations of the epistemic community representatives, professional associations and employee representatives in the program domain.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICAL STAGE

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Design of the hardware, software and communication components; Solving problems using computer science and engineering tools; Design, life cycle management, integration and integrity of hardware, software and communication systems; Identification, description and flow of processes in project management, by taking over of different roles in a team and a clear and concise, verbal and written, description of the results in the acting field; Proof of the spirit of initiative and action for updating professional, economic and organizational culture knowledge. General objectives of the discipline consist of: Practicing theoretical notions from past years. Specific objectives consist of gaining experience with implementing a real world application.
COURSE CONTENTS: Two Practical activities (topics/ homework): I. Microcomputers - Network communication with arduino compatible micro-computers, Monitor and control using arduino devices, Self-configuration and proactiveness; II. Mobile computing – Android applications, Network communications from an android device; III. Programming – Building distributed applications, Interaction protocols, Database design.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

OPTIONAL COURSES

COURSE TITLE: PEDAGOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COURSE TITLE: ROBOTICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COURSE TITLE: CULTURE AND CIVILIZATION

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

4TH YEAR, 1ST SEMESTER

COURSE TITLE: PROJECT MANAGEMENT

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): Introduction of notions from the „body of knowledge" corresponding to Projects Management; Understanding of the differences between „program" and „software program" notions; Presentation of the general concepts "team work" and "team building": Acquiring of the required managerial knowledge: Introduction of ethic and professional themes in software engineering; familiarization with traditional and modern work practices; Establishing of the required abilities directly related to other specialty disciplines.
COURSE CONTENTS: 1. Software project. The general domain of projects management; 2. Software product (the program); 3. Software

processes; 4. Project management within the general frame of software engineering; 5. Zones of knowledge and processes in the practice of managing software projects; 6. The management of project integration; 7. The management of project domain; 8. Time management; 9. Costs management; 10. Projects quality management; 11. Human resources management; 12. Communication management; 13. Management of material resources (purchasing); 14. Risk management in projects.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written exam, quizzes homeworks)

COURSE TITLE: E-COMMERCE
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The aim of this course is to introduce students to the basic elements for creation of e-commerce applications, including concepts, techniques, algorithms and technologies. The laboratory work concerns the experimentation with various e-commerce technologies and techniques that are needed for the development of a sample e-commerce application.
COURSE CONTENTS: 1. Introduction to e-commerce; 2. Business models for e-commerce; 3. E-commerce infrastructure; 4. E-commerce marketing; 5. Security and payment; 6. Negotiation; 7. Trust and reputation; 8. Middle-agents; 9. Social networks; 10. Online content and media; 11. B2B e-commerce: supply chain and collaboration.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DATA SECURITY
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The course is meant to introduce the concepts of information security. The laboratory will give students the opportunity to practically improve their programming skills from a security point of view and also to apprehend the importance of security in internetworked environments.
COURSE CONTENTS:1. Introduction to information security; 2. Cryptographic tools; 3. Authentication; 4. Access control mechanisms; 5. Databases; 6. Intrusion detection; 7. Malicious software; 8. Denial of service; 9. Firewall and intrusion prevention systems; 10. Multilevel security; trust models; 11. Buffer overflow; 12. Physical and infrastructure security; 13. Security management and risk assessment; 14. Legal and ethical issues.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DATABASE DESIGN
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The course introduces fundamental topics in the field of databases design: the enhanced entity-relationship model, EER-relational mapping, the theory of normalization and transactions processing concepts. The labs consolidate the theoretical concepts and create working skills in Oracle DBMS.
COURSE CONTENTS: 1. Enhanced Entity-Relationship and Object Modelling; 2. ER- and EER-to-Relational Mapping; 3. Functional Dependencies and Normalization for Relational Databases; 4. Practical Database Design and Tuning; 5. Transaction Processing Concepts; 6. Concurrency Control Techniques; 7. Database Recovery Techniques; 8. Database Security and Authorization
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: TRANSLATOR DESIGN
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): General objectives of the course: To introduce specific concepts and techniques on compilers and compiler design phases to students. Specific objectives of the course: Understanding the principles and structure of compilers and translators; Understanding the techniques and methods for development of the main components of translators; The use of syntactic and lexical analysis methods to implement translators for small languages.
COURSE CONTENTS: 1. Introduction to Compilers (Compilers, Analysis of the source program, The phasis of a compiler); 2. Lexical analysis (The role of the lexical analyzer, Specification of tokens, Recognition of tokens, The Lex compiler); 3. Syntax analysis (The role of the parser, Top-down parsing, Bottom-up parsing, LR parsers, Parsers genrators); 4. Syntax-directed translation (Syntax-directed translation, Constructions of syntax trees, S-attributed definitions, L-attributed definitions, Top-down translations, Bottom-up evaluation of inherited attributes); 5. Type checking (Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions, Overloading of functions and operators, Polymorphic functions); 6. Intermediate code generation (Three-Address Code, Types and Declarations, Translation of Expressions, Control Flow, Switch-Statement, Intermediate Code for Procedures). Practical activities (topics/ homework) include: 1. Compiler design methods and tools; 2. Construction of a lexical analyser; 3. Using Lex/Flex/Jflex; 4. Construction of a descendent recursive parser; 5. Using Yacc/Bison/JavaCup; 6.

Construction of a predictive syntax-directed translator; 7. Syntax-directed translations using Yacc/Bison/JavaCup; 8. Type checking; 9. Intermediate code generation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: INFORMATION RETRIEVAL
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The general objective of Information retrieval course is to present a wide range of methods for locating needed information in different sets of data. This means searching for information in documents, searching for documents themselves, searching for metadata which describe documents. The efficiency of the search is the key issue. There are addressed problems regarding query generation, query execution, data structures, indexing, employed algorithms and evaluation techniques.
COURSE CONTENTS: 1. Introduction to informations storage and retrieval systems; 2. Introduction to data structures and algorithms related to information retrieval; 3. Inverted files; 4. Information retrieval using the Boolean model; 5. Index construction; 6. Modifications and enhancements to the basic indexing and search processes; 7. Vector space retrieval; 8: evaluation in information retrieval.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: PROJECT III INFORMATION TECHNOLOGY
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): General objective of the discipline: The discipline contributes to the education and training of future computer engineers, specialists in the design and development of software systems, by providing fundamental knowledge in web information systems domain. Specific objectives: By means of the project sessions, students acquire practical experience with respect to state-of-the-art web technologies and frameworks, as well as problem solving abilities. The following set of skills are targeted: analyzing requirements, defining specifications, designing, implementing, testing and managing the life cycle of a web information systems, as well as improving its performance. Team work is also encouraged, with students taking various roles and presenting the results in a clear and concise manner throughout the semester.
COURSE CONTENTS: Practical activities (topics/ homework): Project theme selection and requirements analysis; Web project management; Web information systems modeling; Web information system design and architecture; Addressing security, scalability and performance issues; Web information system development; Testing and improving the Web information system.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COURSE TITLE: COMPUTER NETWORKS MANAGEMENT
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): It is one of the specialty disciplines. The course focuses on the introduction of basic concepts concerning the management of computer networks. One presents the operation principles of a switch and of a router, the ISO-OSI model, the static routing, dynamic routing algorithms. The course is ending a cycle of courses from this domain: Data Communications, Computer Networks and Computer Networks Management. The laboratory is meant to consolidate the theoretical knowledge and to create abilities in what is concerning the configuration and repairing computer networks through practical applications, exercises and problems.
COURSE CONTENTS: 1. Introduction in computer networks management; 2. Bridging and Switching: fundaments; 3. Routing: fundaments; 4. Routing protocols.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: VLSI CIRCUITS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): This course introduces the necessary concepts and tools of verification and then it describes a process for planning and carrying out an effective functional verification of a design. It also introduces the concept of coverage models that can be used in a coverage driven verification process.
COURSE CONTENTS: 1. What is verification?; 2. Verifications tools; 3. The verification plan; 4. Architecting test benches.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMPUTER SYSTEMS VERIFICATION AND TESTING
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: domain

COURSE OBJECTIVE(S): General objective of the discipline: We try to introduce the systematic knowledge on testing objectives, quality metrics, methods and testing techniques for the software programs. Specific objectives: Design of the test cases used in testing the computer systems.
COURSE CONTENTS: Course (content units): Principles of Software Testing; Quality Characteristics System; Software Testing Techniques; Static Testing; Black-Box Testing; White-Box Testing; Test cases Management. Practical activities (topics/ homework): Metrics for Quality Characteristics System; Empiric Testing; Systematic Testing; Static Testing; Black-Box Testing; White-Box Testing.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: PROJECT IV MICROCOMPUTERS

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): General objective of the discipline: The introduction of the basic knowledge on analysis and synthesis of microcomputers so that students acquire practical knowledge for achievement and programming of the microcomputer. Specific objectives: Using intelligent systems.
COURSE CONTENTS: Practical activities (topics/ homework), Project: Implementing a complex system using RasberryPi, Arduino, LEDs, LCD and various types of sensors.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICAL STAGE FOR LICENSE PROJECT COMPLETION

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

4TH YEAR, 2ND SEMESTER

COURSE TITLE: MOBILE COMPUTING

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The overall objective of discipline: Contribute to training future engineers in the field of computers, specialists in designing and developing mobile applications, providing them with knowledge of mobile applications design and practical use of mobile devices, architectures and software development models. They deal with basic concepts used in the design and implementation of mobile applications. Specific objectives: Introduction to principles, architectures and best practices specific to the design of mobile applications. Using libraries for mobile applications to demonstrate their benefits compared to current software industry-specific criteria, productivity, performance, reusability and maintenance. The laboratory aims to fix theoretical knowledge and understanding of the concepts taught to enable the development of practical applications.
COURSE CONTENTS: Course (content units): 1. Introduction to mobile technologies. The structure of a mobile device. Applications of mobile computing; 2. Arhitecura mobile applications and design elements, native Apps; 3. Development Environments. Introduction to Objective-C; 4. Designing templates and model – view-controller delegated applied to mobile devices; 5. development environments for mobile applications. Limited computing resources; 6. Memory management. Fault tolerance and persistence developed applications for mobile devices; 7. Security Strategy; 8. Wireless Communication Technologies. Cellular networks; 9. TCP/IP for mobile technologies. Geo-location and global positioning system; 10. Graphical interfaces for mobile devices; 11. Mobile Computing distributed; 12. Ad hoc networks and mobile devices and sensors; 13. Study future technologies for mobile devices; 14. The convergence of mobile device communication. Activities applied (topics/ themes): 1. Introduction to mobile technologies. The structure of a mobile device. Applications of mobile computing; 2. Arhitecura mobile applications and design elements, native Apps; 3. Development Environments. Introduction to Objective-C; 4. Designing templates and model – view-controller delegated applied to mobile devices; 5. Development environments for mobile applications. Limited computing resources; 6. Memory management. Fault tolerance and persistence developed applications for mobile devices; 7. Security Strategy; 8. Wireless Communication Technologies. Cellular networks; 9. TCP/IP for mobile technologies. Geo-location and global positioning system; 10. Graphical interfaces for mobile devices; 11. Mobile Computing distributed; 12. Ad hoc networks and mobile devices and sensor; 13. study future technologies for mobile devices; 14. The convergence of mobile device communication.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written final exam, Written intermediate exam

COURSE TITLE: MACHINE LEARNING

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization

COURSE OBJECTIVE(S): General objective of the discipline: The course objective is to explore the construction and study of algorithms that can learn from and make predictions on data. Specific objectives: This course includes the following topics: Supervised learning algorithms (support vector machines, neural networks, association rules); Unsupervised learning algorithms (clustering, dimensionality reduction, recommender systems).
COURSE CONTENTS: Course (content units): 1. Introductory elements; 2. Linear regression; 3. Logistic regression; 4. Supervised learning. Unsupervised Learning; 5. Association rules learning; 6. Decision tree learning; 7. Artificial neural networks representation and learning; 8. Unsupervised learning. Clustering; 9. Support vector machine; 10. Bayesian networks; 11. Genetic algorithms.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exam

COURSE TITLE: GRAPHICAL SYSTEMS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The course wishess to introduce the concept of grafic processing system. General concepts and exemplifications, the widely used grafic processing libraries – OpenGL and DirectX are presented. The laboratory has the role of improving the studied infornation and of implementing them in C++ using DirectX libraries.
COURSE CONTENTS: 1. Direct 3D Rendering Chain; 2. Drawing in Direct 3D; 3. Colours; 4. Lights; 5. Textures; 6. Blending; 7. Meshes.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: MULTIMEDIA SYSTEMS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The course introduces basic concepts in multimedia field: multimedia technologies, multimedia data types (image, sound, video), compression algorithms, specific methods for multimedia data querying and two important multimedia applications: for e-learning and on multimedia databases.The lab presents the working way in some very popular authoring tools (Flash, Fireworks). During the labs and with homeworks the students must design and implement multimedia applications that combine all multimedia data types using the presented authoring tools.
COURSE CONTENTS: 1. Introduction; 2. Multimedia Authoring; 3. Multimedia technologies; 4. Sound; 5. Video; 6. Images; 7. Compression methods; 8. Content-based visual query; 9. Aplications on multimedia databases; 10. Multimedia applications of e-learning type.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: HUMAN-COMPUTER INTERACTION

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): General objective of the discipline: The discipline contributes to the education and training of future computer engineers, specialists in the design and development of software systems, by providing fundamental knowledge in human-computer interaction area (analysis, modeling, design, implementation and evaluation of human-computer interfaces). Specific objectives: The course aims to introduce core concepts regarding human-computer interaction: models, theories, techniques and tools for interaction, design methodologies for human-computer interfaces, usability issues, evaluation techniques, performance improvement methods. Topics related to intelligent interfaces (based on user model, natural and multimodal interaction) are also addressed. By means of the lab sessions, students acquire practical experience with respect to state-of-the-art languages and tools for creating user interfaces, as well as problem solving abilities. The following set of skills are targeted: analyzing requirements, creating use cases, building prototypes, implementing user interfaces, applying evaluation techniques for interface usability.
COURSE CONTENTS: Course (content units): Introductory concepts for human-computer interaction; Interaction models, theories, techniques and tools; Human-computer interaction styles; Physiological and psychological characteristics in HCI; Affective and emotional factors; Design methodologies for human-computer interfaces; Design patterns; Languages and tools for building user interfaces; Interface usability; Qualitative and quantitative evaluation techniques; Data visualization interfaces; Interfaces for collaborative work and social interaction; Emerging interaction techniques and communication approaches; Natural and multimodal interaction. Practical activities (topics/homework): Introductory concepts, requirements analysis for the chosen application; User modeling, roles and stereotypes *(personae)*; Generating use cases *(storyboarding)*; Building paper mockups; Building low fidelity protoypes *(wireframing)*; Building high fidelity protoypes; User interface implementation; Interface evaluation and usability testing.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: EMBEDDED SYSTEMS

CODE:

ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The primary goal of this course is to meet the student with basic information for the design and software development for embedded systems. At the conclusion of the course and laboratory, the student will have the knowledge and skills necessary to develop software for embedded systems, using technical specifications as well as specific methods of design and programming languages.
COURSE CONTENTS: 1. Introduction; 2. Specifications ES; 3. Embedded Operating Systems, Middleware and Scheduling.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DIGITAL SIGNAL PROCESSING
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): General objective of the discipline: Design of the hardware, software and communication components specific to digital signal processing area. Specific objectives: The discipline wants to introduce fundamental concepts related to the architecture of the signal processors, implementing of the algorithms for signal processing on DSP systems, using of the computing equipment with DSP in communications.
COURSE CONTENTS: Course (content units): Chap. 1. Digital signal processing; 1.1. Algorithms for DSP; 1.2. Architectures for DSP; 1.4. DSP's range of applications; 1.5. Characteristics of digital signal processing: programmability, stability, repeatability; Chap. 2. Filtering; 2.1. RC filters, CR filters; 2.2. Types of filters; filter performance criteria; 2.3. Finite Impulse Response filters; 2.4. Infinite Impulse Response filters; 2.5. Realization of digital filters; 2.6. Comparison of FIR and IIR filters; 2.7. Noise in filter designs; Chap. 3. Transforming signals into the frequency domain; 3.1. The phasor model; 3.2. Modelling sinusoids; 3.3. Fourier series; 3.4. Discrete Fourier series; 3.5. Nonperiodic signals - the Fourier transforms; 3.6. The discret Fourier transformation; 3.7. Fast Fourier transformation; Chap. 4. Encoding of Waveforms; 4.1. Analog waveform coding; 4.2. Digital waveform coding-Pulse Coded Modulation; 4.3. Delta Modulation; 4.4. Vocoders; 4.5. Windowing; 4.6. Channel vocoder; 4.7. Linear Predictive Coding; Chap. 5. Design of DSP systems; 5.1. Hardware alternatives for DSP; 5.2. Fixed- point DSP devices; 5.3. Floating-point DSP devices; 5.4. DSP system speed considerations; 5.5. Accessing memory resources; 5.6. Integration of peripheral devices. Practical activities (topics/ homework): 1. OMAP 5912 Starter Kit Presentation; 2. CCS4 configuration and utilization; 3. Support library and first program; 4. Sine Wave Generation; 5. Musical Notes Generation; 6. Numerical Filters; 7. Serial Communication; 8. Ethernet Communication; 9. Audio Signals Processing.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SENSOR NETWORKS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): General objective of the discipline: Design of the hardware, software and communication components specific to sensors networks. Specific objectives: The discipline wants to introduce fundamental concepts related different types of sensors and their network interconnections, with applications in automotive, industry and domestic.
COURSE CONTENTS: Course (content units): Chap. 1. General presentation. Sensors types: inductive, capacitive, optics, for humidity, intelligent; Chap. 2. Networks and technologies for data acquisition. Ad-hoc networks. Sensors networks. Standards and platforms for wireless networks; Chap. 3. Standards and integrated networks for automotive: LIN, SENT; Chap. 4. Standards and integrated networks for domestic and industrial applications: RFID, NFC, ZigBee, Bluetooth, Wi-Fi; Chap.5. Wireless monitoring of human health. Wireless applications in environment surveillance. Practical activities (topics/homework): 1. Presentation of communication protocols LIN and SENT; 2. Programming of LED RGB modules with LIN interface; 3. Programming of temperature sensor with SENT interface; 4. ZigBee communication protocol presentation; 5. Programming of temperature sensor with ZigBee protocol; 6. Bluetooth 4.0 communication protocol presentation; 7. Programming of a mouse device with Bluetooth protocol.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written verification

COURSE TITLE: REAL TIME COMPUTER SYSTEMS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialization
COURSE OBJECTIVE(S): The primary goal of this course is to meet the student with basics of real-time systems hardware structure, real-time I/O devices programming, real-time operating systems and task scheduling algorithms. At the conclusion of this course, laboratory and project, the student will have the knowledge and skills necessary to develop software for Real-Time Data Acquisition and Control Systems, using a general purpose PC 104 embedded system and real-time kernels/ operating systems.
COURSE CONTENTS: 1. Introduction to Real-Time Systems Examples of RTCS, Definitions and

classifications, Elements of a RT Computer Control System, Classification of RTCS, Classification of programs; 2. RTCS for Process Control Systems Categories of processes, Computers activities related to RTCS for processes control, Structures of computer systems for real-time processes control; 3. Computer hardware requirements for RTCS General hardware structure, Input/output signals from/to real world, Functional blocks of a Data Acquisition and Control System; 4. Programming the I/O devices in real-time applications Communicating methods with external devices, Programming using hardware interrupts, Counter/Timer devices, An example of Data Acquisition and Control System; 5. Real-time operating multi-tasking systems Introduction, Task management in real-time applications, A case study: RTOS QNX; 6. Scheduling algorithms for Hard Real Time Systems Introduction, Rate-Monotonic Scheduling Algorithm, Preemptive Earliest Deadline First Algorithm, A case study: A mixed RM-EDF scheduling algorithm; 7. Real-time data communication Introduction, Real-time data communication protocols, Deadline based protocols.

LANGUAGE OF INSTRUCTION: English

ASSESSMENT METHOD(S): Written verification

FIELD: SYSTEM ENGINEERING
PROGRAMME TITLE: APPLIED AUTOMATION AND INFORMATION TECHNOLOGY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D28AIAL101
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): A subject of study that is fundamental to any specialization. It outlines the fundamental notions of series and functions, differential calculus for multiple variable functions as well as integral functions, parameter, curved, multiple and surface integral functions. Empowering students to be able to apply differential and integral calculus to practical problems. The seminar is aimed to fix the theoretical knowledge and at developing calculus-based skills through practical applications, exercises and problems.

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFERENTIAL GEOMETRY
CODE: D28AIAL102
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It is one of the fundamental subjects of the academic curriculum for this license domain. It contributes to the formation of future control engineers, specialists in process management and applied informatics, ensuring their access to mathematical knowledge of algebra and geometry that is absolutely necessary in the development of their professional skills.

COURSE TITLE: PHYSICS
CODE: D28AIAL103
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers by developing their knowledge in the fundamental domain of Physics.

COURSE TITLE: MATERIALS CHEMISTRY
CODE: D28AIAL104
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their knowledge in the field of materials chemistry. The subject of studies approaches basic concepts used in the chemical analysis of various materials and substances.

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES
CODE: D28AIAL105
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course contributes to the formation of future control engineers and specialists in applied informatics, by empowering them with knowledge in the general domain of computer programming. It tackles basic concepts used in the design and implementation of applications and software systems using C programming language.

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES – PROJECT
CODE: D28AIAL106
ECTS CREDITS: 1
TYPE OF COURSE: fundamental
PROJECT OBJECTIVE(S): The subject of study contributes to the formation of control and applied informatics specialists by empowering them with practical knowledge in the domain of computer programming.

COURSE TITLE: DOCUMENT PROCESSING
CODE: D28AIAL107
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their basic and advanced knowledge regarding document processing.

COURSE TITLE: ENGLISH 1
CODE: D28AIAL108
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION 1
CODE: D28AIAL109
ECTS CREDITS: 3
TYPE OF COURSE: complementary
SEMINAR OBJECTIVE(S): Developing practical notions of physical education and sports in I-st year students.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL CALCULATION AND MATHEMATICAL STATISTICS

CODE: D28AIAL201
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Fundamental subject of study which is necessary to any specialization. It has the role of introducing students to the main numerical methods and numerical algorithms, with a view on linear and non-linear algebra, function approximation, differential and integral calculus, numerical solutions to differential equations and equations with partial derivates and elements of mathematical statistics. The course aims at developing students' capacity to analyse various mathematical models emerging in research, design, engineering, with numerical techniques and to solve specific problems by using the translation into programming languages of studied numerical methods. The laboratory work aims at a refined understanding and optimal absorption of the course notions. It also targets the construction of numerical codes and testing of the latter on various types of applications.

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D28AIAL202
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It is one of the fundamental subjects of study for the afore-mentioned license domain. The course aims at introducing a minimal package of basic notions pertaining to complex mathematical analysis, ordinary differential equations or equations with partial derivates, Fourier analysis, the Laplace transformation, the Fourier transformation, vector fields. The course is limited to the clear definition of notions, the presentation of the fundamental results, domains of applicability, solving algorithms, connections with further domains. The seminar engages in presenting examples, applying theoretical knowledge, utilising solving algorithms in exercises and problems.

COURSE TITLE: BASICS OF ELECTRICAL ENGINEERING

CODE: D28AIAL203
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The introduction, understanding and clarification of fundamental concepts pertaining to electromagnetic phenomena with applications to systems engineering.

COURSE TITLE: SOFTWARE SYSTEMS ENGINEERING

CODE: D28AIAL204
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): it contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their knowledge in the domain of developing programs systems.
The course tackles basic concepts used in programming techniques and in programming engineering.

COURSE TITLE: MECHANICS

CODE: D28AIAL205
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): acquiring the theories and methods pertaining to mechanical engineering in view of utilising them in professional communication in systems engineering.

COURSE TITLE: COMPUTER AIDED GRAPHICS

CODE: D28AIAL206
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Creating and developing the ability to use the AutoCAD package as a tool of graphical expression for future control engineers in various domains: mechanical engineering, electrical engineering, electronics, construction, architecture, industrial design, publicists, medicine, map making etc.

COURSE TITLE: ENGLISH 2

CODE: D28AIAL207
ECTS CREDITS: 2
TYPE OF COURSE: complementary
SEMINAR OBJECTIVES: It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION 2

CODE: D28AIAL208
ECTS CREDITS: 3
TYPE OF COURSE: complementary
SEMINAR OBJECTIVE(S): Developing practical notions of physical education and sports in I-st year students.

2nd YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ELECTRONIC CIRCUITS

CODE: D28AIAL301
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers by empowering them with basic notions and practical skills in the domain of analogical electronic circuits.

COURSE TITLE: ANALYSIS AND SYNTHESIS OF DIGITAL DEVICES

CODE: D28AIAL302
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process management and applied informatics, by facilitating their knowledge regarding programmable logic controllers, microcontrollers, data transmission and computer architecture. It tackles basic concepts used in the design and testing of sequential logical circuits.

COURSE TITLE: SIGNALS AND SYSTEMS

CODE: D28AIAL303
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for this license domain. The course aims at introducing basic concepts systematically (input/output theory and theory based on the notion of state) and describing them through specific characteristics. The course creates an opening to a dynamics-based approach as well as the ability to use instruments of control and mechatronics, thus being a first step to an interdisciplinary approach to engineering problems.

COURSE TITLE: DATABASES

CODE: D28AIAL304
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process control and applied informatics by facilitating the acquisition of knowledge in the domain of organisation of information theory by means of databases. The course tackles basic concepts used in the design, implementation and administration of databases.

COURSE TITLE: DATABASES-PROJECT

CODE: D28AIAL305
ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process management and applied informatics by facilitating the acquisition of knowledge in the domain of organisation of information theory by means of databases. It tackles basic concepts used in requirement and specifications analysis, implementation and administration of databases.

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

CODE: D28AIAL306
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process control and applied informatics by facilitating the acquisition of knowledge in languages, programming media and technologies, programming engineering and specific tools (algorithms, schemata, models, protocols etc).

COURSE TITLE: MARKETING

CODE: D28AIAL307
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process control and applied informatics by facilitating the acquisition of knowledge in the domain of marketing processes. The seminar aims at applying the theories presented during the course through analysis and representative study cases.

COURSE TITLE: ENGLISH 3

CODE: D28AIAL308
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION III

CODE: D28AIAL309
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): the course aims at developing the ability to perform physical exercises correctly and at perfecting teamwork skills.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: DIGITAL ELECTRONICS

CODE: D28AIAL401
ECTS CREDITS: 4

TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process control and applied informatics by facilitating the acquisition of knowledge in digital electronics. The course tackles basic concepts used in the design and accomplishment of digital systems by means of digital/numerical integrated circuits.

COURSE TITLE: DIGITAL ELECTRONICS – PROJECT
CODE: D28AIAL402
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: ELECTRIC MACHINES AND DRIVE SYSTEMS
CODE: D28AIAL403
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at presenting the theoretical and computational bases, the main phenomena and the operating characteristics of electric machines and actuators. As an objective, the course and the lab are designed to familiarize students with the types of electric machines, their operation and testing, as well as the ways in which they work.

COURSE TITLE: SYSTEM THEORY
CODE: D28AIAL404
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the fundamental disciplines of the curriculum for this license area. The course aims at introducing the fundamental aspects of control systems as feedback structures. The course creates the necessary openness for the dynamics-based approach, as well as the ability to use the control work tools as the preamble of the specialized disciplines.

COURSE TITLE: ROBOTICS
CODE: D28AIAL405
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied informatics scientists, providing them with knowledge in the field of robotics. Basic concepts used in the design and implementation of industrial robot control systems are addressed.

COURSE TITLE: COMPUTER ARCHITECTURE
CODE: D28AIAL406
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of computer engineering and information technology.

COURSE TITLE: COGNITIVE PSYCHOLOGY
CODE: D28AIAL407
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The study of cognitive psychology connects students to the most influential paradigm of contemporary psychology with applications from neuropsychology to artificial intelligence. The course provides students with knowledge about cognitive psychology understood as a detailed study of the human cognitive system and its subsystems, its own language and specific methodology, and the cognitive approach of personality in correlation with the psycho-social environment. The latter refers to a broader way of rethinking new concepts and re-integrating some psychological theories already known to students.

COURSE TITLE: ENGLISH 4
CODE: D28AIAL408
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of the curriculum for the specializations mentioned. It aims to improve language skills by improving the communication flow by practicing all the components involved in using modern language as a communication tool.

COURSE TITLE: PHYSICAL EDUCATION IV
CODE: D28AIAL409
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving team work skills in games.

COURSE TITLE: PRACTICAL TRAINING 1
CODE: D28AIAL410
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of software application development. Basic concepts used in designing and implementing computer programs are addressed.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: MODELLING AND SIMULATION
CODE: D28AIAL501
ECTS CREDITS: 5
TYPE OF COURSE: domain

COURSE OBJECTIVE(S): Contributes to the training of future control engineers, process control and technical IT specialists, providing them with fundamental and applied knowledge about methods and techniques by which processes, installations are modelled (mathematically represented) and then analysed (simulated) using computing systems. The concepts and basic methods used for system modelling and simulation are addressed.

COURSE TITLE: AUTOMATA AND MICROPROGRAMMING

CODE: D28AIAL502
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge in the field of automata theory and microprogramming. Basic concepts used in the design and implementation of automatic control systems are addressed.

COURSE TITLE: AUTOMATA AND MICROPROGRAMMING – PROJECT

CODE: D28AIAL503
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: MEASUREMENTS AND TRANSDUCERS

CODE: D28AIAL504
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with basic knowledge and practical skills in the field of measurement systems and instrumentation.

COURSE TITLE: MICROPROCESSOR SYSTEMS

CODE: D28AIAL505
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the analysis, design and use of microprocessor systems. It is aimed at developing practical competences and skills in the use, design and programming of microprocessor-based or microcontroller systems. Memory interfaces, I/O devices, and interrupt handling are highlighted.

COURSE TITLE: REAL-TIME OPERATING SYSTEMS AND LANGUAGES

CODE: D28AIAL506
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge on programming languages, environments and technologies, programming engineering, and real-time process control tools (real time languages, real-time executives, etc.).

COURSE TITLE: REAL-TIME SYSTEM DESIGN – PROJECT

CODE: D28AIAL507
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge on programming languages, environments and technologies, programming engineering, and real-time process control tools (real time languages, real-time executives, etc.).

COURSE TITLE: EMBEDDED SYSTEMS

CODE: D28AIAL508
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of embedded systems. Basic concepts used in the design and implementation of embedded systems are addressed.

3RD YEAR, 2ND SEMESTER

COURSE TITLE: DATA ACQUISITION SYSTEMS AND PROCESS INTERFACES

CODE: D28AIAL601
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of control and computer science specialists, providing them with knowledge in the field of data acquisition. Basic concepts used in the design and implementation of data acquisition systems and process interfaces are addressed.

COURSE TITLE: CONTROL ENGINEERING

CODE: D28AIAL602
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of control and computer science specialists, providing them with knowledge in the field of control systems. Basic concepts on analysing, designing and implementing control systems are addressed.

COURSE TITLE: DATA TRANSMISSION

CODE: D28AIAL603
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge in the field of information transmission theory. Basic concepts used in the design and implementation of data transmission systems are addressed.

COURSE TITLE: DIGITAL SIGNAL PROCESSING

CODE: D28AIAL604
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge in the field of digital signal processing. Basic concepts used in the design and implementation of digital signal processing systems are addressed.

COURSE TITLE: INDUSTRIAL SOFTWARE

CODE: D28AIAL605
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge in the field of industrial software. Basic concepts used in the design and implementation of data acquisition and control programs in industrial applications are addressed.

COURSE TITLE: PROJECT MANAGEMENT

CODE: D28AIAL606
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, assuring them knowledge of Project Management activities. Basic concepts used in project design and implementation are addressed.

COURSE TITLE: PRACTICAL TRAINING 2

CODE: D28AIAL607
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the design and implementation of control systems. Basic concepts used in the design, implementation and operation of control systems are addressed.

4TH YEAR, 1ST SEMESTER

COURSE TITLE: DIGITAL CONTROL SYSTEMS

CODE: D28AIAL701
ECTS CREDITS: 6
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, by acquiring and using control fundamentals, analysing, designing and implementing numerical systems.

COURSE TITLE: SYSTEMS IDENTIFICATION

CODE: D28AIAL702
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The objective of this course is to provide the knowledge needed to understand and implement numerical techniques for process identification. The course contributes to the formation of future control engineers, providing them with knowledge in systems identification. The basic concepts and methods used to identify systems are addressed.

COURSE TITLE: INDUSTRIAL PROCESS CONTROL

CODE: D28AIAL703
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists. It introduces students to system analysis of industrial plants and information processing in order to control industrial processes with continuous operation. Basic concepts related to industrial process control issues and computer programs for controling industrial processes are addressed.

COURSE TITLE: PROGRAMMABLE LOGIC CONTROLLERS

CODE: D28AIAL704
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the programming problems of programmable logic controllers (PLCs) and process control. It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of process control using PLCs. Practical concepts used in the design and implementation of process control systems with PLCs are addressed.

4TH YEAR, 1ST SEMESTER, PACKAGE A

COURSE TITLE: COMPUTER AIDED DESIGN OF CONTROL SYSTEMS

CODE: D28AIAL705a

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course contributes to the training of specialists in control and applied informatics, providing them with knowledge in the field of computer-aided design of control systems. Basic concepts on the use of specialized software packages for the design of control systems are addressed.

COURSE TITLE: DIGITAL CONTROL SYSTEMS – PROJECT

CODE: D28AIAL706a
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: ARTIFICIAL INTELLIGENCE

CODE: D28AIAL707a
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of artificial intelligence.

4TH YEAR, 1ST SEMESTER, PACKAGE B

COURSE TITLE: HYDRAULIC AND PNEUMATIC SYSTEMS

CODE: D28AIAL705b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in process control and technical informatics, providing them with knowledge in the field of process control. The basic knowledge in the field of hydraulic and pneumatic automation equipment as well as the techniques of fluid systems control are presented. The laboratory practice is designed to analyse and simulate the systems presented in the course.

COURSE TITLE: CONTROL ENGINEERING - PROJECT

CODE: D28AIAL706b
ECTS CREDITS: 2
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The discipline contributes to the training of control and computer science specialists, providing them with practical knowledge in the field of data acquisition, process interfaces and control systems.

COURSE TITLE: HUMAN-MACHINE INTERFACES

CODE: D28AIAL707b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): the course tackles the proper description of programming paradigms and specific language mechanisms, as well as the identification of the difference between the semantic and the syntactic aspects. The development of program units and the elaboration of related documentation are also targeted. Presentations of existing software applications by abstraction levels (architecture, packages, classes, methods) using the basic knowledge are also tackled.

4TH YEAR, 2ND SEMESTER, PACKAGE B

COURSE TITLE: OPTIMIZATIONS

CODE: D28AIAL801
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts regarding the optimization problems, the general conditions of optimality, as well as methods of optimal synthesis for both discrete systems and continuous systems. The problem of mathematical programming in optimization is also presented.

COURSE TITLE: GRADUATION THESIS COMPLETION

CODE: D28AIAL802
ECTS CREDITS: 10
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): variable by case.

4TH YEAR, 2ND SEMESTER, *PACKAGE A

COURSE TITLE: COMPUTER NETWORKS

CODE: D28AIAL803a
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer engineers, providing them with knowledge in the field of computer networks. Basic concepts used in the design and implementation of data acquisition and control programs in industrial applications are addressed.

COURSE TITLE: COMPUTER NETWORKS – PROJECT

CODE: D28AIAL804a
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: INFORMATION SECURITY TECHNOLOGY

CODE: D28AIAL805a
ECTS CREDITS: 4
TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of information security. Basic concepts used in the design and implementation of data security systems are addressed.

COURSE TITLE: HYBRID SYSTEMS

CODE: D28AIAL806a
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge of hybrid systems. Basic concepts used in designing and implementing hybrid systems are addressed.

COURSE TITLE: JAVA APPLICATIONS

CODE: D28AIAL807a
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, applied IT specialists, providing them with knowledge in the general field of computer programming. Basic concepts used in designing and implementing applications and software systems using Java technology and object-oriented programming are addressed.

4TH YEAR, 2ND SEMESTER, PACKAGE B

COURSE TITLE: DISTRIBUTED CONTROL SYSTEMS

CODE: D28AIAL803b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with basic knowledge for the control of distributed systems.

COURSE TITLE: FAULT DIAGNOSIS AND DECISION TECHNIQUES

CODE: D28AIAL804b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists. Basic concepts used in the field of industrial system reliability theory are addressed, with diagnostic and decision techniques applied to control systems.

COURSE TITLE: VIRTUAL INSTRUMENTATION

CODE: D28AIAL805b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course contributes to the training of control and computer science specialists, providing them with knowledge in the field of virtual instrumentation. Basic concepts on designing virtual tools are addressed.

COURSE TITLE: WEB TECHNOLOGIES

CODE: D28AIAL806b
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, applied IT specialists, providing them with knowledge in the general field of computer programming. Basic concepts used in designing and implementing distributed software applications and systems using various current web technologies are addressed.

COURSE TITLE: WEB TECHNOLOGIES – PROJECT

CODE: D28AIAL807b
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: DIPLOMA EXAM

CODE:
ECTS CREDITS: 10
TYPE OF COURSE: domain
EVALUATION: EXAM

FIELD: SYSTEM ENGINEERING
PROGRAMME TITLE: MULTIMEDIA SYSTEM ENGINEERING
BACHELOR'S DEGREE

1^{ST} YEAR, 1^{ST}/ 2^{ND} SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D28ISML101
ECTS CREDITS:
COURSE OBJECTIVE(S): The course presents the fundamental notions of series and functions, differential calculus for functions of several variables as well as the concepts of integrals with parameters, curvilinear, multiple and surface integrals. The seminar aims to consolidate the theoretical knowledge and to create computational skills through practical applications, exercises and problems.
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE: D28ISML102
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic notions of linear algebra, analytical and differential geometry: vector spaces, linear applications, square shapes, Euclidean spaces, symmetrical operators, vectors, the straight line and the plane, conical and quadric shapes, curves in the plane and the space, surfaces. The seminar has the role of consolidating the theoretical knowledge and creating computational skills through practical applications, exercises and problems.
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

COURSE TITLE: PHYSICS
CODE: D28ISML103
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing fundamental notions of physics: elements of analytical mechanics, thermo-dynamics, optics and quantum physics. The seminar and laboratory activities are designed to consolidate theoretical knowledge and create computational skills through practical applications, exercises and problems.
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

COURSE TITLE: MATERIALS CHEMISTRY
CODE: D28ISML104
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at the students' familiarizing with the main concepts of atom structure, chemical bonds, the properties of substances, solutions, notions of electrochemistry, the corrosion of materials and electrical insulating materials. The seminar has the role of consolidating theoretical knowledge and creating practical skills through practical applications.

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES
CODE: D28ISML105
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at using the concepts of informatics and computer technology in solving well-defined problems in system engineering and in applications requiring the use of hardware and software in industrial systems or in computer systems, as well as solving common problems in the field of system engineering using concepts of computer science and information technology

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES - PROJECT
CODE: D28ISML106
ECTS CREDITS:
COURSE OBJECTIVE(S): The project aims at expanding the basic concepts of computer programming and programming languages by designing, implementing and testing some applications that are specific to computer programming.

COURSE TITLE: DOCUMENT PROCESSING
CODE: D28ISML107
ECTS CREDITS:
TYPE OF COUTSE:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts on document processing issues.

COURSE TITLE: ENGLISH 1
CODE: D28ISML108
ECTS CREDITS:
COURSE OBJECTIVE(S): The course and the seminar have the role of consolidating the fundamental vocabulary and the structural conversational paradigms that are specific to exact sciences. It also aims at developing the skills that are necessary to carry out the necessary documentation for the purpose of employment: letters of application, the CV in English, character references or the correct completion of an application form.

COURSE TITLE: PHYSICAL EDUCATION 1

CODE: D28ISML109
ECTS CREDITS:
COURSE OBJECTIVE(S): This subject of study aims at forming the theoretical, practical and methodical skills for individual or group practice in view of a healthy lifestyle.

COURSE TITLE: NUMERICAL CALCULATION AND MATHEMATICAL STATISTICS

CODE: D28ISML201
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the main numerical methods and numerical algorithms regarding: linear and non-linear algebra, function approximation, differential and integral calculus, the numerical solving of differential equations and partial derivatives and mathematical statistics. The course aims at developing in students the ability to analyse various mathematical models that appear in research, design, engineering, by using numerical techniques, and also the skill of solving specific problems by using the translation of the studied numerical methods into programming languages.

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D28ISML202
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing a minimal set of basic concepts from: complex analysis, ordinary or partial differential equations, Fourier analysis, Laplace transforms, Fourier transforms, vector fields. The course is limited to the clear definition of concepts, the presentation of fundamental results, of applicative fields, of solving algorithms, of the connections with other domains.

COURSE TITLE: BASICS OF ELECTRICAL ENGINEERING

CODE: D28ISML203
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing, understanding and expanding the fundamental notions of electromagnetic phenomena with applications in the field of system engineering.

COURSE TITLE: SOFTWARE SYSTEMS ENGINEERING

CODE: D28ISML204
ECTS CREDITS:
COURSE OBJECTIVE(S): The course contributes to the formation of future engineers specializing in multimedia systems engineering, providing them with knowledge in the field of software systems development. Basic concepts are addressed in the design and implementation of software applications and systems used in programming techniques and programming engineering using the programming language C.

COURSE TITLE: MECHANICS

CODE: D28ISML205
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts regarding the methods of constructing the mathematical models of the mechanical systems movement with a constant mass and a finite number of freedom degrees. Their analysis is accompanied by calculation examples, applications illustrating the studied methods.

COURSE TITLE: COMPUTER-AIDED GRAPHICS

CODE: D28ISML206
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at creating and developing the ability to use the AutoCAD software package as a graphic expression tool for future systems engineers in various fields: mechanical engineering, electrical engineering, electronics, construction, architecture, cartography, publishing, medicine, industrial design etc.

COURSE TITLE: ENGLISH 2

CODE: D28ISML207
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at improving language skills by improving the communication flow, by practicing all the components involved in the use of modern language as a communication tool.

COURSE TITLE: PHYSICAL EDUCATION 2

CODE: D28ISML208
ECTS CREDITS:
COURSE OBJECTIVE(S): This subject of study aims at forming the theoretical, practical and methodical skills for individual or group practice in view of a healthy lifestyle.

2ND YEAR, 1ST/ 2ND SEMESTER

COURSE TITLE: LINEAR ELECTRONIC CIRCUITS

CODE: D28ISML301
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at acquiring the theoretical knowledge about the most important electronic devices and linear electronic circuits and introducing the basic concepts regarding the analysis and design of analogue electronic systems.

COURSE TITLE: ANALYSIS AND SYNTHESIS OF DIGITAL DEVICES

CODE: D28ISML302
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding: numbering systems, switching algebra, MSI and LSI integrated circuits, counters and registers, the analysis and synthesis of synchronous and asynchronous sequential circuits.

COURSE TITLE: SYSTEM THEORY

CODE: D28ISML303
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the fundamental aspects of control systems as feedback structures. The course creates the necessary openness for the dynamics-based approach, as well as the ability to use the control tools as the preamble of specialized disciplines.

COURSE TITLE: DATABASES

CODE: D28ISML304
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts related to database design methodology and the assimilation of knowledge on the use of a database management system (SGBD).

COURSE TITLE: DATABASES – PROJECT

CODE: D28ISML305
ECTS CREDITS:
COURSE OBJECTIVE(S): The project has the role of training the student to be able to design and manage a functional relational database.

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

CODE: D28ISML306
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts on object-oriented programming, as well as the features and concepts introduced by C++. Then the syntactic details of the C++ language are presented.

COURSE TITLE: MARKETING AND MANAGEMENT

CODE: D28ISML307
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of the marketing process so that, following training activities, students can acquire useful knowledge about market developments, product policies, promotional activity, pricing and product distribution (focusing on the IT field).

COURSE TITLE: ENGLISH 3

CODE: D28ISML308
ECTS CREDITS:
COURSE OBJECTIVE(S): The seminar has the role of enriching the specialized vocabulary in the computational field, the development of the linguistic competence in this field through the active participation in various IT context situations. Students should be able to understand scientific English in international exchanges (e.g. Erasmus or conferences, presentations) and to follow courses in English in a scientific subject in a foreign university.

COURSE TITLE: PHYSICAL EDUCATION 3

CODE: D28ISML309
ECTS CREDITS:
COURSE OBJECTIVE(S): This subject of study aims at forming the theoretical, practical and methodical skills for individual or group practice in view of a healthy lifestyle.

COURSE TITLE: 2D GRAPHICS I

CODE: D28ISML401
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at using basic and advanced concepts to demonstrate their benefits in relation to the current software industry criteria, which are productivity, performance, reusability and maintenance.

COURSE TITLE: 2D GRAPHICS I – PROJECT

CODE: D28ISML402
ECTS CREDITS:
COURSE OBJECTIVE(S): The project aims at using basic and advanced concepts to demonstrate their benefits in relation to the current software industry criteria, which are productivity, performance, reusability and maintenance.

COURSE TITLE: DATA STRUCTURES AND ALGORITHMS

CODE: D28ISML403
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at developing skills related to: the efficient design/ development of software and software tools; the solution of practical computational problems; improving application performance.

COURSE TITLE: JAVA PROGRAMMING

CODE: D28ISML404
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at acquiring knowledge and using the specific terminology correctly; acquiring knowledge and applying primary methods for the development of Java applications.

COURSE TITLE: COMPUTER ARCHITECTURE

CODE: D28ISML405

ECTS CREDITS:

COURSE OBJECTIVE(S): The course introduces the basic concepts for understanding how a computer works as a system, beyond operating programs and using peripherals. It is intended to present the coding and manipulation modes of data and programs in a computing system.

COURSE TITLE: DIGITAL ELECTRONICS

CODE: D28ISML406

ECTS CREDITS:

COURSE OBJECTIVE(S): The course deals with the presentation, analysis and use of integrated circuits. It provides support for the complete and correct design of a digital system in terms of: the electrical interface, static and transient mode parameters, high speed circuitry as well as the electromagnetic compatibility of numerical systems.

COURSE TITLE: DIGITAL ELECTRONICS – PROJECT

CODE: D28ISML407

ECTS CREDITS:

COURSE OBJECTIVE(S): The project has the role of familiarizing students with the digital circuits themselves, with the SPICE simulation/ modelling of digital structures as well as with the use of HDL languages and programmable circuits for the synthesis of some combinational and/or sequential circuits.

COURSE TITLE: COGNITIVE PSYCHOLOGY

CODE: D28ISML408

ECTS CREDITS:

COURSE OBJECTIVE(S): The course aims at gaining knowledge and understanding the theoretical perspectives, empirical results and current trends in cognitive psychology, to critically evaluate studies in the area of cognitive psychology.

COURSE TITLE: ENGLISH 4

CODE: V409

ECTS CREDITS:

COURSE OBJECTIVE(S): The seminar aims at enriching the students' specialized vocabulary in the computational field, at developing their linguistic competence in this field by actively participating in various situational contexts in the IT world.

COURSE TITLE: PHYSICAL EDUCATION 4

CODE: D28ISML410

ECTS CREDITS:

COURSE OBJECTIVE(S): This subject of study aims at forming the theoretical, practical and methodical skills for individual or group practice in view of a healthy lifestyle.

COURSE TITLE: PRACTICAL TRAINING 1

CODE: D28ISML411

ECTS CREDITS:

COURSE OBJECTIVE(S): It contributes to the training of future multimedia engineers, specialists in multimedia applications development, providing them with knowledge in the field of software application development. Basic concepts used in designing and implementing computer programs as well as developing audio-video presentations, 2D-3D animations, image processing using specific software are addressed.

3RD YEAR, 1ST/ 2ND SEMESTER

COURSE TITLE: REAL TIME SYSTEMS

CODE: D28ISML501

ECTS CREDITS:

COURSE OBJECTIVE(S): The course aims at introducing the basic concepts regarding the real time management of processes in the following directions: the assembly language programming of real-time applications, implementation of a real-time executive, organizing control applications under the command of a real-time executive.

COURSE TITLE: AUDIO-VIDEO BASICS

CODE: D28ISML502

ECTS CREDITS:

COURSE OBJECTIVE(S): The course aims at introducing basic concepts on: audio systems that describe various audio equipment, digital recording and audio postprocessing; the video and film section, which describes subtitling techniques, digital cameras, movie editing, AV editing as well as various conversions between video formats (analogue and digital).

COURSE TITLE: 3D GRAPHICS AND ANIMATION

CODE: D28ISML503

ECTS CREDITS:

COURSE OBJECTIVE(S): The course aims at using basic and advanced concepts to demonstrate their benefits in relation to current software, productivity, performance, reusability and maintenance criteria.

COURSE TITLE: 3D GRAPHICS AND ANIMATION – PROJECT

CODE: D28ISML504

ECTS CREDITS:

COURSE OBJECTIVE(S): The project aims at using basic and advanced concepts to demonstrate their benefits in relation to the current software, productivity, performance, reusability and maintenance criteria.

COURSE TITLE: RADIO TV JOURNALISM

CODE: D28ISML505
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of the media system, the characteristics of the television and reportage message and the ways of handling in the media.

COURSE TITLE: MEASURING AND INSTRUMENTATION SYSTEMS

CODE: D28ISML506
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at the students' acquiring the basic knowledge of electronic circuits specific to measuring devices and systems, the structure and operation of electronic measuring and visualization devices, as well as the presentation of several measuring systems.

COURSE TITLE: MICROCONTROLLERS AND MICROPROCESSORS

CODE: D28ISML507
ECTS CREDITS:
COURSE OBJECTIVE(S): The course provides knowledge of the architecture and operation of 8/16/32 microprocessors with emphasis on the Intel 80 x 86 family. Knowledge of a modern PC/ controller architecture, PC-104/ ISA and PC-104 +/ PCI system buses and interfaces for them; knowledge of the architecture and specific peripheral resources for representative families of 8 and 16 bit microcontrollers as well as knowledge of development environments (software and hardware) used to develop a microcontroller application. It also aims at developing the microcontroller's selection capability (computing power, resources and other criteria) for a specific application.

COURSE TITLE: MICROCONTROLLERS AND MICROPROCESSORS – PROJECT

CODE: D28ISML508
ECTS CREDITS:
COURSE OBJECTIVE(S): Knowledge of the specific peripheral architecture and resources of the 8 bit AVR microcontroller family, as well as development environments (software and hardware) used for an application with such a microcontroller; programming in C for microcontrollers (embedded systems) and using a system simulator (co-simulation).

COURSE TITLE: CONTROL SYSTEMS

CODE: D28ISML601
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding: systems analysis and synthesis, types of control systems, the design of controllers in classical PID structures and in complex structures.

COURSE TITLE: ELECTRONIC STRUCTURES FOR MULTIMEDIA

CODE: D28ISML602
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing concepts on the characterization and implementation of functional structures in mixed signal systems.

COURSE TITLE: DIGITAL SIGNAL PROCESSING

CODE: D28ISML603
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the digital signal processing. It is desirable to create skills for designing and analysing the properties of digital filters, how to implement digital filters and the spectral estimation of signals. It details the truncation and finite length of words when implementing algorithms on digital signal processors.

COURSE TITLE: INFORMATION TRANSMISSION THEORY

CODE: D28ISML604
ECTS CREDITS:
COURSE OBJECTIVE(S): The course contributes to the formation of future engineers, providing them with knowledge in the field of information transmission theory. Basic concepts used in the design and implementation of data transmission systems are addressed.

COURSE TITLE: SOFTWARE FOR MULTIMEDIA SYSTEMS

CODE: D28ISML605
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing and describing the multimedia field, focusing on data type, multimedia technologies and their use for the making of multimedia products intended for publication on the Web.

COURSE TITLE: SOFTWARE FOR MULTIMEDIA SYSTEMS – PROJECT

CODE: D28ISML606
ECTS CREDITS:
COURSE OBJECTIVE(S): The project aims at creating a practical multimedia application for the Web, which involves the design, implementation and troubleshooting of the multimedia product.

COURSE TITLE: PROJECT MANAGEMENT

CODE: D28ISML607
ECTS CREDITS:

COURSE OBJECTIVE(S): The course aims at presenting project management concepts starting with the acceptance of the project proposal, the detailed planning phase of the project, the control and evaluation phase during the project implementation and execution, and the project closure phase. The development of aspects related to: structural organizational alternatives, the project team formation, project planning, stress management, project risk management, the analysis of project phases.

COURSE TITLE: PRACTICAL TRAINING
CODE: D28ISML608
ECTS CREDITS:
COURSE OBJECTIVE(S): It contributes to the training of future multimedia engineers, specialists in multimedia applications development, providing them with knowledge in the field of software application development. Basic concepts used in designing and implementing computer programs, user interfaces, 2D-3D animations, image processing using specific software are addressed.

4TH YEAR

COURSE TITLE: MULTIMEDIA TECHNOLOGIES IN E-LEARNING
CODE: D28ISML701
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts into interactive multimedia technologies and their use in e-learning.

COURSE TITLE: MULTIMEDIA TECHNOLOGIES IN E-LEARNING – PROJECT
CODE: D28ISML702
ECTS CREDITS:
COURSE OBJECTIVE(S): The project aims at the students' gaining practical experience in interactive multimedia technologies and their use in e-learning, as well as acquiring skills in the design, implementation and testing of educational software systems.

COURSE TITLE: INTERNET APPLICATIONS
CODE: D28ISML703
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at presenting concepts related to the design of the working environment, the creation of the framework, the realization of the structural diagrams and the creation of dedicated software applications.

COURSE TITLE: AUDIO-VIDEO EQUIPMENT
CODE: D28ISML704
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of: audio systems that describe various audio equipment, digital recording and audio post-processing; the video and movie section, which describes subtitling techniques, digital cameras, movie editing, AV editing as well as various conversions between video formats (analogue and digital).

COURSE TITLE: HUMAN-MACHINE INTERFACES
CODE: D28ISML705
ECTS CREDITS:
COURSE OBJECTIVE(S): The course looks at the proper description of programming paradigms and specific language mechanisms and identifies the difference between semantic and syntactic aspects; the development of program units and the elaboration of related documentation; explaining existing software applications, abstraction levels (architecture, packages, classes, methods) using the basic knowledge.

PACKAGE A

COURSE TITLE: COMMUNICATION SYSTEMS
CODE: D28ISML706A
ECTS CREDITS:
COURSE OBJECTIVE(S): This subject of study aims at developing the analytical and designing skills of the communication systems, to offer the right solutions in terms of complete, correct and optimal data transfer, providing the correct solutions in terms of the chosen communication protocol.

COURSE TITLE: IMAGE PROCESSING AND RECOGNITION
CODE: D28ISML707A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts and skills related to the use of techniques, methods and equipment specific to the acquisition, processing and recognition of real images for practical applications.

COURSE TITLE: DESIGN, AESTHETICS AND SEMIOTICS OF AUDIO-VISUAL MATERIALS
CODE: D28ISML708A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the issue of verbal and visual communication specific to cinema and television broadcasts.

PACKAGE B

COURSE TITLE: PARALLEL PROCESSING AND DISTRIBUTED SYSTEMS IN MULTIMEDIA
CODE: D28ISML706B
ECTS CREDITS:

COURSE OBJECTIVE(S): The course aims at introducing basic concepts on architecture, equipment and programming knowledge for the parallel processing of the information gathered from the process in order to manage the multi-variable processes that are functionally and spatially distributed.

COURSE TITLE: PROGRAMMABLE LOGIC CONTROLLERS

CODE: D28ISML707B
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the programming of programmable logic controllers (PLCs) and the issue of control processes and systems with PLCs.

COURSE TITLE: COMPUTER AIDED DESIGN OF CONTROL SYSTEMS

CODE: D28ISML708B
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding: the analysis and synthesis of systems, procedures and design standards of control systems.

COURSE TITLE: COMPUTER NETWORKS

CODE: D28ISML801
ECTS CREDITS:
COURSE OBJECTIVE(S): The course contributes to the formation of future engineers, providing them with knowledge in the field of computer networks. Basic concepts used in network design and implementation are addressed.

COURSE TITLE: MULTIMEDIA SYSTEMS – PROJECT

CODE: D28ISML802
ECTS CREDITS:
COURSE OBJECTIVE(S): The aim of the project is to apply theoretically acquired knowledge to the courses that were previously studied and to learn the skills necessary to select and integrate multimedia components in the multimedia application development process.

COURSE TITLE: WRITING OF THE GRADUATION PAPER

CODE: D28ISML803
ECTS CREDITS:
COURSE OBJECTIVE(S):

PACKAGE A

COURSE TITLE: WEB TECHNOLOGIES

CODE: D28ISML804A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of web application programming, using web technologies and scripting languages such as HTML, JavaScript, PHP, CSS, etc.

COURSE TITLE: SECURITY AND ENCRYPTION TECHNIQUES

CODE: D28ISML805A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding: Introduction to information security theory, data protection techniques: passwords, symmetric and public key encryption, digital signatures, antivirus and firewall configuration.

COURSE TITLE: LEGAL PROTECTION OF INFORMATION

CODE: D28ISML806A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing a legal framework for future engineers.

COURSE TITLE: TV AND MULTIMEDIA TECHNOLOGIES AND TECHNIQUES

CODE: D28ISML807A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing and extending the following concepts: multimedia-web and interactive desktop interfaces; internet technologies and standards used in the audio and video communication; multimedia systems for signal processing; developing programs for managing the multimedia activity; AV Streaming.

COURSE TITLE: VIRTUAL REALITY

CODE: D28ISML808A
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing basic theoretical concepts for the making of virtual scenes using the computer.

PACKAGE B

COURSE TITLE: APPLICATIONS OF DIGITAL SIGNAL PROCESSING FOR SPEECH, MUSIC AND TELECOMMUNICATION

CODE: D28ISML804B
ECTS CREDITS:
COURSE OBJECTIVE(S): The course presents concepts, models and basic methods for the processing of one-dimensional signals in music, speech and telecommunications.

COURSE TITLE: FAULT DIAGNOSIS AND DECISION TECHNIQUES

CODE: D28ISML805B
ECTS CREDITS:
TYPE OF COUTSE:
COURSE OBJECTIVE(S): The course focuses mainly on the representation and manipulation of uncertain knowledge in order to model judgment in the decision and diagnosis process. It presents techniques for the monitoring, detection and localization of defects in control systems.

COURSE TITLE: METHODS AND ALGORITHMS FOR CODING MULTIMEDIA INFORMATION

CODE: D28ISML806B
ECTS CREDITS:
COURSE OBJECTIVE(S): Introduction to information security theory, the presentation of data protection techniques: the study of information transmission methods using communication channels; the study of information protection algorithms transmitted by optical fibre, wire and wireless; Methods of protecting distributed databases; Information compression algorithms to reduce storage space / access time / transmission time.

COURSE TITLE: VIRTUAL INSTRUMENTATION

CODE: D28ISML807B
ECTS CREDITS:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of: modern instrumentation, virtual instrumentation software packages, the use of digital signal processing concepts and control systems for virtual instrument design.

COURSE TITLE: MODELLING OF MULTIMEDIA INFORMATION SYSTEMS

CODE: D28ISML808B
ECTS CREDITS:
COURSE OBJECTIVE(S): The motivated use of concepts in multimedia information systems and digital media analysis technologies to solve well-defined problems in system engineering and in applications requiring hardware and software use for media. Solving common problems in the field of system engineering using the concepts of computer science and information technology.

FIELD: ELECTRONIC ENGINEERING, TELECOMMUNICATIONS AND INFORMATION TECHNOLOGIES
PROGRAMME TITLE: APPLIED ELECTRONICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS

CODE: D28ELAL101
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing the fundamental notions of numerical series and functions, differential calculus for functions of several variables as well as the concepts of improper integrals with parameters, curvilinear, multiple and surface integrals and their application to solving practical problems. The seminar aims to fix the theoretical knowledge and to create computational skills through practical applications, exercises and problems.
COURSE CONTENTS: 1. Introduction to Differential Calculus; 1.1 Fundamental strings; complete metric spaces; the principle of contraction; 1.2 Numerical series; 1.3 Series of powers; series developments; 1.3 Limits and continuity for multi-variable functions; 1.4 Partial derivatives and differentiability; 1.5 Local extremes for multi-variable functions; 1.6 Defined default functions; 2. Introduction to the integral calculation; 2.1 Riemann integral; 2.2 Improper Integrals; 2.3 Integrals with parameter; 2.4 Integrals of the curves; 2.5 Double and triple integrals; 2.6 Surface integrals of species I and II.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D28ELAL102
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing the basic notions of linear algebra, analytical and differential geometry: vector spaces, linear applications, square shapes, Euclidean spaces, right and plan, conical and quadriceps, curves in plan and space, surfaces. The seminar has the role of fixing theoretical knowledge and creating computational skills through practical applications, exercises and problems.
COURSE AND SEMINAR CONTENTS: 1. Vector spaces: 1.1 Definition, examples, properties; 1.2 Linear dependence. Generator system; 1.3 Base and size. Coordinates of a vector relative to a base; 1.4 Vector subspaces: definition, examples, vector subspaces operations; 2. Linear applications: 2.1 Definition, examples; 2.2 Kernel and image: definition, rank theorem; 2.3 Matrix associated with a linear application; 2.4 Invariant subspaces; 2.5 diagonalizable endomorphisms; 3. Biliary forms. Patterns: 3.1 Biliary forms: definition, examples; 3.2 Symmetrical bilinear forms and square shapes; 3.3 The canonical form (Gauss and Jacobi methods); 3.4 Patterns defined on a real vector space; 4. Euclidean vector spaces: 4.1 Definition, examples; 4.2 Orthogonality, norm, Cauchy's inequality; 4.3 Orthonormal bases; The Gram-Schmidt Process; 4.4 Orthogonal complement of a subspace of Euclidean space; 4.5 Linear symmetric operators; Orthogonal transformation method; 5. Free (geometric) vectors: 5.1 Real vector space of free vectors; 5.2 Scalar product, vector product, mixed product; 6. Lines and planes in space: 6.1 Lines: geometric determinations, equations, distance from one point to the right, the angle of two straight lines; 6.2 Plan: Geometric determinations, equations, distance from one point to a plane, the angle of two planes, the common perpendicular of two non-planar lines; 7. Cones and Quadrics: 7.1 The general Cartesian equation of a quadric (conical). Centre of symmetry; 7.2 Intersection of a quadrics (conical) with a straight line; plan tangent to a quadric; 7.3 Reducing the general Cartesian equation of a quadric (conical) to canonical form; 7.4 Study of quadrics (conic) on the canonical equation; 8. Curves in plan and space: 8.1 Parameterized paths; natural parameterization; 8.2 Definition of curves; modes of representation; tangent and normal; plan normal; 8.3 Curvature; torsion; Frenet's class; Frenet's formulas; 9. Surfaces: 9.1 Parameterized blades. 9.2 Surfaces; curves on a surface; coordinated curves. 9.3 Single and regular points, tangent plane; normal; 9.4 The first fundamental form of a surface. 9.5 The second fundamental form of a surface. Curvatures. Geodetic lines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PHYSISCS I

CODE: D28ELAL103
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Students acquire basic knowledge in physics necessary for the understanding of specialized courses
COURSE CONTENTS: 1. Elements of mathematical physics: 1.1 Vector and tensorial calculus; 1.2 Differential calculation; 2. Elements of analytical mechanics: 2.1 Lagrange equations; 2.2 Hamilton equations; 2.3 Poisson brackets. Applications; 3. Thermodynamic elements: 3.1 Thermodynamic state, status parameters, state equations; 3.2 Principle I of thermodynamics; 3.3 Polytropic processes; 3.4 Principle II of thermodynamics; The Carnot theorem; 3.5 The inequality of Clausius. Entropy. 3.6 Distributions in statistical physics; 4. Oscillations and waves: 4.1 Unsampled

oscillations; 4.2 Damped oscillations; 4.3 Wave propagation equation; 4.4 Solutions of propagation equations: types of waves; 4.5 Reflection and refraction of waves; 4.6 Wave interference; 4.7 Propagation of elastic waves in an environment; 5. Optical elements: 5.1 Reflection, refraction, Fresnel formulas; 5.2 Interference; 5.3 Diffraction; 5.4 Dispersion.
LABORATORY CONTENTS: 1. Vector and differential calculus problems; 2. Lagrange and Hamilton equations. Applications; 3. Poisson brackets; 4. Principles of thermodynamics; 5. Polytropic transformations. entropy; 6. Unsampled oscillations, damped oscillations, wave propagation equation; 7. Propagation of elastic waves in an environment; 8. Reflection, refraction. Interference. Diffusion, dispersion.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES

CODE: D28ELAL104
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts used in the design and implementation of applications and software systems using the programming language C and the imperative programming paradigm. The seminar aims to fix theoretical notions by program examples. The laboratory has the role of fixing the theoretical knowledge and creating programming skills through practical applications, homework and solving problems
COURSE AND LABORATORY CONTENTS: 1. Programming Languages; algorithms; 2. Numerical systems; Stages of developing a C program; 3. Core of C language (I): Data and instructions; 4. Core of C (II): Functions; 5. Language C: Types, operators, expressions; 6. Program execution control (instruction blocks, if-else, iteration structures, repetitive while, do…while, for) structures; Search and ordering algorithms; 7. Structure of functions and program; Pigtail; stack; Reverse Polish form; Modular programming; functions; Horizon of variables; Static, local and global variables; recursion; 8. Pointers. 9. Pin pointers; Pointers to functions; Structures; Binary trees; Spreadsheets; User-defined data types. 10. Inputs and outputs. Work with Input/ Output Files (I/O); 11. Standard C library: Explanation of header files: stdio.h, ctype.h, string.h, stdlib.h, assert.h, stdarg.h, time.h. 12. Dynamic memory allocation. Simple and double-coordinated linear lists dynamically assigned. 13. Revisions of the standard C. Standard C11.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: MATERIALS CHEMISTRY

CODE: D28ELAL105
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to familiarize students with the main concepts of atom structure, chemical bonds, properties of substances, solutions, notions of electrochemistry, corrosion of materials and electrical insulating materials.
COURSE AND SEMINAR CONTENTS: Notions of the structure of the atom; Chemical bonds; Solutions; Chemical balance; Electrochemical notions; Corrosion and protection of metals and alloys against corrosion; Chemistry of insulating materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: INTRODUCTION TO INFORMATION TECHNOLOGY

CODE: D28ELAL106
CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims to introduce the fundamental concepts of information technology. The lab has the role of building up shell skills under Linux.
COURSE AND LABORATORY CONTENTS: 1. General concepts of engineering and information technology; 2. Information and data; 3. Numerical representation of information; 4. Systems and signals; 5. Introduction to the organization and structure of digital computing systems; 6. Getting Started with Operating Systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ENGLISH I

CODE: D28ELAL107
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at teaching general theoretical notions regarding the morphology and syntax of English language, acquiring technical terminology specific to the field of computers and its use in relevant contexts and developing the autonomy of speech in English.
COURSE AND SEMINAR CONTENTS: 1. Introduction; The References – Course Resources. Technical vocabulary: Computer Sciences and IT; 2. The Numeral; 3. Verbs Not Normally Used in the Continuous Aspect; The Place of Frequency Adverbs; Humanisation of Computing; A Copernican Moment for Tech; 4. GCCQ-Backed Competition Names Cyber Security Champion; The Present Simple vs. The Present Continuous. Spelling features of the ING-form; 5. RaspberryPi Computer Review: 'A Great Step Forward'. Types of Computer Systems; 6. The Past Simple Tense. Irregular Verbs. Spelling features of the Past Participle ("-ed" Form).

Exercises; 7. The Past Simple Tense vs. The Past Continuous Tense. Exercises; 8. The Present Perfect Simple Tense. The Past Simple Tense. Exercises; 9. Minecraft Maker Reveals New 'Hard Science-Fiction' Game; Input Devices; 10. The Present Perfect Simple Tense. The Present Perfect Continuous Tense. Exercises; 11. Facebook's Free Anti-Virus Marketplace Targets Malware; 12. The Past Perfect Simple Tense. The Past Perfect Continuous Tense. Exercises; 13. Revision; 14. Evaluation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PHYSICAL EDUCATION I

CODE: D28ELAL108
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Strengthening health and increasing effort; Developing basic motor skills and skills specific to some sporting disciplines; Stimulating interest and forming the ability to practice independent exercise systematically.
COURSE CONTENTS: 1. Harmonious physical development – aerobic gymnastics (girls). Bilateral game: table tennis, basketball and football; 2. Speed run on 30-50 m, starting in different positions. The improvement of the technical elements in volleyball: the fundamental position, the upper hand with two hands, the lower service with one hand; 3. Improving long-distance jumping; 4. Control test – jump without elbow, running speed 30-50 m. Bilateral game: volleyball, basketball, table tennis, football, aerobics (girls).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports trials

1ST YEAR, 2ND SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D28ELAL201
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing a minimal package of basic concepts from: Complex analysis, Ordinary differential or partial derivative equations, Fourier analysis, Laplace transform, Fourier transform, Vector fields. The course gives the definition of concepts, presentation of fundamental results, applicability domains, solving algorithms, connections with other domains. The seminar is intended to present examples, the application of theoretical results, the use of solving algorithms through exercises and problems.
COURSE AND SEMINAR CONTENTS: 1. Complex Analysis: 1.1. Complex numbers, algebraic properties. Distance. Module. Inequalities. Geometric representation; 1.2. Complex number strings; 1.3. Series of powers with complex coefficients; 1.4. Elementary functions defined as series of powers; 1.5. Integrate a complex function. Cauchy's theorem; Formula Newton Leibniz; 1.6 Zeroing of a holomorphic function, singular points; 1.7 Laurent series. The convergence crown; 1.8 Residue of single holomorphic function; 2. Ordinary Differential Equations: 2.1. Differential equations, initial conditions, Cauchy problem; 2.2. Differential equations solved by elementary methods; 2.3 Higher linear differential equations with constant coefficients. Euler's equations; Linear systems of first order differential equations with constant coefficients; 2.4 Determination of field lines. Differential equations with total differential (Pfaff type); 3. Fourier Analysis - Fourier Series: 3.1 Functions prolonged by periodicity; 3.2 Orthogonal trigonometric system, trigonometric polynomials, trigonometric series; 3.3. Fourier coefficients, Fourier series associated with a function; 3.4. Parseval's formula. Bessel's inequality. 3.5. Weierstrass approximation theorems; 3.6. Fourier series development; 4. Laplace transform and the discrete transform "z"; 4.1. Incorrect integrations. Beta and Gamma functions; 4.2. Original signal. Computing properties; 4.3. Fundamental theorems; 4.4. Calculation of Laplace transforms, determination of the original; 4.5. Elementary discrete signals. Discrete Laplace Transform (z); 5. Fourier Transform: 5.1. Embedded functions (signals). Reversing the Laplace transform; 5.2. Fourier transform for fast descending functions; 6. Linear differential equations with second order partial derivatives; 7. Vector fields using complex analysis: 7.1. Field of gradients; 7.2. Determining a scalar potential using complex analysis; 7.3. Solenoid field, rotor field; 7.4. Determining a vector potential.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: NUMERICAL METHODS

CODE: D28ELAL202
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to present the main numerical methods and numerical algorithms. The course aims to develop the ability to analyse various mathematical models in engineering based on numerical techniques and to solve specific problems by translating numerical methods into programming languages. The lab aims at deep understanding and optimal algorithmizing of the notions presented at the course, with the aim of building numerical codes and testing them on various types of applications.
COURSE CONTENTS: 1. Numerical methods in algebra: 1.1 Matrix types and matrix transformations applied to solving linear systems; 1.2 Matrix transformations applied to solving linear systems; 1.3 Numerical methods for solving systems

of non-linear equations; 1.4. Determining characteristic polynomial, values and vectors for a real, square matrix; 2 Approximation of functions: 2.1. Interpolation on single and multiple nodes. Lagrange, Newton, Hermite interpolation polynomial; 3 Numerical methods for evaluation of integrals: 3.1 Evaluation of simple integrals; 3.2 Evaluation of double integrals on convex domains of polygonal boundary; 4 Numerical methods for solving differential equations and partial derivatives: 4.1. First order and upper order differential equations with initial condition (Euler, Runge-Kutta); 4.2. Ordinary differential equations with bi-local conditions (pp. Sturm-Liouville); 4.3 Operators with finite differences; types of equations with second order partial derivatives; 4.4. Differential equations with partial derivatives of the second order – the elliptical type; finite difference method. The course and the seminary consist of solving the systems of linear algebraic equations: Gauss method, LR factorization (Doolitle, Cholesky), iterative methods (Jacobi and Seidel-Gauss); 2. Calculation of matrix determinant and inverse (Gauss method, pivotal condensation method and iterative method); 3. Characteristic polynomial, eigen values and vectors (methods: diagonal minors, Fadeev, LeVerrier, Krylov, LR, Danilevski); 4. Solving nonlinear equations (Bairstow method); 5. Lagrange, Newton, Hermite interpolation polynomial; Interpolation by cubic spline functions; Approximation by least squares methods; 6. Numerical evaluation of simple integrals (Simpson, Newton); 7. Numerical evaluation of double integrals; 8. Ordinary differential equations: Euler method, Runge-Kutta methods; systems of ordinary differential equations. Sturm-Liouville differential equations; 9. Finite difference method; 10. Differential equations with partial derivatives - the elliptical type. Finite difference method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: BASICS OF ELECTRICAL ENGINEERING

CODE: D28ELAL203
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to introduce, understand and fix the fundamental notions of electromagnetic field theory and electric circuit theory. The seminar aims to fix the concepts through applications specific to electrical and electronic engineering, with emphasis on qualitative interpretations and quantitative assessments. The lab develops practical skills and helps to understand the notions taught by experimental observations.
COURSE CONTENTS: 1. Fundamental notions regarding electromagnetic phenomena: Regimes of electromagnetic phenomena; 2. General Electromagnetic Fields: General Laws of Maxwell-Hertz theory; Particularities of electrostatic, magneto-static, static electro-kinetics and quasi-static electro-kinetics; Resistor, coil, capacitor, ideal transformer; 3. Fundamentals of Electrical Circuit Theory: 3.1. Electric circuit, multipole, multipurpose, electronic circuit elements; Non-linear circuit elements; Ideal dipole elements; Kirchhoff's theorems; 3.2. Linear DC circuits: Voltage source. Powers. Kirchhoff's theorems of continuity; Theorem of conservation of powers in isolated circuits; The Superposition Theorem. Theorem of reciprocity; Balance of powers; Graphic methods, Graph-analytical methods, numerical methods; 3.3. Sine wave alternating current circuits; Powers in sinusoidal mode; Resonant circuits; 3.4. Three-phase electric circuits; 3.5. Quadrupoles and electric filters; Frequency features; Classification of electrical filters; Determination of cutting frequencies; 3.6. Deformed circuits; 3.7. Transient Electrical Circuits: Initial Conditions. Continuity theorem, State equations; Non-linear circuits in transient mode; 3.8. Long electric lines; Long, transient, sinusoidal lines; Solutions to telegraph equations. The seminar consists of the following topics: 1. Electromagnetic properties of the substance, specific sizes and units of measurement; General laws of the Maxwell-Hertz theory, applications; 2. Linear electrical circuits in DC mode, applications; 3. Electrical circuits in sinusoidal alternating current. Three-phase circuits. applications; 4. Electrical circuits in transient mode. Applications. 5. Two-ports, applications. The laboratory consists of the following topics: 1. Experimental study of DC circuits; 2. Experimental study of circuits with nonlinear resistors; 3. Experimental study of RLC series circuits in sinusoidal alternating current; 4. Experimental study of transient regimes in RC and RLC circuits; 5. Experimental study of the linear passive circuits; 6. Experimental study of three-phase circuits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: MATERIALS USED IN ELECTRONICS

CODE: D28ELAL204
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to present elementary notions related to materials used in electronics, namely conductive materials, insulating materials, semiconductor materials and electronics devices made in semiconductor technology. The laboratory has the role of fixing the theoretical knowledge and creating practical simulation skills with the MATLAB program for materials and electronic devices.
COURSE CONTENTS: 1. Elementary notions of material structure; Structure of the atom; Kinetic-

molecular theory; Crystalline state. Crystal defects. Amorphous semiconductors; 2. Electrical and thermal conduction in solids; Hall effect and Hall devices; Thermal conductivity; Elemental quantum physics; Hydrogen and Helium Atoms 3. Modern theory of solid materials; Quantum theory of metals; Intrinsic and extrinsic semiconductors; Dependence of temperature conductivity; Diffusion and continuity equations; 4. Conductive and superconducting materials; Superconductivity state; 5. Dielectric materials; Types of polarization; Displacement and orientation polarizations of dielectrics; Rigidity of dielectrics; 6. Magnetic materials; Types of magnetisations; ferromagnetism. The laboratory consists of the following topics: 1. Work safety training. Introduction to MATLAB; 2. Matlab software for simulation of electrical materials; 3. MATLAB diode simulation programs; 4. Dielectric constant and losses in dielectrics; 5. Hall Effect; 6. Magnetoresistive effect; 7. Final laboratory assessment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DATA STRUCTURES AND ALGORITHMS
CODE: D28ELAL205
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at forming skills related to the understanding of data structures and fundamental algorithms as an integral part of creating the ability to operate with scientific and engineering fundamentals in the field of computers. The lab has the role of fixing theoretical knowledge and creating programming skills through practical applications, exercises and problems. The course consists of the following topics: 1. Tree information structures; 2. Trended trees: Define and implement search trees; Retrieving information, inserting and deleting a node in a search tree; Applications in geometry, Huffman codes; 3. Optimized search trees: Optimal search tree algorithms; 4. Balanced Trees: Definitions; theorems; Insertion technique and node suppression in balanced trees; Splay Tree; 5. Multicultural trees; 6. Trees. B: Algorithms for inserting and suppressing a key in a tree; 7. Chart structures: representations, passages; 8. Chart structures: distances: SSSP algorithms: Dijkstra, Bellman-Ford; APSP Algorithms: Roy-Floyd, Johnson's; 9. Chart structures: connectivity: Determination of related components in non-directed graphs; Determination of related strong components. Kosaraiu's algorithm; 10. Chart structures: minimum coat trees: Prim's, Kruskal's, Boruvka's algorithm; 11. Search for a substring in a string: Knuth-Morris-Pratt algorithm; The Boyer-Moore Algorithm. The laboratory consists of the following topics: 1. Binary trees/ Search trees; 2. Trees optimized for search; 3. Trees balanced in height; 4. Trees B; 5. Trees TRIE; 6. Graphs: distances; 7. Graphs: Minimum Coatings; 8. Splay Arrows, Red-Black; 9. Trees 2-3.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMPUTER AIDED GRAPHICS
CODE: D28ELAL206
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing the basic notions of computer assisted graphics: theoretical notions of technical graphics, two-dimensional and three-dimensional modelling in AutoCAD, general aspects of computer graphics. The laboratory has the role of fixing theoretical knowledge through graphical applications in AutoCAD.
COURSE CONTENTS: 1. General notions of technical drawing: 1.1 Object and purpose of the technical drawing; 1.2 About Romanian Standards; 1.3 Classification of technical drawings; 1.4 Formats; 1.5 Lines used in industrial design; 1.6 Standardized writing; 1.7 Indicator; 1.8 Folding; 1.9 Representation systems; Layout of projections; Views, sections and ruptures; Drawing up technical drawings; 1.10 Quotation in the technical drawing; 1.11. Overall drawing; 2. General Computer Graphics: 2.1. Graphics evolution on the computer; 2.2. A short history of the Computer Aided Design (CAD) concept; Classification of CAD products; 2.3. CAD place in the industrial enterprise; 2.4. Concepts and programs adjacent to the CAD concept; 3. Two-dimensional modelling: 3.1. Getting Started with AutoCAD; 3.2. Drawing, editing, quoting, hatching in AutoCAD; 4. Three-dimensional modelling: 4.1. Coordinate systems; 4.2. Modelling commands. Generating primitives; 4.3. Predefined solid operations; 4.4. Three-dimensional and viewing area command commands. The laboratory consists of the following topics: 1. A4 format and indicator; 2. Geometrical constructions; 3. Orthogonal representation; 4. Plate; 5. Simple Piece; 6. Electronic scheme; 7. Checking applications and themes; 8. Ground floor; 9. Piece complex; 10. Threaded assembly; 11. House plan P + 1, 3D model; 12. 2D exercises.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ENGLISH 2
CODE: D28ELAL207
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Acquisition of general theoretical notions regarding the morphology and syntax of English; Acquisition of technical terminology specific to the field of computers and

its use in relevant contexts; Developing speech autonomy in English.
COURSE AND SEMINAR CONTENTS: 1. Microsoft Sneak Preview of Windows 8; Means of Expressing Future: The Present Continuous; The Being to Form; The Future Simple Tense; 2. Means of Expressing Futurity: Will + infinitive versus The Becoming to Form; The Future Continuous Tense; 3. Means of Expressing Future: Will + infinitive versus The Future Continuous Tense; Will not + infinitive versus The Future Continuous Negative; Second Person Interrogation: Will You and Other Forms; Shall and Will; 4. Time Clauses; The Future Perfect Tense; The Future in the Past; 5. Writing: Informal Letters / Emails; 6. Swiftkey, and Scientific Start-up Grammar: The -ING Participle; 7. Learning to Code General vocabulary: Words connected to remuneration; 8. Writing: The CV General vocabulary: Qualities of an ideal employee; Unreal Games Engine Licensed to FBI and Other US Agencies; 9. The Gerund; The Infinitive; 10. The Passive Voice; 11. Student Scholarship. Processing. The Passive Voice; 12. The Covering Letter. Exercises.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PHYSICAL EDUCATION II

CODE: D28ELAL208
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Strengthening health and increasing effort; Developing basic motor skills and skills specific to some sporting disciplines; Stimulating interest and training capacity to practice systematic exercise independent.
COURSE CONTENTS: 1. Harmonious physical development - aerobic gymnastics (girls). Bilateral game: table tennis, basketball and football; 2. Speed run on 30-50 m, starting from different positions; 3. The improvement of the technical elements in volleyball: the fundamental position, the upper hand with two hands, the lower service with one hand; 4. Improving long-distance jumping; 5. Control test - leap-free jump, running speed 30-50m. Bilateral game: basketball volleyball, table tennis, aerobics (girls).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ELECTRONIC DEVICES

CODE: D28ELAL301
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing the basic notions necessary for the understanding of the operation and use of bipolar, unipolar and multi-junction electronic devices as well as the acquisition of methods of analysis and design of the elementary amplification stages. The seminar has the role of fixing the theoretical knowledge and creating computational skills through exercises and problems. The lab has the role of fixing theoretical knowledge and creating skills for the use of electronic devices through practical applications.
COURSE AND SEMINAR CONTENTS: 1. Semiconductor physics: 1.1. Intrinsic and extrinsic semiconductors; 1.2. Transport of semiconductor load carriers; 1.3. Basic equations of semiconductor devices; 2. Homogeneous and heterogeneous junction. Diode: 2.1. The static characteristic of the junction pn; 2.2. The dynamic junction mode pn; 2.3. Metal-semiconductor contact; 2.4 Types of diodes; Diode circuits; 3. Bipolar transistor with junctions: 3.1. Transistor effect and transistor current relations; 3.2. Transistor connections and operating modes; 3.3. High bipolar transistor signal model and static characteristics of the bipolar transistor; 3.4. Bipolar transistor polarization circuits and limitations in bipolar transistor operation; 3.5. Bipolar transistor in dynamic mode; 3.6. Behaviour of bipolar transistor at high frequencies; 4. Junction-effect transistor: 4.1. Physical structure and modelling; 4.2. Static features; 4.3. Polarization circuits; 4.4. Small Signal Model; 4.5. Amplification stages; 5. Transistor MOS: 5.1. MOS capacitor; 5.2. Functional principle and types of MOS transistors; 5.3. Static characteristics and polarization circuits of MOS transistors; 5.4. The small signal variable state of the MOS transistor; 6. Semiconductor device switching regime: Semiconductor diode switching mode, bipolar and unipolar transistors; 7. Other semiconductor devices with junctions: 7.1. Semiconductor structures pnpn (pnpn diode, conventional thyristor, diacs, triacs); 8. Electronic noise: 8.1. The nature of electronic noise; 8.2. Noise of semiconductor devices; 9. Elementary amplifiers: 9.1. Small signal amplifiers; 9.2. Modelling the noise of small signal amplifiers; 9.3. Signal distortions in small signal amplifiers; 9.4. Study of amplification stages. The seminar consists of the following topics: 1. Diode. Diode circuits; 2. Polarization circuits of bipolar transistors; 3. Field effect transistors: JFET and MOS. Static mode; 4. Elementary amplification stages with TB and TU. The laboratory consists of the following topics: 1. Semiconductor diodes. Diode circuits; 2. TB-Static characteristics. Stabilization of pb of TB; 3. Determination of natural pattern elements and high frequency behaviour for TB. TB amplification stage; 4. Field effect transistors. Behaviour in static mode; 5. Field effect transistors. Dynamic mode; 6. Other semiconductor devices with junctions. applications; 7. Switching elementary semiconductor devices.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: SIGNALS AND SYSTEMS

CODE: D28ELAL302
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing some notions regarding: signals and systems, the software packages used for the implementation, modelling and simulation of the signals, the use of the digital processing of the signals. The seminar has the role of fixing the theoretical knowledge encountered during the course. The laboratory has the role of creating practical skills in the development of modelling, simulation, analysis and signal synthesis applications.
COURSE AND SEMINAR CONTENTS: 1. Signals and systems: 1.1 Mathematical models of signals and systems; 1.2. Continuous signals in time and discrete signals; 2. Classification of signals; 3. Basic operations applied to the signals: 3.1. Operations that apply to the dependent variable, the independent variable; 3.2. Preceding rules for time-shifting and scaling over time; 4. Elementary signals: 4.1. Exponential, sinusoidal signals. Relationships between sinusoidal signals and complex exponential signals; 4.2. Step functions, unit pulse and ramp function; 5. Time representation of invariant linear systems: 5.1. Introduction; 5.2. Convolution; 6. Fourier representation of the signals: 6.1. Fourier representations of the four classes of signals; 6.2. Continuous periodic signals. Fourier Series; 6.3. Fourier series of complex exponential signal type; 6.4. Trigonometric Fourier Series; 6.5. Harmonic Fourier series; 6.6. Spectrum of amplitude and phase spectrum of a periodic signal; 7. Fourier Transform of Signals: 7.1. Fourier transform of aperiodic continuous signals; 7.2. The properties of the Fourier transform. The seminar consists of the following topics: 1. Continuous and discrete signals; 2. Deterministic signals and random signals; 3. Quantified signals and limited signals. Power of a signal; 4. Basic operations applied to signals; 5. Continuous Fourier series; 6. Discrete time Fourier series; 7. Fourier transform. The laboratory consists of the following topics: 1. Introduction to the Matlab programming environment; 2. Representing the signals using the Matlab programming environment; 3. Making Matlab scripts to generate continuous signals; 4. Making Matlab scripts to generate discrete signals; 5. Simulation of systems using MATLAB; 6. Symbolic calculation in Matlab. Applications for the synthesis of periodic signals; 7. Analysis of periodic signals.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ANALYSIS AND SYNTHESIS OF DIGITAL CIRCUITS

CODE: D28ELAL303
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding: numbering systems, switching algebra, MSI and LSI integrated circuits, counting and registers, analysis and synthesis of synchronous and asynchronous sequential circuits. The laboratory has the role of acquiring theoretical knowledge by students as well as their practical training in the use and design of combinational and sequential logic schemes.
COURSE AND SEMINAR CONTENTS: 1. Numerical systems: 1.1. transformations; 1.2. Binary encoding of decimal numbers; 1.3. Binary arithmetic; 2. Binary Codes: 2.1. Binary and geometric representation of binary numbers; 2.2. Error Detection Codes; 2.3. Self-signalling codes; 3. Switching algebra: 3.1 Introduction; 3.2. The commutative algebra postulates; 3.3. Algebra switching theorem; 4. Analysis and synthesis of switching functions; 5. Families of integrated circuits: 5.1. Bipolar families (TTL, ECL, I2L); 5.2. Families MOS, CMOS; 6. MSI Integrated Circuits: 6.1. Decoders; 6.2. Demultiplexers; 6.3. Multiplexers; 7. Integrated LSI Circuits: 7.1. PAL circuits; 7.2. Circuits with ROM memories; 8. Integrated flip-flops: 8.1. properties; 8.2. Logical function; 8.3. Behaviour over time; 9. Countdown: 9.1. Design of synchronous and asynchronous counters; 9.2 Registers series and parallel; 10. Analysis and synthesis of synchronous sequential circuits: 10.1 Analysis and synthesis of synchronous sequential circuits; 10.2 Synthesis of synchronous sequential circuits with D and JK flip-flops; 11. Synthesis of sequential circuits with ROMs. The seminar and the laboratory consist of the following topics: 1. Numerical systems. Codes. Arithmetic operations; 2. Minimize Boolean functions with K-V diagrams; 3. Composition and decomposition of Boolean functions; 4. Encoders and decoders; 5. Synthesis of synchronous sequential circuits using J-K flip-flops. Circuit synthesis using the AND, OR, AND NOT gate logic on the WEWBD simulator; 6. Synthesis of circuits using NAND, NOR logical gates on the WEWBD simulator; 7. Design of 4:1 MUX multiplexers on the WEWBD simulator; 8. Design of synchronous and asynchronous counters using D-type and J-K simulator WEWBD simulators; 9. Analysis and synthesis of synchronous sequential circuits using D flip-flop.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PHYSICS II

CODE: D28ELAL304
ECTS CREDITS: 5
TYPE OF COURSE: fundamental

COURSE OBJECTIVE(S): The course contributes to the formation of future electronics engineers by providing them with knowledge in the fundamental physical field.
COURSE AND SEMINAR CONTENTS: 1. Electromagnetism: 1.1 Electric phenomena; 1.2 Magnetic phenomena; 1.3 Maxwell equations; 1.4 Moving charged particles into electric and magnetic fields; 2. Elements of solid physics: 2.1 Crystalline networks; 2.2 Real Crystal Structures. Space networks; 2.3 Diffraction on crystals; 2.4 X-ray diffraction methods; 2.5 Types of crystalline bonds: the van der Waals bond; the covalent bond; 3. Quantum theory of solids: 3.1 Theory of network vibrations. phonons; 3.2 Thermal properties of phonons; 3.3 Einstein model, Debye model for solids heat capacity. Thermal conductivity; 4. Quantum Physics Elements: 4.1 The Compton Effect. Bohr's hydrogen atom model; 4.2 The hypothesis of Broglie. Heisenberg's non-determination principle; 4.3 The Schrödinger equation; 4.4 General form of the principle of uncertainty. The seminar consists of the following topics: 1. Electricity issues; 2. Problems of magnetism; 3. Moving charged particles into electric and magnetic fields; 4. Connecting energies; 5. Calculation of network features. Heat capacity models; 6. The Schrödinger equation. Particular cases. Potential Pit; 7. The effect of Compton. Bohr's hydrogen atom model. The laboratory consists of the following topics: 1. Study of crystalline structure with X-ray diffraction; 2. Thermal conductivity of metals; 3. Photoconduction; 4. Study of diamagnetic and paramagnetic susceptibility; 5. Curie temperature determination; 6. Determination of extraction work of thermo electrons; 7. Metal-semiconductor contact potential.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

CODE: D28ELAL305
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts on object-oriented programming, as well as the features and concepts introduced by C +. The syntactic details of C++ are presented. The laboratory has the role of fixing theoretical knowledge and creating programming skills through practical applications, exercises and problems.
COURSE AND SEMINAR CONTENTS: 1. Programming Paradigms and Program Design Methods: 1.1. Procedural programming; 1.2. Data encapsulation (modularisation); 1.3. Abstraction of data; 1.4. Object Oriented Programming; 2. C++ and object-oriented programming: 2.1. Extensions of C language in C++; 2.2. Preliminary Elements for Object Oriented Programming; 3. Defining and using classes in C++; 4. Using pointers and references. Preliminary features about functions; 5. Constructor and destructor functions. Restrictions on constructor and destructor functions; 6. Composite Objects: 6.1. Defining and using composite objects; 6.2. Creating and destroying simple and compound objects. Members Invoice Lists; 7. Legacy mechanism. Building hierarchies of classes: 7.1. Derivatization of classes. Access specifiers; 7.2. Use of protected members; 7.3. Builders and destroyers in class hierarchies; 7.4. Multiple Legacy Mechanism; 7.5. Multiple Heritage Issues; 8 Functions and friend classes. Nude classes: 8.1. Functions and classrooms; 8.2. Classes defined within other classes; 9. Overloading operators: 9.1. General. Definition and call of operators; 9.2. Unary operators, binary; 9.3. Conversion of types; 10. Polymorphism and virtual functions: 10.1. Pointers pointing to derived classes; 10.2. Declaring virtual functions; 10.3. Virtually pure functions; 10.4. polymorphism; 11. Parameterized classes and functions. The template mechanism; 12. C++ I/O "stream" system: 12.1. Basic principles of the C++ I/O system; 12.2. I/O format operations; 12.3. Use of manipulator I/O functions; 12.4. Redefining operators << and >>; 12.5. Creating user-defined manipulators. The laboratory consists of the following topics: 1. "I/E" C++ stream; 2. Functions and structures in C++; 3. Classes and objects; 4. Using pointers and references; 5. Constructor and destructor functions; 6. Legacy mechanism; 7. Properties of the inheritance mechanism; 8. Classes defined within other classes (nested classes); 9. Overloading operators; 10. Virtual Functions. Usage modes; 11. C++ I/O "stream" system. Data formatting.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: OBJECT ORIENTED PROGRAMMING- PROJECT

CODE: D28ELAL306
ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project aims to expand the basic concepts of object-oriented programming by designing, implementing and testing specific application-specific programming applications.
COURSE CONTENTS: 1. ATM simulator; 2. Travel agency; 3. CD library from the personal library; 4. Record books in a library; 5. Administrator Association of Proprietary; 6. University employees; 7. Material storage; 8. Faculties admissions; 9. Patients of a family doctor; 10. Student assessment; 11. Television grid management programs; 12. Personal Address Book; 13. Vehicle registration; 14. Evidence of the resulting employees; 15. Air flights; 16. Evidence of accommodation places; 17. Football Championship; 18. Office of Civil Status;

19. Real estate agent; 20. Search the phone book; 21. Company records suppliers; 22. Description of a country's relief; 23. The management of a company's fleet of cars; 24. Hospital management; 25. Basketball Championship; 26. Handball championship; 27. Protection and security firm; 28. Phonebook; 29. E-mail management; 30. PC component store management; 31. The management of a supermarket.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: ELECTRONICS TECHNOLOGY
CODE: D28ELAL307
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding the use of computer-aided design technologies of electronic equipment, based on ORCAD Capture and ORCAD Layout. The laboratory activity consists of designing printed circuits and wires for different types of analogue, digital, power, low voltage electronic circuits, etc.
COURSE AND LABORATORY CONTENTS: 1. Introduction to PCB and CAD design; Design files made with ORCAD Layout; 2. The structure of the project and the set of design tools; Design tools and design environment settings; 3. Presentation of industrial standards; IPC standards, IEA JEDEC, ANSI and IEEE; Dimensions and tolerances for PCBs; 4. Design for manufacturing; Assembly and welding processes; 5. PCB design to maintain signal integrity. Zodiac, distortions, frequency response, electromagnetic interference, mass loops. Route design methods. 6. Examples of PCB projects. Power supplies. Mixed digital analogue design. The laboratory consists of the following topics:1. Design of analogue and digital circuits with ORCAD Capture; 2. Design of PCB projects with ORCAD Layout for analogue and digital circuits; 3. Design of an electronic circuit in welding and SMT technology; 4. Design of low noise circuits; 5. Design of power circuits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PHYSICAL EDUCATION III
CODE: D28ELAL308
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving skills in team games.
COURSE CONTENTS: 1. Improving the running resistance; Improving the technical elements of volleyball: the strike, the jam, the top service; 2. Harmonic physical development – aerobic gymnastics (girls); Bilateral game: table tennis, basketball and football; 3. Preparation of control samples: running speed – 50m, long-distance jump, resistance run; Bilateral volleyball game; 4. Verification: Samples and control rules: Speed running – 50m, long-distance jump, run-through - 800m (w) and 1000m (m).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

2ND YEAR, 2ND SEMESTER

COURSE TITLE: FUNDAMENTAL ELECTRONIC CIRCUITS
CODE: D28ELAL401
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course presents the notions needed to understand the operation, analysis and use of hybrid and monolithic amplifiers, voltage stabilizers and harmonic oscillators. The seminar has the role of fixing theoretical knowledge and creating computational skills through practical applications, exercises and problems.
COURSE AND SEMINAR CONTENTS: 1. Small Signal Amplifiers; 2. Feedback in amplifiers: 2.1. General properties of the feedback; 2.2. Negative feedback types; 2.3. The topology of the feedback circuits and their analysis. Examples of application of the theory; 3. Operational Amplifiers (AO): 3.1. Parameters of operational amplifiers; 3.2. Elementary circuits with AO; 3.3. Converters V-C, C-V; 4. Operational Amplifiers Transconductance (OTA): 4.1. OTA parameters; 4.2. Typical usage patterns; 5. Norton Amplifiers (NA); Negative Feedback Amplifiers (CFOA): 5.1. NA parameters; 5.2. Typical NA patterns; 5.3. CFOA parameters; 5.4. Typical CFOA usage patterns; 6. Rectifiers: 6.1. Mono-alternating mono-phase single-phase rectifiers, ordered with thyristors, with voltage multiplication; 7. Voltage stabilizers: 7.1. Parameters of voltage stabilizers; 7.2. Stabilizers with derailleur; Stabilizers with series adjustment; 7.3. Types of control elements. Protection circuits of stabilizers; 7.4. Monolithic stabilizers for general use; 7.5. Monolithic stabilizers with three terminals; 8. Harmonic oscillators: 8.1. Methods for analysing the operation of oscillators; 8.2. Limitation of oscillation amplitude; 8.3. WIEN bridge oscillators; 8.4. Double T network oscillators; 8.5. "Three point" oscillators with TB and TU; 8.6. Quartz Crystal Oscillators. The seminar consists of the following topics: 1. Small signal amplifiers; 2. Feedback Amplifiers; 3. Operational Amplifiers; 4. Rectifiers; 5. Voltage stabilizers; 6. Harmonic oscillators.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: FUNDAMENTAL ELECTRONIC CIRCUITS- PROJECT
CODE: D28ELAL402

ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project aims at setting the fundamental notions needed to understand the operation, analysis and design of hybrid amplifiers, rectifiers, voltage stabilizers and harmonic oscillators.
COURSE CONTENTS: 1. Small Signal Amplifiers; 2. Power Amplifiers; 3. Harmonic oscillators; 4. Voltage stabilizers; 5. Voltage sources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: ELECTRONIC CIRCUITS – LABORATORY

CODE: D28ELAL403
ECTS CREDITS: 2
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The laboratory has the role of refining the theoretical knowledge and creating skills for analysis and testing of fundamental electronic circuits.
COURSE CONTENTS: 1. Determination of the upper and lower limit frequency at a small signal amplifier; 2. Small signal amplifier with TB and RC coupling; 3. Feedback Amplifiers; 4. Operational Amplifiers; 5. Rectifiers; 6. Voltage stabilizers; 7. Harmonic oscillators.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

DUBJECT OF STUDY: MEASUREMENTS IN ELECTRONICS

CODE: D28ELAL404
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Formation of basic skills for quantitative and qualitative assessment of specific sizes in electronic circuits. The objective of the laboratory: to develop and develop practical skills regarding the handling of electronic measuring instruments for specific applications.
COURSE AND LABORATORY CONTENTS: 1. Terms and definitions specific to electrical measurements. Characteristic values for electrical quantities. The general form of measurement structures; 2. Definition, classification and estimation of measurement precision. Distribution laws and essential properties of measurement errors; 3. Signals specific to electronic circuits. Amplitude and frequency modulation of signals; 4. Measuring Currents and Voltages. Indicator type tools. DC measurements. Differential tools; 5. Measuring alternating currents and tensions. Frequency band of electronic instruments. AC disturbances; 6. Visualize and record the time trends of electrical quantities. Real Time Oscilloscope; 7. Using oscilloscope to measure some parameters of electronic components and circuits; 8. Study of frequency response of electronic circuits. Determination of amplitude and phase characteristics; 9. Methods and measurement structures for the evaluation of circuit parameters. Measurement of resistances; 10. Balancing measurement structures. General characteristics of the Wheatstone bridge; Measurement of small resistances. Kelvin bridge; 11. Measurement of capacitors and coils. Schematic equation of the parameters of the circuit elements. AC bridges. Bridges for measuring capacitors and inductors. Schemes of principle and equilibrium relations; 12. Methods of measuring time and frequency. Measurement of phase shifts; 13. Measurement of some parameters of power supplies and signal generators for testing electronic circuits; 14. High Frequency Measurements. The laboratory consists of the following topics: 1. Instrumentation study for voltage and current measurement; 2. Comparative measurement of voltage and current; 3. Oscilloscope study; 4. Measurement of some parameters of oscilloscope signals; 5. Frequency characteristics reading with the oscilloscope; 6. Interim Testing; 7. Visualize the dynamic features of some electronic devices; 8. Instrumentation study for measurement of circuit parameters; 9. Measurement of resistances with analogue and digital ohmmeters; 10. Measurement of resistors with DC; 11. Measurement of bridges and inductances with AC bridges; 12. Measurement of internal resistances of signal sources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DATA TRANSMISSION AND ENCODING

CODE: D28ELAL405
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future electronics engineers, providing them with knowledge in the field of information transmission theory. Basic concepts used in the design and implementation of data transmission systems are addressed. The laboratory has the role of fixing the theoretical knowledge and of understanding phenomena through practical applications
COURSE CONTENTS: 1. Introduction to the theory of information transmission; 2. Channels of communication: 2.1 Channel types; 2.2 The mathematical model of a transmission line with distributed parameters; 2.3 The reflections of the signal; 2.4 Fault detection on a transmission line; 2.5 Attenuation of signals on transmission lines; 2.6 Linear and nonlinear distortions; 2.7 Multichannel systems; 2.8 Optical channels. Optical fibre; Types of optical fibres; 3. Signals used in data transmissions: 3.1 Representation of signals through orthogonal function systems; 3.2 Analysis and synthesis of signals using generalized Fourier

series; 3.3 Spectral density function. Sampled signals; 4. Information transmission using sinusoidal carrier, Amplitude modulated (MA) signals, with angular modulation; Phase Differential Modulation (PDM); 5. Digital transmission of information: 5.1 Discrete Frequency Amplitude (ASK), Discrete Frequency (FSK), Discrete Phase (PSK); 5.2. Impulse modulation; 5.3 Delta Modulation (MD); 6. Control of errors in data transmissions: 6.1 Definition and parameters of detecting and correcting error codes; 6.2 Linear, Hamming, polynomial, convolutional codes; 7. Organizing tele-informatic systems to avoid errors. Compression of data; 8. Data transmission systems in process management; 9. Communication networks. Topologies. Open Systems (OSI). Protocols used on the data link. Trends in deploying networks. The seminar and laboratory consist of the following topics: 1. The mathematical model of a transmission line with distributed parameters; 2. Reflections of signals on propagation lines; 3. Spectral analysis of signals; 4. Extracting the useful signal from the disturbed signal. Analogue filters; 5. Extract the useful signal from the disturbed signal. Digital filters; 6. Amplitude modulation of signals. Interference of an MA signal with an appropriate frequency carrier; 7. Reconstitution of the carrier signal from the MA signal; 8. Frequency modulation of signals. Interference of an FSK signal with an appropriate frequency carrier; Phase modulation of signals. 9. Interference of a PSK signal with a near frequency carrier. Delta modulation; 10. Impulse modulation. 11. Transmission in baseband. 12. Eye chart. Baseband transmission. 13. Signal equalizers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: CAD TECHNIQUES IN DESIGNING ELECTRONIC CIRCUITS

CODE: D28ELAL406
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to acquaint students with the methods and techniques used in the analysis and design of the electronic modules with the help of the computer, as well as the acquisition of the most used simulation program for the operation of electronic circuits – SPICE. The laboratory has the role of fixing the theoretical knowledge of SPICE and of creating skills for its use in the analysis and design of electronic circuits.
COURSE CONTENTS: 1. General notions: 1.1 Definitions – circuits and systems; analysis, synthesis and design; CAD and EDA; 1.2 Computational aspects of circuits and systems design; 2. Fundamentals of Analogue Circuit Theory: 2.1 Primitives of Analogue Circuits and Their Models; 2.2 Analysis of analogue circuits; 3. Computer-aided design of analogue circuits: 3.1 Circuit synthesis; 3.2 Simulation and adjustment of circuits; 3.3 Generating the layout of the circuit; 3.4 Extraction and verification; 3.5 Manufacture and testing; 3.6 Classification of automatic synthesis methods of analogue circuits; 4. SPICE simulator: 4.1. Description of circuit elements and semiconductor devices; 4.2. Circuit analysis: DC, AC, time analysis, distortion analysis; 4.3. Functional and hierarchical simulation; 4.4. Algorithms and options in SPICE; 4.5. Convergence issues. The laboratory consists of the following topics: 1. Presentation of the SPICE program; 2. DC analysis of elementary and compound amplification stages; 3. AC analysis of elementary and compound amplification stages; 4. Time domain analysis of RLC circuits, oscillators, elementary logic circuits; 5. Functional and hierarchical simulation: operational amplifier, voltage-controlled oscillator; 6. Design of amplifiers using SPICE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ANALYSIS AND SYNTHESIS OF ANALOGUE CIRCUITS

CODE: D28ELAL407
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at acquiring knowledge in order to develop and improve skills and abilities for analysis of analogue electrical and electronic circuits with concentrated parameters, including passive and active filters, as well as for the synthesis of filter circuits commonly used in electronics and telecommunications. Laboratory work develops practical skills through experimental observations that allow qualitative interpretations and quantitative assessments of the phenomena studied.
COURSE AND SEMINAR CONTENTS: 1. Introduction to analysis and synthesis of analogue circuits: 1.1 Methods of modelling non-linear elements; 1.2 Topology elements of analogue circuits with magnetic couplings and controlled sources; 2. Analysis of analogue circuits in stationary mode; Modified nodal method; 3. Analysis of low analogue signal circuits: 3.1 General mathematical model of a harmonic regime; 3.2 Modelling of magnetic couplings; 4. Analysis of linear circuits in any variable mode: 4.1 Analysis of transient regimes by SPICE-type resistive equations. 4.2 Analysis of transient regimes by operational method; 5. Circuit functions and their approximation: 5.1 Influence of poles and zeros on the natural response of the circuit; 5.2 Generating circuit functions; 5.3 Frequency characteristics, Bode characteristics; 5.4 Problem of function approximation; approximation of Taylor; 5.5 Approximations of Circuit Functions: Butterworth, Cebâşev, Bessel, elliptic; 6. Electrical filters – basic notions: 6.1 Ideal filters, real filters; 6.2

Approximation of ideal frequency characteristics; 6.3 Higher order filters; 6.4 Normalization of filters; 6.5 Generating frequency characteristics for standard passive and active filter structures; 7. Synthesis of passive filters: 7.1 Elementary low pass filter; 7.2 Frequency transformations: low-pass, high-pass, stop-band, pass-band; 7.3 Cascade type synthesis with RC elements; 7.4 Design elements for Passive Filters Butterworth, Cebâşev, Bessel; 8. Synthesis of active filters: 8.1 Active-order and first-order active filter structures with operational amplifier; 8.2 Design elements for active filters with Sallen Key type universal structures; 8.3 Higher order filters. Integrated filter circuits. 8.4 Filters with switched capacitors. The seminar consists of the following topics: 1. Bode diagrams for electronic circuits; 2. Design of active filters of the order; 3. Designing active 2nd order filters; 4. Design of Sallen-Key filters; 5. Designing MFB Superior Filters; 6. Choice of circuit elements for designing active filters; 7. Design of active filters with specialized computer programs; The laboratory consists of the following topics: 1. Passive RC passes down and goes up; 2. Active RC Filters Passes Down and Passes Up; 3. Butterworth 2 TJ, TS and TB filters; 4. Study of active filters with FilterLab2; 5. Study of active filters with FCAD program; 6. Analysis of active filters with AFD program under MATLAB.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COGNITIVE PSYCHOLOGY

CODE: D28ELAL408
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at deepening the knowledge and understanding of the theoretical perspectives, empirical results and current trends in cognitive psychology, critically evaluating studies in the area of cognitive psychology.
COURSE AND SEMINAR CONTENTS:1. Cognitive sciences and cognitive psychology: 1.1. Origins and constitution of cognitive sciences and cognitive psychology; 1.2. Fundamental elements of neuropsychology; 1.3. Neurobiological bases of psychology; 2. The human psyche as an information system: 2.1. Features and principles of SPS organization; 2.2. Levels of SPU functionality; 2.3. The hierarchical modular structure of the SPU; 3. Primary and secondary processing of information; 4. Caution: 4.1. Divided attention and selective attention; 4.2. Models of Attention; 5. Neurobiology of learning and memory; 6. Language mechanisms: 6.1. Understanding the language: listening and reading; 7. Categorization as Integrating Information at Conceptual Level: 7.1. Informational modelling at the level of thinking; 8. The architecture of the human cognitive system; 9. Operational structure of behaviour; 10 Personality and its neurophysiological bases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PHYSICAL EDUCATION IV

CODE: D28ELAL409
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving skills in team games.
COURSE CONTENTS: 1. Improving the running resistance; Improving the technical elements of volleyball: the strike, the jam, the top service; 2. Harmonic physical development – aerobic gymnastics (girls); Bilateral game: table tennis, basketball and football; 3. Preparation of control samples: speed – 50m running, long-distance jump, resistance run; Bilateral volleyball game; 4. Verification: Samples and control rules: Speed running – 50m, long-distance jump, run-through - 800m (w) and 1000m (m).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PRACTICAL TRAINING 1

CODE: D28ELAL410
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Deepen knowledge of software tools dedicated to simulation, design and realization of electronic circuits and various programming languages useful in applied informatics applications. Case studies. Developing practical applications.
COURSE CONTENTS: 1. MATLAB/ Simulink. Features and features of the program. Developing practical applications: 1.1. Mathematics in MATLAB; 1.2. Graphics elements in MATLAB; 1.3. Dynamic systems in MATLAB; 1.4. Developing applications in Simulink; 2. SPICE. Analysis of electronic circuits. Development of macro models: 2.1. Analysis of fundamental electronic circuits; 2.2. Functional and hierarchical simulation of complex electronic circuits; 2.3. Robust design of electronic circuits using the SPICE ORCAD program. PCB and CAD design; 3.1. Project structure and set of design tools; 3.2. Industrial standards. Classes and types of PCBs. Dimensions and tolerances for PCBs; 3.3. PCB design for various types of electronic circuits. Development of software modules. In C++ for applications in communications systems and automotive industry. VHDL. Features and features.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

3RD YEAR, 1ST SEMESTER

COURSE TITLE: INTEGRATED ANALOGUE CIRCUITS

CODE: D28ELAL501
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Students will assimilate the necessary knowledge to understand the operation, design and use of basic constructive stages of analogue integrated circuits, linear and nonlinear circuits with operational and comparator amplifiers, multipliers, monolithic and hybrid signal generators, switching stabilizers, the use of specific instrumentation to determine the performance of the studied circuits. The seminar has the role of fixing the theoretical knowledge and creating computational skills through exercises and problems. The laboratory has the role of fixing the theoretical knowledge and creating skills for the use of specific instrumentation to determine the performance of the studied circuits.
COURSE AND SEMINAR CONTENTS: 1. Basic constituent elements of analogue integrated circuits: 1.1. Power sources and active loads; 1.2. Voltage sources and references; 1.3. Entry and gain floors; 1.4. Floating current levels; 1.5. Output stages; 2. Analysis of monolithic amplifiers: 2.1. Qualitative description of the typical structures of monolithic amplifiers; 2.2. Dynamic behaviour of monolithic amplifiers; 2.3. Design Considerations for Monolithic Amplifiers; 3. Comparators: 3.1. Generalities and parameters; 3.2. Typical applications; 4. Analogue multipliers: 4.1. Generalities and parameters; 4.2. Typical applications; 5. Non-linear analogue circuits: 5.1. Precision rectifiers; 5.2. Top detectors; 5.3. Logarithmic and exponential amplifiers; 6. Voltage stabilizers in switching: 6.1. General. Parameters of voltage stabilizers in switching; 6.2. Types of switching stabilizers and their analysis; 7. Signal generators: 7.1. Rectangular signal generators; 7.2. Triangular signal generators; 7.3. Sinusoidal signal formers; 8. PLL circuits: 8.1. Generalities and parameters; 8.2. applications; 9. Active Filters: 9.1. Active filters with continuous operation over time; 9.2. Active filters with switched capabilities. The seminar consists of the following topics: 1. Internal structures of AO; 2. Non-linear applications of AO; 3. Function generators; Active Filters; 4. Stabilizers in switching. The laboratory consists of the following topics: 1. Basic constituent elements of analogue integrated circuits; 2. Integrated Power Amplifiers; 3. Converters V-I with AO; 4. Precision rectifiers; 5. Timers and applications; 6. Function Generators; 7. Active Filters; 8. Stabilizers in switching; 9. SPICE simulation of the operation of some basic constituent stages of analogue integrated circuits as well as of analogue integrated analogue circuits and their applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: INTEGRATED DIGITAL CIRCUITS

CODE: D28ELAL502
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to assimilate the students the knowledge necessary to understand the operation of the main types of digital integrated circuits, as well as to acquire the methods of analysis and synthesis of the combinational and sequential logic circuits. The lab allows for the theoretical knowledge to be set and for the practical use of digital circuits.
COURSE CONTENTS: 1. Semiconductor devices (semiconductor diode, bipolar and unipolar transistor): 1.1 Electrical representation of logic symbols; 2. Basic logic circuits: 2.1 Logical circuits with discrete components; 2.2. Integrated logic circuits RTL and DTL; 2.3 Standard TTL family. Inverter, NAND and TTL NOR; 2.4 Gate HTTL and TTL Schottky; 2.5 Empty collector circuits, "Three State", ECL and I2L; 2.6 Static and dynamic PMOS and NMOS circuits; 2.7. Transfer gateway; 2.8 CMOS Circuits. Inverter, NAND and NOR; 2.9 CMOS Transfer Gateway; 3. Combined logic circuits: 3.1. Analysis and synthesis c.c.c.; 3.2. Parity detector; 3.3. Multiplexers and demultiplexers; 3.4. Numerical comparators; 3.5. combiners; 3.6. Code converters; 3.7. Encoders and decoders; 3.8. Memory ROM, PROM, EPROM, E2PROM; 3.9. Programmable logic areas; 4. Sequential logic circuits: 4.1 Asynchronous CBB-SR, Synchronous and Master-Slave; 4.2. Asynchronous and synchronous CBB-D; 4.3. Addressable Latch; 4.4. RAM memories; 4.5. CBB-D Master-Slave. records; 4.6. CBB-T; 4.7. Asynchronous CBB-JK, Synchronous and Master-Slave; 4.8. Counting. The laboratory consists of the following topics:1. Analysis and synthesis c.c.c.; 2. Impartiality-parity detector. Code converters; 3. Numerical and Summarizing Comparators; 4. Multiplexers and demultiplexers; 5. Encoders. Address decoders, BCD - decimal and BCD - 7 segments; 6. Flip-flop circuits: SR, D, T, JK; 7. Registers: Parallel, Series Travel, Universal; 8. Static RAM: Running and Testing; 9. Counting and frequency dividers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ELECTRONIC MEASURING INSTRUMENTS

CODE: D28ELAL503
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The transmission of knowledge on the structure, operation and use of modern electronic measuring instruments, appreciation of the performance of current

instruments, interconnection and manipulation of elementary modules in modular instrumental structures; The objective of the laboratory: the formation and cultivation of practical skills in the use of modern instrumentation.
COURSE CONTENTS: 1. Typical structures for mono and multichannel electronic instruments for measuring the electrical and non-electric quantities; 2. Typical structures for mono and multichannel electronic instruments for measuring electrical and non-electrical quantities; 3. Input circuits for current and voltage; 4. Elementary measuring amplifiers; 5. Special Amplifiers. Measurement of high resistances. Shielding of bridges; 6. Input circuits for non-electrical quantities. Overview of transducers. Temperature transducers. Thermo-sensitive thermistors; 7. Integrated temperature transducers (PTAT, PTCT). Thermoelectric effect, specific laws, thermocouples, radiation pyrometers; 8. Electrical transducers for deformation. Brands of strain gauge. Parametric transducers for linear and angular displacements; 9. Speed transducers. Analogue and numerical variants. Transducers for acceleration; 10. Power transducers, moments and mechanical power. Resistive and magnetoelastic variants; 11. Transducers for hydrodynamic sizes (pressure, flow); 12. Special measuring instruments (instrumentation and isolation); 13. Converters ca-cc, U-f, R-U, R-f. The laboratory consists of the following topics: 1. Lab protection (NTSM, PSI) and presentation of the laboratory theme; 2. Study of an electronic current sensor with Hall sensor; 3. Study of an electronic voltage transducer with Hall sensor; 4. Study of temperature transducers; 5. Study of a linear displacement differential transformer transducer (LVDT); 6. Study of resistive deformation transducers (strain gauges); 7. Study of electro-optical transducers (photoresist, photodiode); 8. Study of electronic laboratory multimeters; 9. Study of portable multifunctional tools; 10. Study of function generators (Hameg, Seintek); 11. Study of a Multifunctional Tool with Mc; 12. Analysis of numerical signals with DSO TDS2014B (Tektronix); 13. Study and programming of a multifunctional panel-meter instrument.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PROGRAMMABLE DIGITAL ARCHITECTURES

CODE: D28ELAL504
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Knowledge of the architecture and operation of 16/32 micro-processors: Intel 80 x 86 family. Knowledge of a modern PC/ controller architecture, PC-104/ ISA and PC-104 +/ PCI system buses and interfaces for them. Knowledge of architecture and peripheral resources specific for representative families of 8/16 bit microcontrollers as well as development environments (software and hardware) used for a microcontroller application. Developing the ability to select a microcontroller (computing power, resources, and other criteria) for a specific application.
COURSE CONTENTS: 1. C programming for embedded systems: microcontrollers, micro-processors; Integrated Development Environment (IDE) programming environment, Toolchains; (Re) introduction to C language, coding standards; 2. Introduction to the architecture of computer systems; the 80x86 microprocessor family (Intel Corp.); controllers (PC-I 04/ JSA and PC-104 +/ PCI buses and interfaces); 3. Microcontrollers: applications, features, representative families, selection criteria of a microcontroller; 4. Introduction to ATMEL A VR family 8 bits: central unit architecture, registers, instructions, memories, clock generation system, fuses; 5. ATMEL A VR 8 bits: hardware initialization (reset), numerical inputs/ outputs (1/0 ports), interrupt system; 6. ATMEL A VR 8 bits: Timing/ counting system; interrupt system (2): external interruptions, use of interrupts with WinAYR compiler; 7. ATMEL AVR 8 bits: analogue inputs, analogue-to-digital conversion system; 8. ATMEL AYR 8 bits: serial communication; RS-232, RS422/ 485, AVR U (S) ART and asynchronous serial communication; SPI, TWI (I2C), USI, synchronous serial communication; 9. ATMEL AYR 8 bits: the XMEGA family; 10. Integrated software development (IDE) environment for the 8-bit AVR family; Hardware programming and troubleshooting methods for 8-bit ATMEL AVR microcontrollers. The laboratory consists of the following topics: 1. Introduction AVR Studio 4/ Win AVR/ Proteus VSM, Atmel AVR 8 bit; 2. Numerical inputs and outputs: switches and LEDs, countdown timer, interrupt system; 3. Numerical inputs and outputs: switches and displays 7 segments, tables in program memory; 4. Analogue inputs and serial asynchronous communication (RS-232); 5. Use of alphanumeric display modules, user libraries; 6. Speed/ frequency measurement: external interruptions; 7. PWM leakages: control of a DC micromotor, control of a RC servo, synthesis of sinusoidal waveforms; 8. Analogue inputs: temperature sensors; 9. TWI bus, I/O expander PCF 8574.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: PROGRAMMABLE DIGITAL ARCHITECTURES – PROJECT

CODE: D28ELAL505
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Knowledge of the architecture and operation of 16/32 micro-processors: Intel 80 x 86 family. Knowledge of a

modern PC/ controller architecture, PC-104/ ISA and PC-104 +/ PCI system buses and interfaces for them. Knowledge of architecture and peripheral resources specific for representative families of 8/16 bit microcontrollers as well as development environments (software and hardware) used for a microcontroller application. Developing the ability to select a microcontroller (computing power, resources, and other criteria) for a specific application.
COURSE CONTENTS: Students have designed and built an application with numerical inputs and outputs using an 8-bit AVR microcontroller; the time dimension must be implemented using the timing/ counting system and the interruptions; the full functionality of the application is demonstrated using a system simulator.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: OPTOELECTRONICS
CODE: D28ELAL506
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The discipline aims to assimilate the students the necessary knowledge to understand the operation and use of optoelectronic devices, understanding the operation and design of circuits with optoelectronic devices, circuits dedicated to the transmission of optical fibre information, fibre optic sensors, and the use of specific instrumentation for performance determination circuits studied.
COURSE CONTENTS: 1. Theoretical notions of light physics: 1.1. General; 1.2. Wave-based optics; 1.3. Corpuscular optics; 1.4. Radiometry and Photometry; 1.5. Optical elements and systems; 2. Semiconductor light sources: 2.1. Getting Started. Types of broadcasting; 2.2. Basic structures of semiconductor luminescent sources; 2.3. Luminescent sources based on spontaneous emission and applications; 2.4. Luminescent sources based on stimulated emission and applications; 2.5. Luminescent sources based on super-radiant and applications; 3. Quantum detectors and applications: 3.1. Photoelectric effect; 3.2. Characteristics of quantum detectors; 3.3. Surface photoelectric detectors and applications; 3.4. Detectors with internal photoelectric effect and applications; 3.5. Noise in quantum detectors; 4. Fibre-optic sensors: 4.1. Generalities and parameters; 4.2. Typical applications; 5. Optoelectronic devices with passive operation (liquid crystals): 5.1. General; 5.2. Operation; 5.3. applications; 6. Optical fibres: 6.1. General. The theoretical basis of light beams guidance through optical fibres; 6.2. Characteristics of optical fibres. The manufacturing process and examples of optical fibres; 6.3. Optical coupling between light sources and fibre optics; 6.4. Fibre Optical Applications in Optical Telecommunications. The laboratory consists of the following topics: 1. Optoelectronic devices; 2. Analogue fibre-optic communication circuits; 3. Digital fibre communication circuits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: COMMUNICATION SYSTEMS
CODE: D28ELAL507
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of analogue and digital communication systems, signal transmission, system noise study. The lab has the role of fixing the theoretical knowledge and creating programming skills through practical applications, exercises and problems.
COURSE CONTENTS: 1. Introduction: 1.1 Elements and limitations of communication systems. Information, messages, signal elements of a communications system, fundamental limitations; 1.2 Modulation and encoding. Modulation methods. Applications and benefits of modulations. Coding methods and their benefits; 2. Probability theory and random processes; 2.1. Probability and sampling space; 2.2 Conditional probabilities and statistical independence; 2.3 Random variables and probability functions; 3. Random signals and noises: 3.1 Random processes; 3.2. Random signals; 3.3 Noise; 4. Performance of noise-affected communication systems; 5. Structure of a communication system: 5.1 Structure of a phone network; 5.2. Structure of a computer network; 5.3. Internet Structure; 6. Basic technologies for intelligent communication systems; 7. Analogue communication systems: 7.1 CW modulation receivers; 7.2. Multiplexing systems; 7.3 PLL; 7.4 Television systems; 8. Behaviour of analogue communication systems in the presence of noise; 9. Systems and digital signals: 9.1 General; 9.2 Noise and error; 9.3 Bandwidth Limits; 9.4 Synchronization Techniques; 10. Behaviour of digital communication systems in the presence of noise; 11. Coding and encryption of channels: 11.1 Error detection and correction; 11.2 Linear Codes; 11.3 Convolutional codes; 11.4 Encrypting data. The laboratory consists of the following contents: 1. Modulations; 2. Noise; 3. Performance of noise-affected communication systems; 4. The structure of a communications system – the telephone exchange; 5. Structure of a communication system – Computer network; 6. Analogue Communication Systems; 7. Behaviour of analogue communication systems in the presence of noise; 8. Digital systems and signals; 9. Behaviour of digital communication systems in the presence of noise; 10. ISDN. FAX; 11. Speech coding.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam

3RD YEAR, 2ND SEMESTER

COURSE TITLE: DIGITAL ACQUISITION OF EXPERIMENTAL DATA
CODE: D28ELAL601
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course introduces basic concepts of specialized electronic components and circuits for digital data acquisition. Applied laboratory works form practical skills for the realization of measurement assemblies and the handling of numerical instrumentation for the numerical acquisition of data through specific programs.
COURSE CONTENTS: 1. Principles of digital data acquisition: sampling and A/N conversion. Generic structure of digital systems; 2. Types of systems for data acquisition; 3. Sampling circuits; Mathematical model, electrical and temporal conditioning; 4. A/D conversion; Types of A / D converters; 5. Analogue-digital converters with simultaneous conversion (flash, semi-flash) and integration (with intermediate conversion over time); 6. A/D converters with numerical ramp. A/D converters with successive approximations and Σ-Δ. Conversion control and data transfer; 7. Analogue and digital adjustment of gain of measuring amplifiers. Special functions: autoscal, autocalibration, autozero; 8. Microcontrollers with Built-in Acquisitor. Control signals generated by the acquisition controller; Digital signal processors; 9. Techniques of acquisition; Transferring data in memory; 10. Determination of the sampling rate according to the frequency of the signals and the measurement accuracy and the sampling moments using registers; 11. Acquisition algorithms for unipolar, bipolar, alternate signals; 12. SCADA systems; 13. Common problems of electromagnetic compatibility of the DAS. Parasite couplings and disposal techniques. The laboratory consists of the following topics: 1. The study of a digital system with μC with data acquisition; 2. The study of an analogue-to-digital converter with successive approximations; 3. Acquisition of unipolar signals; 4. Acquisition of bipolar signals; 5. Acquisition of alternative signals; 6. Multi-channel acquisition; 7. Study of a multichannel system for measuring temperatures; 8. Study of an energy monitor for three-phase circuits; 9. Study of a monitoring and protection system for the single-phase consumer; 10. Study of a MT monitoring and protection system; 11. Study of a digital disturbance recorder in electrical stations;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DIGITAL ACQUISITION OF EXPERIMENTAL DATA – PROJECT
CODE: D28ELAL602
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Developing skills and abilities regarding the analysis and complete or partial synthesis of systems for the digital acquisition of experimental data.
COURSE CONTENT: 1. Presentation of generic structures of data acquisition systems; Individual assignment of design themes; 2. Typical input module structures for data acquisition systems; 3. Dimensioning of analogue processing circuits; 4. Typical structures of digital control sections; 5. Data acquisition programs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: MICROWAVES
CODE: D28ELAL603
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Students are encouraged to understand the operation, design and use of uniform waveguides, directional and power couplings, microwave filters, microwave semiconductor devices, microwave amplifiers and microwave generators. The seminar has the role of fixing the theoretical knowledge and creating computational skills through exercises and problems.
COURSE AND SEMINAR CONTENTS: 1. Uniform waveguides: 1.1 Maxwell equations; 1.2 Propagation modes and limit conditions; 2. TEM propagation uniform waveguides: 2.1 Line equations; 2.2 Distributions of voltages and currents, where stationary; 2.3 Input impedance of the lines; 2.4 The line as uniport and two-port; 2.5 Transmission of power by means of lines; 2.6 Line types used at high frequencies; 3 Uniform waveforms with TE or TM propagation mode: 3.1 Parameters characteristic of propagation; 3.2 Rectangular, circular, flat, dielectric plate type guides; 4. Linear Microwave Circuit Theory Elements: 4.1 Where generalized power; 4.2 Distribution matrix S and its properties; 4.3 Properties of multiport classes; 5. Directional couplings and power dividers: 5.1 Directional couplings with coupling through line sections, with coupled lines, with coupling slots; 5.2 Power dividers; 6 Microwave filters: 6.1 Filter prototypes; 6.2 Particularities and technological limitations related to the design of microwave filters; 7. Non-reciprocating ferrite devices: 7.1 Propagation of electromagnetic waves in polarized ferrite; 7.2 Non-reciprocating ferrite devices; 8. Microwave Amplifiers with Transistors: 8.2 Stability of a Transistor Amplifier Floor; 8.3 Unilateral transistor; 8.4 Noise of transistor amplifiers; 9 Special

microwave tubes: 9.1 Reflex Klistron; 9.2 Magnetron; 9.3 Progressive waveguide; 10. Microwave devices: 10.1 Unique devices with negative resistance; 10.2 Diodes and Frequency Change Diodes; Oscillating diodes and amplifiers; PIN code; Varactor diode; Diode step-recovery (SR); 10.3 Encapsulation of microwave diodes. The seminar consists of the following topics: 1. Uniform waveform guides with TEM propagation mode; 2. Uniform wave guides with TE or TM propagation mode; 3. Linear Microwave Circuit Theory Elements; 4. Transistor Microwave Amplifiers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DIGITAL SIGNAL PROCESSING

CODE: D28ELAL604
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of digital signal processing. It is desirable to create skills for designing and analysing the properties of numerical filters, how to implement digital filters, and spectral estimation of signals. It details the truncation and finite length of words when implementing algorithms on digital signal processors. The laboratory has the role of fixing theoretical knowledge and creating programming skills through practical applications, exercises and problems.
COURSE AND LABORATORY CONTENTS: 1. Problems of signal processing: 1.1 Signal processing; types of processing; 1.2 Preliminary signal processing; 1.3 Windows; 2. Discrete systems and transformation Z: 2.1 Discrete systems; 2.2 The bases of Z transformation; 2.3 System description and transfer function; 2.4 Entry-exit stability; 2.5. Internal Stability, Stability Criteria; 3. Digital filters: 3.1 General description and classes of digital filters; 3.2 Frequency characteristics of digital filters; 3.3 Non-recursive linear phase filters; 4. Design of numerical filters: 4.1 Design of non-recursive filters by window method, by frequency sampling method; 4.2 Design of RII filters (with infinite pulse response); 4.3. Design of analogue filters; 4.4 Conversion of analogue filters into digital filters; 5. Spectral Estimation of Signals: 5.1 Random Signals; 5.2 Estimation theory and applications; 5.3 Direct, indirect and spectral estimation method; 6. Digital digital signal processors: 6.1 Characteristics and programming of digital signal processors; 6.2 Development systems with digital signal processors. The laboratory consists of the following topics: 1. Presentation of Matlab/ Simulink digital analysis, simulation and design tools; 2. Analysing the properties of various types of windows by simulation; 3. Design of FIR filters; 4. Design of IIR filters; 5. Conversion of analogue filters into digital filters; 6. Design and implement digital filters using DsPic Pro 4 real time tiles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DECISION AND ESTIMATION IN INFORMATION PROCESSING

CODE: D28ELAL605
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the fundamental disciplines of the curriculum for this license area. It contributes to the formation of future electronics engineers, providing them with knowledge in the field of information transmission theory. Basic concepts used in the design and implementation of data transmission systems are addressed. The laboratory has the role of fixing the theoretical knowledge and of understanding phenomena through practical applications.
COURSE AND LABORATORY CONTENTS: 1. Random signals. Fundamental notions: 1.1 Distribution functions and probability densities of random signals over time; 1.2 Temporal average values and statistical average values of random signals; 1.3 Correlation and covariance functions; 1.4 The Wiener – Khinchin Theorem; 1.5 Transfer of Stochastic Signals through Linear Systems. 1.6 Passing the white noise through an ideal low pass filter through an ideal passband filter; 2. Receiving Discrete Signals: 2.1 Ideal Channel; 2.2 Types of binary signals used in the baseband; 2.3 Inter-symbol Interference; 2.4 Detection of binary signals using correlation receiver and coherence function. 2.5 Signal-to-noise ratio; 3. Transmission systems with signal detection: 3.1 Model of a transmission system with signal detection; 3.2 Observing random signals at discrete time points; 3.3 Bayes Criterion; 3.4 Detection of a known amplitude signal; 3.5 Detection of a known shape signal; 4. Optimal reception of discrete modulated signals: 4.1 Estimation of signal form; 4.2 Wiener optimal filtering; 4.3 Optimum Filters Kalman-Bucy; 4.4 Maximizing the signal-to-noise ratio; 5. Transmission systems with parameter estimation: 5.1 Estimation based on minimal mean square error, on posterior maximum probability density; 5.2 Estimation of an unknown deterministic parameter; 5.3 Estimating Channel Transfer Features. The laboratory consists of the following topics: 1. Polar modulation. Modulation simulation, demodulator, transmission channel; 2. Modulation in quadrature. Modulation simulation, demodulator, transmission channel; 3. Extract the useful signal from the disturbed signal. Design of digital filters of type FIR (computer simulation); 4. Comparative analysis of modulation performances using harmonic carrier signals. Signal-to-noise ratio calculation; 5. Detection of binary signals using the correlation receiver. Experimental determination of

statistical performances; 6. Detection of a known amplitude signal (computer simulation).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: RADIOCOMMUNICATIONS

CODE: D28ELAL606
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to develop the analysis and design skills of the radiocommunication systems, to offer the right solutions for the propagation of the radio signals, to offer the correct propagation solutions with a minimal level of disturbance.
COURSE CONTENTS: 1. Introduction to radio-communications. History of radio communications and evolution over time; 2. Propagation and modelling of radio waves. Propagation patterns; 3. Wireless communication antenna systems; 4. Design of radio connections; 5. Representation of signals and systems specific to radiocommunications; 6. Radio channel modelling; 7. Techniques to combat defective signal propagation and mitigate disturbances; 8. Introduction to wireless networks. Multi-access methods. Reuse of frequencies and channel allocation. Wireless network analysis elements. The laboratory and the seminar consist of the following topics: 1. Using the oscilloscope to determine specific parameters of the radio communication systems; 2. Using the spectrum analyser to determine specific parameters for the radio-communications systems; 3. Determination of data transmission performance in 433MHz band; 4. Determination of data transmission performance in the 869 MHz band; 5. Determination of data transmission performance in the 2.4 GHz band; 6. Determine performance parameters in mobile telephony.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DIGITAL SYSTEMS – PROJECT

CODE: D28ELAL607
ECTS CREDITS: 2
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Developing skills and abilities for the analysis and complete or partial synthesis of digital systems. Familiarization with the structures and components of digital systems, with interconnection modes and functions in typical and particular elementary variants.
COURSE CONTENT: 1. Presentation of generic structures of digital systems. Individual assignment of design themes; 2. Dimensioning of circuits in digital systems structures; 3. Typical hardware sections; 4. Examples of programs for simple digital systems; 5. Project support.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: PRACTICAL TRAINING 2

CODE: D28ELAL608
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Deepen knowledge of software tools dedicated to simulation, design and realization of electronic circuits and various programming languages useful in applied informatics applications. Case studies. Developing practical applications.
COURSE CONTENTS: 1. The study of the objectives of an enterprise producing electronic equipment; 2. The study of the equipment and the organizational structure of an enterprise producing electronic equipment; 3. Study of specific standards for the production of circuits and electronic equipment; 4. Study of the manufacturing technologies of electronic circuits and equipment in current production; 5. Study of software tools used in the design and realization of electronic circuits and equipment in current production; 6. Study of data acquisition and virtual instrumentation equipment used for testing circuits and electronic equipment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

4^{TH} YEAR, 1^{ST} SEMESTER

COURSE TITLE: POWER ELECTRONICS

CODE: D28ELAL701
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the specialty disciplines of the curriculum for this license area. The course aims to introduce the basic concepts of power electronics. The lab has the role of fixing the theoretical knowledge and creating programming skills through practical applications, exercises and problems
COURSE AND LABORATORY CONTENTS: 1. Introduction; 2. Devices used in power electronics: transistor, thyristor, IGBT, IGCT, intelligent power modules; 3. Classification of converters; 4. Rectifier: Not Commanded, Commanded; 5. Continuous voltage variators; 6. Inverters: I. Mono-phase, I. Three-phase; 7. Alternative voltage variants: single-phase VTA, three-phase VTA; 8. Fields of use of converters. The laboratory consists of the following topics: 1. Single-phase unregulated rectifiers; 2. SPICE modelling of the non-phase one-phase rectifier; 3. Three-phase unassigned rectifiers; 4. SPICE modelling of the three-phase non rectifier; 5. Voltage alternators; 6. Modelling SPICE and VTA; 7. Rectifiers ordered; 8. SPICE modelling of the rectifier ordered; 9. One-phase inverters; 10. SPICE modelling of the inverter; 11. Continuous voltage variators.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam

COURSE TITLE: POWER ELECTRONICS – PROJECT
CODE: D28ELAL702
ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It is one of the specialty disciplines of the curriculum for this license area. The project aims to develop practical skills in the field of Power Electronics.
COURSE CONTENTS: 1. Non-phase single phase rectifiers; 2. SPICE modelling of the non-phase one-phase rectifier; 3. Three-phase unassigned rectifiers; 4. SPICE modelling of the three-phase non rectifier; 5. Voltage alternators; 6. Modelling SPICE and VTA; 7. Rectifiers ordered; 8. SPICE modelling of the rectifier ordered; 9. One-phase inverters; 10. SPICE modelling of the inverter; 11. Continuous voltage variators.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: TELEVISION EQUIPMENT
CODE: D28ELAL703
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to assimilate students the theoretical and practical knowledge of television equipment. The lab allows to fix the theoretical knowledge taught at the course, to familiarize with the particularities and the way of functioning of the television equipment and to acquire some technical skills in the field of digital assembling.
COURSE AND LABORATORY CONTENTS: 1. General principles of television equipment; 2. Video cameras. CCD and CMOS image sensors; 3. Video playback devices; LCD and LED. projectors; 4. A/D and D/A converters in processing and playback of images and films; 5. Numerical coding. Serial transmission of Y, CR, C8 signals. Code 8/10. Parallel transmission. Form D1 and D2; 6. Digital video recording/ playback; 7. Synchronizing, switching and mixing video signals; 8. Direct transmission in radio frequency of television signals; 9. Polarization of the radiated signal. TV broadcast service area. Sporadic propagation. Radio transmission; 10. Transmission by coaxial metal cable and optical fibres; 11. Video coding systems; 12. Reception of geostationary satellite broadcasts; 13. The type of modulation used in satellite TV broadcasts. MAC encoding. Terrestrial satellite TV reception system. The laboratory consists of the following topics: 1. Overview of TV Studio Tele U Craiova; 2. Study of portable and plateau cameras; 3. Video recording equipment. Video production mixer; 4. TV Monitor; 5. Logo and mirage generators; Subtitling equipment; 6. Equipment for measuring TV signals in cables and in ether; 7. TV broadcasting installation; 8. Satellite TV reception system; 9. Mounting elements with numerical equipment; 10. Mixing images from different signal sources. Sync the sound; 11, 12. Special Effects; 13. Testing knowledge and ending the situation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: MOBILE COMMUNICATIONS
CODE: D28ELAL704
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing the knowledge necessary to understand the operation of the main mobile communication systems used, their characteristics and the standards used in this field. The laboratory, through its theoretical and practical applications, has the role of assimilating the knowledge of the students and creating the necessary practical skills in this field.
COURSE AND LABORATORY CONTENTS: 1. Introduction. Multiple access techniques; 2. Professional mobile communication systems: 2.1 PMS simplex, conventional and trunking systems; 3. Cordless systems; 4. Cellular systems: 4.1 Frequency management; 4.2 Using Segmented Cells. Channel management; 5. GSM system: 5.1 Definition, architecture, technical characteristics; 5.2 Coding information in GSM; 5.3 GPRS system: architecture, channels. Evolution to 3G; 6. Principles of CDMA systems: 6.1 CDMA methods; 6.2 CDMA transmitters and receivers; 6.3 PN code sequences and orthogonal codes. The DS-CDMA receiver; 7. UMTS system: 3G standardization: 7.1 UMTS network principles; 7.2 User-Network radio interface; 8. Wireless technologies: 8.1 WPAN and WLAN technologies. Bluetooth. The laboratory consists of the following topics: 1. TDMA transmissions in mobile communications; 2. Traffic estimation, frequency allocation and segmentation in cellular systems; 3. PSK transmissions in mobile communications; 4. GSM system – architecture, call, establishing and terminating the connection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

PACKAGE A

COURSE TITLE: ELECTRICAL AND ELECTRONIC DRIVE SYSTEMS
CODE: D28ELAL705a
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at presenting the general notions regarding the theory of electric drives as well as the operating principles, the characteristics and the control of the drive systems with DC motor, asynchronous motor, synchronous motor with permanent magnets and stepper motor. The lab is designed to provide

students with the opportunity to carry out the experimental assemblies of the most important actuation systems, as well as the experimental lifting of the operating characteristics.
COURSE AND LABORATORY CONTENTS: 1. Introduction to electric drive theory: 1.1 General structure of drive systems; 1.2 Torque; 1.3 Reporting torques and moments of inertia; 1.4. Cinematic of electric drives; 2. DC motor drives; 3 Three-phase asynchronous motor drives: 3.1 Principle of operation, Construction elements, Operating equations; 3.2 Mechanical features; 3.3 Control; 3.4. Drive system with asynchronous motor and voltage inverter; 3.5 Asynchronous machine vector control concepts; 3.6 Principle of direct asynchronous machine torque (DTC) control; 4. Synchronous motor drive systems with permanent magnets: 4.1. Operating Principle, Constructive Elements, Operating Equations; 4.2 Mechanical features; 4.3 Control; 4.4 Vector control of synchronous motor drive and voltage inverter with prescribed currents; 4.5 Vector control of synchronous motor drive and voltage inverter; 4.6 "Fault tolerant" applications; 5. Step-by-step drive systems: 5.1. Operating Principle, Constructive Elements, Operating Equations; 5.2 Features; 5.3 Control. The laboratory consists of the following topics: 1. Drive speed control study (separate excitation); 2. Brake Mode Study; 3. The speed control for asynchronous motor with coil rotor; 4. Brake mode study for asynchronous motor drive with winding rotor; 5. Study of the Drive System with separate excitation and open circuit controlled rectifier; 6. Study of the Drive System with separate excitation and Continuous Voltage Modifier (VTC); 7. Study of the Drive System and rectifier in closed loop; 8. Study of the drive system with asynchronous motor and inverter with U/f control; 9. The study of the asynchronous motor drive system and the frequency modulation inverter; 10. Study of the asynchronous motor drive system and voltage inverter with pre-calculated modulation and harmonic elimination; 11. The study of the asynchronous motor drive system and vector inverter; 12. Study of MPP drive system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMMUNICATIONS ANTENNAS
CODE: D28ELAL706a
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to introduce the necessary knowledge to understand the operation and characteristics of the main types of antennas used in communications. The project, through its applications, has the role of assimilating the students' knowledge of the course and creating the practical design skills required in this field.
COURSE AND LABORATORY CONTENTS: 1. Introduction, Types of antennas; 2. The general property of radio waves: 2.1 Types of waves and their polarization; 2.2 Radiation conditions. Diffraction of waves; 2.3 Ionosphere and its influence in the propagation of waves; 2.4 Propagation of high frequency waves; 3. Rectilinear antennas: 3.1 Radiation of thin antennas; 3.2 Long and medium wave antennas; 4. Non-rectilinear antennas: 4.1 Frame antenna; 4.2 Rhyming antenna; 4.3 Very wide band antennas; 4.4 Helical antennas; 5. Other antenna types: Slot antennas. Apertures. Antenna horn. Parabolic antennas. Surface wave antennas; 6. Antenna feeding: 6.1 Adaptation and symmetry problems; 6.2 Different ways of feeding; 6.3 Output of an antenna system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DESIGN OF MICROELECTRONIC STRUCTURES
CODE: D28ELAL707a
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to create design skills for integrated bipolar and CMOS structures.
COURSE AND LABORATORY CONTENTS: 1. Substrate and well island: 1.1 Island trace N (N well); 1.2 Calculation of N Well Resistances; 2. Well-substrate diode. RC well distributed in well: 2.1 Well-substrate diode characteristics; 2.2 Parasites associated with the structure; 3. Technological processes for well: 3.1 N-well, p-well, twin-well, triple-well; 3.2 Design rules for well; 3.3 Location of forests; 3.4 Current limitations through metal layers; 4. Layout of MOS resistors and transistors: 4.1 CMOS process and connection of wires to different layers; 4.2 Location paths for resistors, NMOS and PMOS; 4.3 Standard cell frames and design rules; 5. Poly-poly condensers manufactured in CMOS technology. Condensers made of metal plates. The laboratory consists of the following topics: 1. Location of forests; 2. Design and drawing of metal layers; 3. Layout and circuit examples; 4. Elementary structures of resistors manufactured in CMOS technology; 5. Poly-poly condensers manufactured in CMOS technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DESIGN OF MICROELECTRONIC STRUCTURES – PROJECT
CODE: D28ELAL708a
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Creating design skills for bipolar and CMOS integrated structures.
COURSE CONTENT: 1. Presentation and discussion of the general requirements of the semester project;

2. Distribution of project themes and individual scoring of the original structure; 3. Individual verification of the synthesis algorithm of the structures specific to the design themes; 4. Establishing the modules and the elementary circuits that are included in each structure; 5. Individual verification of module models and elementary circuits in the project; 6. Individual determination of the interconnections specific to the projected structures; 7. Verification of the interconnections between the modules and the elementary circuits and the establishment of stimuli and simulation conditions of the designed structures; 8. Individual training of the structures developed within the project in order to simulate it under the required working conditions; 9. Individual verification of each project.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

PACKAGE B

COURSE TITLE: IMAGE RECOGNITION AND PROCESSING

CODE: D28ELAL705b
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing basic concepts and skills related to the use of acquisition, processing and recognition of real images for practical applications other than computer graphics and work with synthesis images.
COURSE AND LABORATORY CONTENTS: 1. Introduction; 2. Acquisition of the image: 2.1 Introduction; 2.2 The human view system; 2.3 Image sensors; 2.4 Characteristics of cameras; 2.5 Acquisition and processing of imaging plates; 3. Formation of digital image: 3.1 Optical transformation; 3.2 Geometric transformation; 3.3 Calibration of cameras; 3.4 Analogue-digital conversion; 4. Contour detection: 4.1 Introduction; 4.2 Histograms of images and their processing; 4.3 Filtering digital images; 4.4 Follow-up contours in printed form; 5. Segmenting the image: 5.1 Editing contours; 5.2 Polygonal approximation of contours; 5.3. Hough Transformation; 5.4 Labelling of regions; 5.5 Dilation and erosion; 6. Description of the objects: 6.1 Contour descriptors; 6.2 Surface Descriptors; 6.3 Normalization processing; 7. Classification of forms: 7.1 The concept of learning and classifiers; 7.2 Statistical Classifications. Artificial applications. The laboratory consists of the following topics: 1. Description of the parameters of a digital still image acquisition system (photo); 2. Description of parameters of a digital video acquisition system (video); 3. Presenting the Omron acquisition and imaging system. Integrate it into the SMC flexible manufacturing plant; 4. Applications for visual inspection of product quality using the Omron artificial vision system; 5. Presentation of the ADEPT Artificial Visual System for the SCARA robot; 6. Programming the ADEPT Artificial Visual System for the SCARA robot. Parts recognition and localization applications; 7. Presentation of the Cognex artificial vision system for the Mitsubishi robot, PUMA configuration; 8. Programming the Cognex artificial vision system for the Mitsubishi robot, PUMA configuration. Parts recognition and sorting applications; 9. Presentation and programming of Fastec Imaging rapid acquisition room.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DATABASES DESIGN

CODE: D28ELAL706b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing basic concepts on the design of a database and assimilating knowledge about the use of SQL language and a relational database management system (SGBDR) for implementation and administration. The laboratory has the role of fixing theoretical knowledge, allowing understanding of phenomena through various applications, and gaining practical skills in designing a database and using the appropriate SQL language and SGBDR.
COURSE AND LABORATORY CONTENTS: 1. Introduction: 1.1 The architecture of a database system; 1.2 Relational Database Management Systems; Codd's rules; 2. The relational model of the DB: 2.1 The basic concepts of the relational model; 2.2 Relational system operators; 3. Design of relational databases; 4. Normalization of databases; 5. SQL (Structured Query Language): 5.1 DDL Instructions; 5.2 DML Instruments; 5.3 DQL Instructions; 5.4 DCL Instruments; 6. Oracle SGBDR: 6.1 Oracle SGBDR Architecture; 6.2 Logical storage structures for BD; 6.3 Logical organization of BD; 6.4 Managing an Oracle instance; 7. Competing access to data and maintaining its consistency: 7.1 Ensuring consistency with transactions; 7.2 Concurrent access to data. Locks; 8. Database security: 8.1 Database users. User schema; 8.2 Creating, modifying and destroying users; 8.3 System Privileges. Privileges at the object level. roles; 8.4 Creating, activating, modifying, disabling and destroying roles; 8.5 Granting and revoking a user's roles and privileges; 9. Optimizing database work: 9.1 Clusters, Sequences, Synonyms, Procedures, Functions, Stored and Trigger Packages; 9.2 Instant; 9.3 Dictionaries of data; 9.4 Views; 10. PL/SQL: 10.1 PL/SQL stored and embedded functions; 10.2 PL/SQL Procedures. Packages, errors, exceptions, cursors, triggers. The laboratory consists of the following topics: 1. Presentation of a computer network with ORACLE

database server; Installing and uninstalling a database; 2. Analysis of application specifications and requirements. Creating database users. Creating, modifying, and populating database tables; 3. Presentation of SQL language – Oracle version. Querying tables. Column projection. Filtering, sorting and grouping of lines. junctions; 4. SQL functions. Functions for a single record and group functions; 5. Sub-queries. Nested Sub-References. Subordinate queries; 6. Database management concepts. SQL *Plus, Query Builder, Enterprise Manager. Competing access Security BD. Optimizing work with BD; 7. Applications based on the development of a BD with SOL, PHP, APACHE, HTML.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DATABASES DESIGN – PROJECT
CODE: D28ELAL707b
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The project has the role of instructing the student to be able to design and manage a functional relational database. It aims at introducing basic concepts on the design of a database and assimilating knowledge on the use of a relational database management system for implementation and management. There are fixed theoretical knowledge that allows students to understand phenomena through diverse applications.
COURSE CONTENTS: 1. Establishment of teams, distribution of project themes and tasks of the teams. Analysis of application specifications and requirements; 2. Making conceptual schemes (entity-link diagrams) for different scenarios. Specify entities, attributes, and table links. Presentation of representation conventions and symbols. Establish unique identifiers and mandatory attributes; 3. Making logical schemes, physical projects and determining sets of tables for different conceptual schemes; 4. Presentation and discussion of special situations; 5. Making database normalization; 6. Implementation, testing and correction of the database; 7. Project presentation with video projector.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: SOFTWARE ENGINEERING FOR COMMUNICATIONS
CODE: D28ELAL708b
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing concepts for the management and development of software products related to computer networks and data communications in computer networks. The lab has the role of fixing the theoretical knowledge and creating programming skills through practical applications, homework and solving problems.
COURSE AND LABORATORY CONTENTS: 1. Introduction to Software Engineering: 1.1 System approach to software development; 1.2 Code of Ethics and Recommendations; 2. Software Development Models: 2.1 Life Cycle Models in Software Development; 2.2 Sequential model; 2.3 The iterative model; 3. Software modelling: 3.1 Software modelling concepts; 3.2 UML as a software modelling tool. Introduction; 4. UML, Diagram Use Case. Status charts, classes, activities and interactions; 5. Collection of requirements for software development: 5.1 Data types; 5.2 Requirements / data collection techniques from the client; 5.3 Types of applications; 6. Software requirements analysis: 6.1 Features and content requirements for software development; 6.2 Requirements analysis methodologies. Process-oriented analysis, data or object; 7. Design of software: 7.1 Principles of software design; 7.2 Design of software architecture; 7.3 Software Design Approaches. Design oriented on process, data or object; 8. Software implementation: 8.1 Choosing the language used; 8.2 Establish the hardware and software components to be used; 9. Software testing: 9.1 Testing strategies; 9.2 Testing the software; 10. Project Management: 10.1 Software tools used in project management. The laboratory consists of the following topics: 1. Assisted software development tools; 2. Class Diagrams. Automatic code generation; 3. UML Use Case diagrams; 4. UML status charts; 5. UML classes of classes; 6. UML activity and interaction charts; 7. Software in Data Communications; 8. Software in Data Communications; 9. Software Testing in Data Communications. 10. Project Management. Software tools.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

4TH YEAR, 2ND SEMESTER

COURSE TITLE: TELEVISION SYSTEMS
CODE: D28ELAL801
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to help students assimilate the theoretical knowledge related to remote transmission, reception and processing of images. The laboratory allows theoretical knowledge to be taught at the course and familiarization with the characteristic parameters and signals specific to the television systems.
COURSE AND LABORATORY CONTENTS: 1. Introductory notions. Transmission of image information; 2. Features of the visual analyzer. perception; 3. Colorimetry notions. Grassman's

laws. Colorimetric systems; 4. TV systems in black and white. Calculation of fmax and fc. Image signal. Extinguishing and sync signals. Complex video signal; 5. Spectrum frequency of the television signal. Spectral distribution of the AN video signal. Transmitting the TV-AN signal at a distance; 6 Colour television systems (TVC). Classification of TVC and common features of the shale. Compatible TVCs; 7. Quadrature Modulation (MAQ-PS). MAQ demodulation; 8. NTSC system. Amplitude reduction, phase rotation, colour sync signal, CVBS-NTSC signal; 9. Choosing the subcourse in the NTSC system. NTSC encoder and decoder; 10. PAL system. Coding and decoding of chrominance signals. The additive composition of the chrominance sub-carrier modulation products in the PAL receptor; 11. Coloured subwoofer synchronization and line identification signals. PAL encoder and decoder; SECAM system; 12. SECAM chrominance, synchronization and identification signals. SECAM encoder and decoder; 13. Comparison of the main TVC systems. Transcoding TVC signals. The laboratory consists of the following topics: 1. Types of TVC signal; 2. Block diagram and operation of a TV receiver; 3. Switching power supplies; 4. NEI - Indiana 200 TV Feeder; 5. Channel selector; 6. The common path; 7. Processing of colour information. Codor PAL. SECAM-PAL Transcoder; 8. The final video amplifier and the beam current limiting circuit; 9. Scanning blocks; 10. Audio-video block, teletext block; 11. control block and controls; 12. Remote control; The infrared receiver.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ADVANCED ELECTRONIC STRUCTURES – PROJECT

CODE: D28ELAL802
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The project contributes to the formation of future electronics engineers, providing them with basic knowledge and practical skills in the field of electronic circuits and systems. The project aims to develop the analysis and design capabilities of the various electronic circuits and systems used in the applied electronics.
COURSE CONTENTS: 1. Establish the block diagram according to the design specifications; 2. Hierarchical decomposition of design specifications and verification for each functional block; 3. Design of functional blocks (presentation of variants, variant selection, electronic scheme design, simulation verification); 4. System design (hardware and software); 5. Physical implementation (wiring/ layout / layers design, realization); 6. Verification.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

PACKAGE A

COURSE TITLE: MEDICAL ELECTRONICS

CODE: D28ELAL803a
ECTS CREDITS: 3
SEMESTER: II
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course introduces basic concepts of biological signals measured or provided by medical electronics, electronic components and electronic circuits for electronic equipment used in medicine. Laboratory applications have basic and advanced circuits used in medical electronics, specific electronic instruments and medical equipment.
COURSE AND LABORATORY CONTENTS: 1. Introduction: 1.1 Elements of cellular physics; 1.2 Bioelectric signals; 2. Sensors for capturing bioelectric signals; 3. Specialized electronic circuits for the processing of bioelectric signals: 3.1 Amplifiers for biological signals; 3.2 Electro-security of medical equipment; 4. Basic Equipment for Functional Exploration: 4.1 The Principles of ECG; 4.2 Generic structure of cardiographs; 4.3 Principles of EEG; 4.4 Generic structure of electroencephalographs. The principles of EMG; 4.5 Principles of ultrasound. Elementary ultrasound. Principles of tomography. The structure of the tomography; 4.6 Principles of scintigraphy. Principles of TMR exploration; 5. Electronic medical prosthetics. Hearing aids. Cardiac pacemakers. Muscle stimulators; 6. Electronic therapy equipment: 6.1 Resuscitation and Intensive Care Instrumentation; 6.2 Electronic instrumentation for physiotherapy. Instrumentation for non-invasive monitoring. The laboratory consists of the following topics:1. Study of electrosurgical rules in the field of electromedical equipment. Presentation of specific NTSM and laboratory topics; 2. Special electronic circuits for conditioning bioelectric signals; 3. Electrocardiography study; 4. Ultrasound study; 5. Study non-invasive salon monitors.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: MEDICAL ELECTRONICS – PROJECT

CODE: D28ELAL804a
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The project aims to establish knowledge of medical electronics. Students design (and optionally complete, in whole or in part) an elementary electrocardiograph for displaying the waveform from the main deviation on a memory oscilloscope or on a computer screen.
COURSE CONTENTS: 1. Harvesting of bioelectric signals with non-invasive sensors; 2. Special amplifiers and heart rate filters; 3. Conditioning of heart signals for visualization with the numerical

memory oscilloscope; 4. Analogue-numerical conversion and serial transmission of data to the PC; 5. Presentation and support of projects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: NEURAL NETWORKS

CODE: D28ELAL805a
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at improving knowledge of cognitive computation, knowledge of the artificial neuron model, artificial neural network architectures and learning rules, knowledge of the possibilities of analysis and synthesis of neural networks, possibilities of application of neural networks in various fields and of implementation and simulation of artificial neural networks. The lab is designed to provide students with practical skills in implementing and simulating artificial neural networks. Students will implement different types of neural networks to solve various problems, test and troubleshoot them.
COURSE AND LABORATORY CONTENTS: 1. Human nervous system. Cognitive computation; 2. Artificial neural networks: 2.1 Artificial neuron; 2.2 Models of Artificial Neural Networks and Learning Types of Artificial Neural Networks; 3. ADALINE perceptron; 4. feedforward neural networks: 4.1 feedforward neural networks – totally connected; 4.2 feedforward neural networks – connected locally; 5. Kohonen neural networks. Hopfield Neural Networks; 6. Boltzmann Neural Networks. Hamming Neural Networks; 7. Neural Networks with Delay. Recurring neural networks. Neuronal Networks Carpenter/ Grossberg; 8. Contextually sensitive neuronal networks. Hierarchical neural networks; 9. Applications of artificial neural networks in voice recognition and form recognition; 10. Applications of their artificial neural networks in process control; 11. Applications of artificial neural networks in electronics and telecommunication; 12. Simulation and implementation of artificial neural networks. The laboratory consists of the following topics: 1. Perceptron. ADALINE; 2. feedforward neural networks; 3. Kohonen networks; 4. Identification of systems using neural networks; 5. Recognition of forms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: TESTING SYSTEMS

CODE: D28ELAL806a
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course contributes to the formation of future electronics engineers, providing them with knowledge in the field of system testing. Basic concepts used to detect and locate defects are addressed. The laboratory has the role of fixing the theoretical knowledge and of understanding phenomena through practical applications.
COURSE AND LABORATORY CONTENTS: 1. Fault detection and localization: 1.1 Defects in dynamic systems; 1.2 Importance of fault detection and localization; 1.3 Systems with defects; 1.4 Detection and localization of faults; 2. Reliability. Particular aspects of reliability: 2.1 Axiomatic definition of probability. Definition of conditioned probability. Random variable; 2.2 Basic notions of reliability: indicators, mathematical models; 2.3 Reliability of elements; 2.4 Reliability of systems; 2.5 Parametric reliability; 2.6 Quality engineering elements; the use of ISO 9000 standards; 2.7 Reliability of series-by-pass structures; 2.8 Behaviour of damage intensity over time; 2.9. Reliability of restoration systems; 3. Analytical methods for detecting and locating defects in electronic systems: 3.1 Importance of fault detection and localization; 3.2 Linear systems for detecting and locating defects based on standard models; 3.3 Detection and localization of defects using multiple filtering method, majority vote method and sensitivity analysis; 4. Introduction to Decision Making: 4.1 Key Stages of the Decision Process; 4.2 Classification of decision-making processes; 4.3 Methods of decision making. The laboratory consists of the following topics: 1. Detection and localization of defects in dynamic systems. Methods based on the mathematical model. Generating the residual vector; 2. The analysis and synthesis of a fault-tolerant system based on majority voting; 3. Redundant fault-tolerant systems. Minimum operating structures. Minimal defect structures; 4. Reliability calculation. Estimation of good running time; 5. Analysis of direct sensitivity in relation to input sizes; 6. Direct sensitivity analysis in relation to system parameters; 7. Detection and localization of defects using inverse sensitivity analysis; 8. Tolerance to failure by dynamic reconfiguration.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: NUMERICAL CONTROL

CODE: D28ELAL807a
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing some ideas on: manual and assisted programming, assimilation of different types of assisted languages. The laboratory has the role of fixing the theoretical knowledge and creating practical skills in the operation of numerical controls.
COURSE AND LABORATORY CONTENTS: 1. Analysis: 1.1. Getting; 2. Programming in manual language; 3. Assisted programming; 4. Values to be assessed. 5. Conversational languages. The laboratory consists of the following topics: 1.

Programming in manual language; 2. Assisted programming; 3. Values to be assessed; 4. Conversational languages.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

PACKAGE B

COURSE TITLE: COMPUTER NETWORKS

CODE: D28ELAL803b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course contributes to the formation of future engineers, providing them with knowledge in the field of computer networks. Basic concepts used in network design and implementation are addressed. The lab has the role of fixing the theoretical knowledge and creating practical skills in the implementation of computer networks.
COURSE AND LABORATORY CONTENTS: 1. Computer Architecture: 1.1 Application-oriented Computers; 1.2 Classification of computers in terms of integration degree; 2. Local Computer Networks (LAN): 2.1 OSI Reference Model; 2.2 Local computer networks; 2.3 Physical pathways. Basic topologies; 3. Transmission environment in local area networks: 3.1 Coaxial cable, Twisted cable, Optical cables; 3.2 Frequency band of a local network; 3.3 Network board; 4. Interconnection of local networks: 4.1 Repeater, Bridge, Router, Gates; 5. Physical access methods: 5.1 Multiple access with carrier sensing and CSMA-CD collision detection; 5.2 Communication protocols for local ring networks; 5.3 Communication protocols for local networks with broadcast bus; 6. Ethernet network: 6.1 Elements of an Ethernet network; 6.2 MAC-Ethernet Protocol; 6.3 Ethernet frames; 6.4 Fast Ethernet network; 6.5 Designing an Ethernet network; 6.6 Solutions to increase network performance; 7. Addressing and routing algorithms on the network: 7.1. Filters and access lists; 7.2. IP Address Classes; 7.3. Routing function; 7.4. Algorithm for the shortest path; 7.5. Current network interconnection architectures; 8. Internet and Intranet networks: 8.1 Structure of the Internet network; 8.2 TCP/JP Protocol; 8.3 Namespace in the Internet; 8.4 Data transfer to the Internet (application level); 8.5 Electronic mail; 8.6. WWW Service; 8.7 Particularities of Intranet networks. The laboratory consists of the following topics: 1. Structure of a computer. Getting Hardware; 2. Representation of information; 3. ISO-OSI model and TCP/JP stack. Physical level. Structured cabling; 4. OSI Architecture; 5. Network level protocols. ARP address resolution protocol; 6. Translating addresses. Static, dynamic, default; 7. Managing the translation of network addresses; 8. Interconnection devices within the LAN; 9. Managing Novell Netware networks; 10. Network services under Linux.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

SUVJECT OF STUDY: VIRTUAL INSTRUMENTATION

CODE: D28ELAL804b
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to introduce the basic concepts of modern instrumentation, virtual instrumentation software packages, the use of digital signal processing concepts and control systems for virtual instrument design. The lab has the role of fixing theoretical knowledge and creating practical skills in application development using virtual instruments for signal analysis and synthesis, signal filtering, process control.
COURSE AND LABORATORY CONTENTS: 1. Analysis and synthesis of periodic signals in the time domain; 1.1 Symbolic calculation in MATLAB; 1.2 Fourier Synthesis of Periodic Signals; 2. Synthesis of periodic signals; 2.1 LabVIEW functions for synthesis and analysis of signals; 2.2 Synthesis of Periodic LabVIEW Signals Using the Fourier Series; 2.3 Saw tooth signal generator; 2.4 Triangular and rectangular signal generator; 2.5 Generator of multiform signals; 2.6 Generator of signals represented by analytical formulas; 2.7 Special tools for generating waveforms; 2.8 Real-time synthesis of signals; 3. Analysis of signals: 3.1 Time and frequency windows; 3.2 Frequency analysis elements. Discrete Fourier Transform. 3.3 LabVIEW applications for signal analysis; 4. Dispersion of continuous systems: 4.1 Continuous control systems; 4.2 Hybrid control systems; 4.3 Discretization of continuous signals; 4.4 Simulation of hybrid systems; 5. Digital Filters. FIR filters: 5.1 Design of FIR filters. 5.2 Implementation of FIR filters in LabVIEW and in MATLAB/ Simulink; 6. Digital filters. Impulse response filters – IIR: 6.1 Design of IIR filters; 6.2 Implementation of IIR filters in LabVIEW and in MATLAB/ Simulink. The laboratory consists of the following topics: 1. Applying the symbolic calculation to integral transforms and calculating the coefficients of some Fourier series; 2. Synthesis of periodic signals; 3. Designing and implementing virtual instruments for generating signals; 4. LabVIEW applications for signal analysis; 5. Design and implementation of FIR filters and IIR filters in LabVIEW; 6. Virtual signal generator in LabVIEW; 7. Periodic signal generator implemented with LabView and NI 6251 board.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: SIGNAL PROCESSORS IN COMMUNICATIONS

CODE: D28ELAL805b
ECTS CREDITS: 3

TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding the architecture of a signal processor, the implementation of signal processing algorithms on DSP systems, the use of computing equipment with DSP in communications.
COURSE AND LABORATORY CONTENTS: 1. Digital signal processing 1.1 Algorithms for DSP; 1.2 Calculation architectures for DSP; 1.3 Integrated circuits for DSP; 1.4. Characteristics of numerical signal processing; 2. Filtration: 2.1. RC and CR Filters; 2.2 Filter types; filter performance criteria; 2.3 Impulse Finite Filters (FIR); 2.4 Infinite Impulse Response Filters (IIR); 2.5 Realization of Digital filters; 2.6 Comparison between FIR and IIR filters; 2.7 Noise in filter design; 3. Transforming signals in the frequency domain: 3.1 Phase model; 3.2 Modelling of sinusoids; 3.3 Fourier Series, Discrete Fourier Series; 3.4 Non-periodic Fourier transforms; 3.5 Discrete and Fast Fourier Transform; 4. Coding of waveforms: 4.1 Analogic waveform coding; 4.2 Digital coding-coded pulse modulation; 4.3 Delta Modulation; 4.4 Voice Coders; 4.5 Window distribution; 4.6 Channel Voice Coders; 4.7 Predictive linear coding; 5. Design of DSP systems: 5.1 Hardware alternatives for DSP; 5.2 Fixed-floored DSP; 5.3 floating-point DSP; 5.4 Speed DSP Considerations; 5.5 Accessing memory resources; 5.6 Integration of peripheral devices. The laboratory consists of the following topics: 1. Overview OMAP 5912 Starter Kit; 2. Generation of sine wave frequencies and variable amplitude; 3. Generating music notes with signal processors; 4. Numerical filters; 5. Serial communication. 6. Ethernet communication.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: SENSORS AND INTELLIGENT PROCESS MONITORING SYSTEMS
CODE: D28ELAL806b
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at acquiring the basic knowledge of the internal structure and functioning of sensors and intelligent systems for process monitoring, as well as the presentation of several applications of these systems. The laboratory aims to present and use several intelligent sensors and systems for process monitoring, as well as practical skills to use these sensors and monitoring systems.
COURSE AND LABORATORY CONTENTS: 1. Sensors and transducers: 1.1 Classifications, internal structures, principle of operation and application of sensors and transducers; 1.2. Multisensor systems architectures; 2. Overview of process monitoring systems; 3. Specific electronic structures for process monitoring: 3.1 Central purchasing, processing and communication units; 3.2 Electronic modules for the local user interface; 3.3 Data acquisition; 3.4 Signal Conditioning Circuits; 3.5 Field communication; 4. Application software for intelligent process monitoring systems: 4.1 Requirements for processing the acquired signals; 4.2 Specific processing methods; 4.3 Software tools and development media for monitoring applications; 5. Applications of intelligent process monitoring systems: 5.1 System for the monitoring and recording of the transients in electro-energy; 5.2 System for monitoring and recording of stationary and transient modes of a static excitation energy group. The laboratory consists of the following topics: 1. Signal Conditioning Block with RMS-DC Integrated Converter; 2. System for temperature monitoring in an enclosure using an intelligent temperature sensor; 3. Study of an intelligent system for monitoring and recording the stationary and transient modes of a static excitation energy group; 4. Study of an intelligent system for monitoring and recording the stationary and transient regimes of a static excitation energy group: configuration, experimental determinations, interpretation of the results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: SENSORS AND INTELLIGENT PROCESS MONITORING SYSTEMS – PROJECT
CODE: D28ELAL807b
ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The aim of the project is to acquire basic knowledge on the construction, operation and performance of sensors, electronic signal conditioning blocks and related measurement systems, as well as the skills of designing and using such sensor-based electronic systems.
COURSE CONTENTS: 1. The structure of measurement of analogue signals from several sensors: design, operation and testing; 2. Signal Conditioning Block with Integrated Thermal Resistance Adapter: Design, Operation and Testing; 3. Signal Conditioning Block with RMS-DC Integrated Converter: Design, Operation and Testing; 4. Intelligent measuring system with rotational incremental numerical transducer: design, operation and testing; 5. Intelligent force measuring system using strain gauges: design, operation and testing; 6. Intelligent proximity sensor and I-7000 modules: design, operation and testing; 7. Evaluation of the individual project, with a theme similar to those presented.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

FIELD: MECHATRONICS AND ROBOTICS
PROGRAMME TITLE: MECHATRONICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Through the knowledge provided in the course, through the given examples and the applications made during the seminar, the course aims at acquiring the differential and integral calculus skills, the application of the differential calculus methods to solving some problems resulting from the modelling of some engineering phenomena; as well as acquiring the skills for the application of integral computations in mechanics.
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing the basic notions of linear algebra, analytical and differential geometry: vector spaces, linear applications, square shapes, Euclidean spaces, symmetrical operators, free vectors, the straight line and the plane, conical and quadric shapes, curves in the plane and the space, surfaces. The seminar has the role of consolidating the theoretical knowledge and creating computational skills through practical applications, exercises and problems.
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION:
ASSESSMENT METHOD(S):

COURSE TITLE: PHYSICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future engineers by providing them with knowledge in the fundamental physical field by creating computational skills in the case of concrete problems in which fundamental and practical physics knowledge is needed.

COURSE TITLE: THE CHEMISTRY OF MATERIALS
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their knowledge in the field of materials chemistry. The subject of study approaches basic concepts used in the chemical analysis of various materials and substances.

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course contributes to the formation of future control engineers and specialists in applied informatics, by empowering them with knowledge in the general domain of computer programming. It tackles basic concepts used in the design and implementation of applications and software systems using C programming language.

COURSE TITLE: DOCUMENT PROCESSING
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their basic and advanced knowledge regarding document processing.

COURSE TITLE: ENGLISH 1
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION 1
ECTS CREDITS: 3
TYPE OF COURSE: complementary
SEMINAR OBJECTIVES: Developing practical notions of physical education and sports in 1st year students.

COURSE TITLE: COMPUTER-AIDED DESIGN
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Creating and developing the ability to use the AutoCAD software package as a graphical tool for future automotive engineers in various fields: mechanical engineering, electrical engineering, electronics, construction, architecture, industrial design, publishing, medicine, cartography, etc.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL CALCULATION AND MATHEMATICAL STATISTICS

ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Through the knowledge provided in the course, through the given examples and the applications made within the course/ laboratory, the course aims at forming the following professional skills: mastering basic techniques in Numerical Analysis regarding: linear and nonlinear algebra, function approximation, differential and integral calculus, the numerical solving of differential equations and partial derivatives, as well as mathematical statistics; programming simple algorithms and using routines available in a programming environment for algorithms with high complexity; mathematical data processing, the analysis and interpretation of phenomena and processes; the development and analysis of some algorithms for solving engineering problems; designing mathematical models for describing phenomena; recognizing the main classes/ types of numerical analysis problems and selecting the appropriate methods and techniques for solving them; making projects for the mathematical modelling of a concrete problem; programming numerical methods in C++.

COURSE TITLE: SPECIAL MATHEMATICS

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course presents a few math chapters in terms of their use as engineers' investigation tools and a language that is specific to specialized disciplines. Students must possess mathematical knowledge acquired in high-school and specialty knowledge acquired in the following subjects: Mathematical Analysis, Linear Algebra and Analytical and Differential Geometry. The teaching of the course employs the explanatory and interactive methods on the board. A course book in electronic format is provided, and also access to updated documentation. The teaching process has the following structure: 70% theoretical presentation, based on the course book and 30% interactive activity with the students. It is one of the fundamental subjects of study in the undergraduate education plan. The course aims at introducing a minimal package of basic notions from: Complex Analysis, Ordinary and Partial Differential Equations, Fourier Series, Discrete Laplace and Laplace Transforms, Fourier Transform, Vector Fields. The course is limited to a clear definition of concepts, the presentation of fundamental results, applicability domains, solving algorithms, connections with other domains. The seminar follows the course topics and consists of interactive discussions with students, presenting problems and the connection with real, concrete problems. It has the role of presenting examples of application of the theoretical results and the use of solving algorithms through exercises and problems.

COURSE TITLE: THE BASICS OF ELECTRICAL ENGINEERING

ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Students should acquire the knowledge and skills required to gain professional skills for understanding and managing electromagnetic phenomena with applications in mechatronics and robotics and related fields. The subject of study refers to: fundamental notions of static, stationary and quasi-static electromagnetic field theory; fundamental notions of electric circuit theory in all functional regimes specific to engineering applications. Laboratory work develops practical skills through experimental works that allow qualitative interpretations and quantitative assessments of the studied phenomena, with reference to the stationary, sinusoidal and transient modes of linear and non-linear circuits with concentrated parameters.

COURSE TITLE: DRIVE SYSTEMS

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S):

COURSE TITLE: MECHANICS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): acquiring the theories and methods pertaining to mechanical engineering in view of utilising them in professional communication in systems engineering.

COURSE TITLE: ENGLISH 2

ECTS CREDITS: 2
TYPE OF COURSE: complementary
SEMINAR OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION 2

ECTS CREDITS: 3
TYPE OF COURSE: complementary
SEMINAR OBJECTIVE(S): Developing practical notions of physical education and sports in 1st year students.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ELECTRONIC CIRCUITS
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers by empowering them with basic notions and practical skills in the domain of analogical electronic circuits.

COURSE TITLE: THE ANALYSIS AND SYNTHESIS OF NUMERICAL DEVICES
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future mechatronics engineers, specialists in the management of mechatronic and applied computer systems, providing them with knowledge in the field of programmable logic controllers, microcontrollers, data transmission and computer architecture. Basic concepts used in the design and testing of sequential logic circuits are addressed. The course aims at introducing the basic concepts of: numerical systems; switching algebra; MSI and LSI integrated circuits; bi-stable trigger circuit, counts and registers; the analysis and synthesis of synchronous and asynchronous sequential circuits. The laboratory has the role of acquiring the theoretical knowledge by students, as well as their practical training in the use and design of combinational and sequential logic schemes.

COURSE TITLE: SYSTEMS THEORY
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): 1) General Objective: The course aims at introducing basic system concepts (input/ output theory and state-based theory) and their description through specific characteristics. The course creates the necessary openness for the dynamic approach but also the ability to use working tools of automation and mechatronics, being also a first step towards an interdisciplinary approach to engineering problems. 2) Specific objectives: An introduction to signals and systems, analogue signals and systems, discrete signals and systems; input/ output and structural properties; performances and their expression based on system data; intrinsic performance and external signal behaviour. The tutorial classes have the role of consolidating the theoretical knowledge and allowing the understanding of the approaches through practical applications allowing the perception of the actual results. The seminar realizes acquisition of knowledge through exercises, knowledge that will serve to achieve competences.

COURSE TITLE: DATABASES
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Through this course, students assimilate concepts of system modelling through databases and the use of database management systems (DBMSs) for their management. SGBD Oracle is studied and SQL language is used to create, programme, and query databases.

COURSE TITLE: DATABASES – PROJECT
ECTS CREDITS: 1
TYPE OF COURSE: domain
PROJECT OBJECTIVES: The project has the role of training students in order to enable them to design a functional relational database based on a given set of scenarios (set of specifications). The following are presented: the analysis of required specifications, design methods, the normalization and de-normalization of the database, notions of administration and testing.

COURSE TITLE: OBJECT ORIENTED PROGRAMMING
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future engineers in the mechatronics and robotics field, specialists in the development of robots and robotic systems, providing them with knowledge and skills related to languages, environments and programming technologies, programming engineering and specific tools (algorithms, schemes, models, etc.).

COURSE TITLE: MARKETING
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding the marketing process so that, following the training activities, the students acquire useful knowledge about the evolution of markets, product policies, promotional activities, pricing and the distribution of products (with an emphasis on IT). The seminar has the role of developing on the theories from the course through analyses and discussions of representative case studies.

COURSE TITLE: ENGLISH3
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the

skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION III

ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): the course aims at developing the ability to perform physical exercises correctly and at perfecting teamwork skills.

COURSE TITLE: PHYSICAL EDUCATION 3

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving team work skills in games.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: DIGITAL ELECTRONICS

ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process control and applied informatics by facilitating the acquisition of knowledge in digital electronics. The course tackles basic concepts used in the design and accomplishment of digital systems by means of digital/numerical integrated circuits.

COURSE TITLE: PROGRAMMING IN JAVA

ECTS CREDITS: 3
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of the Java programming language. The tutorial classes are designed to enable students to develop low/ medium complexity applications with programming techniques and graphics/ graphical interfaces.

COURSE TITLE: THE BASICS OF MECHATRONIC SYSTEMS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This subject of study contributes to the formation of future engineers in the field of *Mechatronics and Robotics*, providing them with fundamental knowledge in the field of mechatronic systems. Basic concepts related to the components of a mechatronic system, fluid and electrical actuation systems, sensory systems and functional representation techniques are addressed. The course contributes to the formation of students, providing them with knowledge in the field of construction, functional analysis and the exploitation of mechatronic systems. The laboratory activity aims to create practical skills in this field through exercises performed with the teaching equipment existing in the profile laboratory.

COURSE TITLE: THE BASICS OF ROBOTICS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This subject of study contributes to the training of future engineers in the field of *Mechatronics and Robotics*, providing them with the fundamental knowledge in the field of robotics. Basic concepts related to the components of a robot system, geometric, cinematic and dynamic models, sensory systems, actuation systems and the control of a robot on the trajectory are addressed. The course contributes to the formation of students, providing them with knowledge in the field of construction, the functional analysis and exploitation of robotic systems. The laboratory activity aims to create practical skills in this field, through exercises performed with the existing teaching platforms in the laboratory.

COURSE TITLE: COMPUTER ARCHITECTURE

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future graduate engineers of the Robotics programme, a component part of the Mechatronics and Robotics field, an integrated engineering branch, providing them with knowledge in the field of computer engineering and information technology. It introduces basic concepts for understanding how a computer works as a system, beyond operating programs and using peripherals. It is intended to present the coding and manipulation modes of data and programs in a computing system.

COURSE TITLE: COGNITIVE PSYCHOLOGY

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The study of cognitive psychology connects students to the most influential paradigm of contemporary psychology with applications from neuropsychology to artificial intelligence. The course provides students with knowledge about cognitive psychology understood as a detailed study of the human cognitive system and its subsystems, its own language and specific methodology, and the cognitive approach of personality in correlation with the psycho-social environment. The latter refers to a broader way of rethinking new concepts and re-integrating some psychological theories already known to students.

COURSE TITLE: ENGLISH 4

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of the curriculum for the specializations

mentioned. It aims to improve language skills by improving the communication flow by practicing all the components involved in using modern language as a communication tool.

COURSE TITLE: PRACTICAL TRAINING
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of software application development. Basic concepts used in designing and implementing computer programs are addressed.

COURSE TITLE: VISUAL PROGRAMMING MEDIA
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: PROGRAMMING IN ASSEMBLY LANGUAGES
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: PHYSICAL EDUCATION 4
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving team work skills in games.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: DRIVE MECHANISMS AND MICROSYSTEMS
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The aim of this course is to develop an application oriented on an overview of intelligent structures and materials. Intelligence describes its own adaptability, its own understanding, the memory and multi-functionality of materials or structures. These features provide many possible applications for these material structures in the industrial environment, civilian infrastructure systems and bio-mechanisms. The tutorial classes have the role of consolidating the theoretical knowledge, explaining and interpreting the basic principles regarding the optimal choice of subsystems and mechatronic components.

COURSE TITLE: AUTOMATA AND MICROPROGRAMMING
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course contributes to the formation of future robotics engineers, specialists in the control of robotic systems, providing them with knowledge in the field of automata theory and microprogramming. Basic concepts used in automata theory, designing micro-programmed systems and automated systems are addressed. Methods of analysis and synthesis of automated systems and industrial control systems will be explored. The laboratories have the role of consolidating the theoretical knowledge and of understanding phenomena through practical applications.

COURSE TITLE: AUTOMATA AND MICROPROGRAMMING – PROJECT
ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project aims at consolidating the theoretical knowledge from the Automata and Microprogramming course and at understanding the phenomena through practical applications. Practical concepts used in the design and implementation of robotic systems/ processes control systems are addressed. Methods of analysis and synthesis of programmable control systems will be further developed.

COURSE TITLE: SMART MATERIALS AND STRUCTURES
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing concepts of intelligent materials and structures, in conjunction with their applicability in engineering, art and medicine. The approach to the theoretical foundation is doubled by case studies for the most important applications of intelligent fluids and shape memory materials. The lab is designed to enable students to experiment directly with the potential of intelligent materials and structures, thereby stimulating their creativity and teamwork.

COURSE TITLE: ROBOT CONTROL SYSTEMS
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This subject of study contributes to the training of future engineers in the field of *Mechatronics and Robotics*, providing them with knowledge in the field of robotics management systems. Basic concepts used in the design and operation of robotic driving systems are addressed and several case studies are developed. The course contributes to the formation of students, providing them with knowledge in the field of design, construction, functional analysis and exploitation of management systems in robotics. The laboratory activity aims to create practical skills in this field through exercises performed with the help of the

didactic platforms and the existing equipment in the laboratory.

COURSE TITLE: MEASUREMENTS AND TRANSDUCERS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with basic knowledge and practical skills in the field of measurement systems and instrumentation.

COURSE TITLE: MICROCONTROLLERS AND MICROPROCESSORS

ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the analysis, design and use of microprocessor systems. It is aimed at developing practical competences and skills in the use, design and programming of microprocessor-based or microcontroller systems. Memory interfaces, I/O devices, and interrupt handling are highlighted.

COURSE TITLE: MICROCONTROLLERS AND MICROPROCESSORS – PROJECT

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: FLUID MECHANICS

ECTS CREDITS: 5
TYPE OF SUBJECT: domain
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in mechatronics, providing them with knowledge in the field of robot control. Basic knowledge of hydraulic and pneumatic equipment, as well as fluid conduction techniques, are presented. The tutorial classes are designed to analyse and simulate the systems presented in the course.

COURSE TITLE: MECHATRONICS

ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the design and control of mechatronic systems; introducing some notions regarding the structure of mechatronic systems, the integration of the mechanical system with the sensorial system, the actuation and control system; control systems for mechatronic systems. The laboratories are designed to provide students with practical skills in the design, use and control of mechatronic systems in manufacturing processes. Students will control different types of mechatronic systems in order to use these in processes, they will test and debug control programs.

COURSE TITLE: MECHATRONICS – PROJECT

ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This project aims at using basic concepts regarding the design and control of mechatronic systems. The project aims at using some notions regarding the structure of mechatronic systems; integrating the mechanical system with the sensory, actuation and control system; control systems for mechatronic systems. The project aims to provide students with practical skills in the design, use and control of mechatronic systems in manufacturing processes.

3RD YEAR, 2ND SEMESTER

COURSE TITLE: APPLICATIONS OF ROBOTIC SYSTEMS

ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at students' assimilating the knowledge about the problems of different industrial and non-industrial applications using robots in the automated processes, focusing on the analysis of physical structures and the architectures of installations, the modelling of the systems used and the implemented algorithms control systems.

COURSE TITLE: APPLICATIONS OF ROBOTIC SYSTEMS –PROJECT

ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The project has the role of training students in order to enable them to design an automated and robotic industrial application of medium complexity.

COURSE TITLE: REGULATION ENGINEERING

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: DATA TRANSMISSIONS

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the formation of future specialists in mechatronic systems, providing them with knowledge in the field of information transmission theory. Basic concepts used in the design and implementation of data transmission systems are addressed.

COURSE TITLE: INDUSTRIAL SOFTWARE

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge in the field of industrial software. Basic concepts used in the design and implementation of data acquisition and control programs in industrial applications are addressed.

COURSE TITLE: PROJECT MANAGEMENT

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, assuring them knowledge of Project Management activities. Basic concepts used in project design and implementation are addressed.

COURSE TITLE: PRACTICAL TRAINING

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future robotics engineers, process control and applied IT specialists, providing them with knowledge in the design and implementation of control systems. Basic concepts used in the design, implementation and operation of control systems are addressed.

COURSE TITLE: ELECTRONIC COMMERCE

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: THE DEVELOPMENT OF NETWORK DISTRIBUTED APPLICATIONS

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: ENTREPRENEURSHIP

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

4TH YEAR, 1ST SEMESTER

COURSE TITLE: COMPUTER AIDED DESIGN

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the formation of future graduates of the Robotics programme, a component part of the Mechatronics and Robotics field, an integrating engineering branch, providing them with knowledge in the field of computer aided design for parameterized robotic applications. The course aims at introducing basic concepts and skills related to the use of computer aided design environments, focusing on programming in specialized languages (using AutoCAD and AutoLISP as exemplary products) for practical robotic applications.

COURSE TITLE: PROGRAMMABLE LOGIC CONTROLLERS

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the programming of programmable logic controllers and control of processes/ mechatronic systems with programmable logic controllers. It contributes to the formation of future mechatronics engineers, specialists in the control of mechatronic systems, providing them with knowledge in the field of processes control using programmable logic controllers. Practical concepts used in the design and implementation of mechatronic systems/ processes control systems with programmable logic controllers, knowledge of systems control methods and algorithms using programmable logic controllers, network communication, the design, implementation and testing of processes control applications with programmable logic controllers. The laboratories have the role of consolidating the theoretical knowledge and of enabling the understanding of processes control methods with programmable logic controllers through practical applications.

COURSE TITLE: PROGRAMMABLE LOGIC CONTROLLERS – PROJECT

ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project has the role of consolidating the theoretical knowledge from the programmable logic controllers course and of understanding the phenomena through practical applications. Practical concepts used in the design and implementation of mechatronic systems/ processes control systems with programmable logic controllers, knowledge of systems control methods and algorithms using programmable logic controllers, ways of interfacing programmable logic controllers, network communication, the design, implementation and testing of process control applications with programmable logic controllers.

COURSE TITLE: THE DYNAMICS OF MECHATRONIC SYSTEMS

ECTS CREDITS: 4
TYPE OF COURSE: domain

COURSE OBJECTIVE(S): The course aims at the students' acquiring of the theoretical knowledge and the skills and competences to create kinematic and dynamic models for mechatronic systems by various methods: Denawit-Hartemberg, Lagrange, Newton-Euler, D'Alembert, Kane, etc.

COURSE TITLE: ARTIFICIAL INTELLIGENCE

ECTS CREDITS: 4

TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): It contributes to the formation of future graduates of the Robotics program, a component part of the Mechatronics and Robotics field, an integrating engineering branch, providing them with knowledge in the field of artificial intelligence. The course aims at introducing basic concepts in the field of artificial intelligence, knowledge representation and their use. The students' training is supported in the field of the programming languages with the widest use in Artificial Intelligence (PROLOG).

COURSE TITLE: FLEXIBLE MANUFACTURING SYSTEMS

ECTS CREDITS: 5

TYPE OF COURSE: complementary

COURSE OBJECTIVE(S): This subject of study contributes to the formation of future engineers in the field of "Mechatronics and Robotics", providing them with knowledge in the field of modern manufacturing systems and associated computer technologies. Basic concepts used in the design and implementation of robotic flexible manufacturing systems are addressed. The course contributes to the formation of students, providing them with knowledge in the field of the design, construction, functional analysis and exploitation of flexible manufacturing systems. The laboratory activity aims at creating practical skills in this field through case studies and analyses as well as exercises performed with the help of existing teaching facilities in the laboratory.

COURSE TITLE: COMPUTER NETWORKS

CODE:

ECTS CREDITS:

TYPE OF COURSE:

COURSE OBJECTIVE(S):

COURSE TITLE: DISTRIBUTED DRIVING SYSTEMS

CODE:

ECTS CREDITS:

TYPE OF COURSE:

COURSE OBJECTIVE(S):

COURSE TITLE: VIRTUAL MANUFACTURING

ECTS CREDITS: 3

TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): The course aims at introducing basic theoretical concepts of virtual processes and products using the computer. It contributes to the formation of future specialists in the modelling, simulation and management of processes, providing them with knowledge in the field of virtual reality and manufacturing. Basic concepts used in the design and implementation of virtual systems are addressed. The objectives of this subject of study converge towards the use of virtual reality in three directions: virtual production, virtual robotics and collaborative engineering. Laboratories have the role to create practical skills for programming virtual scenes and interacting with the virtual environment.

COURSE TITLE: PURCHASING SYSTEMS AND INTERFACES

CODE:

ECTS CREDITS:

TYPE OF COURSE:

COURSE OBJECTIVE(S):

4TH YEAR, 2ND SEMESTER

COURSE TITLE: MOBILE ROBOTS AND MICROROBOTS

ECTS CREDITS: 4

TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): This subject of study contributes to the formation of future engineers in the field of *Mechatronics and Robotics*, providing them with knowledge in the field of mobile robotic systems in their operating space and micro-robots. Basic concepts used in the construction, design and range of common applications of these unconventional robotic systems are addressed. The course contributes to the formation of students, providing them with knowledge in the field of the design, construction, functional analysis and exploitation of mobile robotic systems and micro-robots. The laboratory activity aims at creating practical skills in this field through case studies and analyses, as well as exercises with the help of existing teaching equipment in the laboratory.

COURSE TITLE: THE TESTING AND RELIABILITY OF MECHATRONIC SYSTEMS

ECTS CREDITS: 3

TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): It contributes to the formation of future engineers, specialists in the design and management of mechatronic systems. Basic concepts used in the theory of industrial systems reliability theory are addressed, with diagnosis and decision making techniques applied to mechatronic systems in order to ensure operational safety.

COURSE TITLE: THE WRITING OF THE GRADUATION PAPER

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: PROGRAMMING LANGUAGES FOR ROBOTS

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts for the programming languages of robots. The tutorial classes are designed to enable students to develop applications based on microcontrollers and interfacing them with robot systems.

COURSE TITLE: ARTIFICIAL NEURAL NETWORKS

ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The main objectives of this course is to provide the students with the basic understanding of artificial neural networks, applications to robotics, pattern recognition etc., for programming the related algorithms and designing the required and related systems.

COURSE TITLE: DIPLOMA EXAM

CODE:
ECTS CREDITS: 10
TYPE OF COURSE: domain
COURSE OBJECTIVE(S):
ASSESSMENT METHOD(S): Exam

FIELD: MECHATRONICS AND ROBOTICS
PROGRAMME TITLE: ROBOTICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Through the knowledge provided in the course, through the given examples and the applications made during the seminar, the course aims at acquiring the differential and integral calculus skills, the application of the differential calculus methods to solving some problems resulting from the modelling of some engineering phenomena; as well as acquiring the skills for the application of integral computations in mechanics.

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at introducing the basic notions of linear algebra, analytical and differential geometry: vector spaces, linear applications, square shapes, Euclidean spaces, symmetrical operators, free vectors, the straight line and the plane, conical and quadric shapes, curves in the plane and the space, surfaces. The seminar has the role of consolidating the theoretical knowledge and creating computational skills through practical applications, exercises and problems.

COURSE TITLE: PHYSICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future engineers by providing them with knowledge in the fundamental physical field by creating computational skills in the case of concrete problems in which fundamental and practical physics knowledge is needed.

COURSE TITLE: THE CHEMISTRY OF MATERIALS
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their knowledge in the field of materials chemistry. The subject of study approaches basic concepts used in the chemical analysis of various materials and substances.

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course contributes to the formation of future control engineers and specialists in applied informatics, by empowering them with knowledge in the general domain of computer programming. It tackles basic concepts used in the design and implementation of applications and software systems using C programming language.

COURSE TITLE: DOCUMENT PROCESSING
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers, specialists in process control and applied informatics, by facilitating their basic and advanced knowledge regarding document processing.

COURSE TITLE: ENGLISH 1
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION 1
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: complementary
SEMINAR OBJECTIVES: Developing practical notions of physical education and sports in 1st year students.

COURSE TITLE: COMPUTER-AIDED DESIGN
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Creating and developing the ability to use the AutoCAD software package as a graphical tool for future automotive engineers in various fields: mechanical engineering, electrical engineering, electronics, construction, architecture, industrial design, publishing, medicine, cartography, etc.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL CALCULATION AND MATHEMATICAL STATISTICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Through the knowledge provided in the course, through the given examples and the applications made within the course/ laboratory, the course aims at forming the following professional skills: mastering basic techniques in Numerical Analysis regarding: linear and nonlinear algebra, function approximation, differential and integral calculus, the numerical solving of differential equations and partial derivatives, as well as mathematical statistics; programming simple algorithms and using routines available in a programming environment for algorithms with high complexity; mathematical data processing, the analysis and interpretation of phenomena and processes; the development and analysis of some algorithms for solving engineering problems; designing mathematical models for describing phenomena; recognizing the main classes/ types of numerical analysis problems and selecting the appropriate methods and techniques for solving them; making projects for the mathematical modelling of a concrete problem; programming numerical methods in C++.

COURSE TITLE: SPECIAL MATHEMATICS

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course presents a few math chapters in terms of their use as engineers' investigation tools and a language that is specific to specialized disciplines. Students must possess mathematical knowledge acquired in high-school and specialty knowledge acquired in the following subjects: Mathematical Analysis, Linear Algebra and Analytical and Differential Geometry. The teaching of the course employs the explanatory and interactive methods on the board. A course book in electronic format is provided, and also access to updated documentation. The teaching process has the following structure: 70% theoretical presentation, based on the course book and 30% interactive activity with the students. It is one of the fundamental subjects of study in the undergraduate education plan. The course aims at introducing a minimal package of basic notions from: Complex Analysis, Ordinary and Partial Differential Equations, Fourier Series, Discrete Laplace and Laplace Transforms, Fourier Transform, Vector Fields. The course is limited to a clear definition of concepts, the presentation of fundamental results, applicability domains, solving algorithms, connections with other domains. The seminar follows the course topics and consists of interactive discussions with students, presenting problems and the connection with real, concrete problems. It has the role of presenting examples of application of the theoretical results and the use of solving algorithms through exercises and problems.

COURSE TITLE: THE BASICS OF ELECTRICAL ENGINEERING

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Students should acquire the knowledge and skills required to gain professional skills for understanding and managing electromagnetic phenomena with applications in mechatronics and robotics and related fields. The subject of study refers to: fundamental notions of static, stationary and quasi-static electromagnetic field theory; fundamental notions of electric circuit theory in all functional regimes specific to engineering applications. Laboratory work develops practical skills through experimental works that allow qualitative interpretations and quantitative assessments of the studied phenomena, with reference to the stationary, sinusoidal and transient modes of linear and non-linear circuits with concentrated parameters.

COURSE TITLE: DRIVE SYSTEMS

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S):

COURSE TITLE: MECHANICS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): acquiring the theories and methods pertaining to mechanical engineering in view of utilising them in professional communication in systems engineering.

COURSE TITLE: ENGLISH 2

ECTS CREDITS: 2
TYPE OF COURSE: complementary
SEMINAR OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION 2

ECTS CREDITS: 3
TYPE OF COURSE: complementary

SEMINAR OBJECTIVE(S): Developing practical notions of physical education and sports in 1st year students.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ELECTRONIC CIRCUITS

ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers by empowering them with basic notions and practical skills in the domain of analogical electronic circuits.

COURSE TITLE: THE ANALYSIS AND SYNTHESIS OF NUMERICAL DEVICES

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future mechatronics engineers, specialists in the management of mechatronic and applied computer systems, providing them with knowledge in the field of programmable logic controllers, microcontrollers, data transmission and computer architecture. Basic concepts used in the design and testing of sequential logic circuits are addressed. The course aims at introducing the basic concepts of: numerical systems; switching algebra; MSI and LSI integrated circuits; bi-stable trigger circuit, counts and registers; the analysis and synthesis of synchronous and asynchronous sequential circuits. The laboratory has the role of acquiring the theoretical knowledge by students, as well as their practical training in the use and design of combinational and sequential logic schemes.

COURSE TITLE: DATABASES

ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Through this course, students assimilate concepts of system modelling through databases and the use of database management systems (DBMSs) for their management. SGBD Oracle is studied and SQL language is used to create, programme, and query databases.

COURSE TITLE: DATABASES – PROJECT

ECTS CREDITS: 1
TYPE OF COURSE: domain
PROJECT OBJECTIVES: The project has the role of training students in order to enable them to design a functional relational database based on a given set of scenarios (set of specifications). The following are presented: the analysis of required specifications, design methods, the normalization and de-normalization of the database, notions of administration and testing.

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): It contributes to the formation of future engineers in the mechatronics and robotics field, specialists in the development of robots and robotic systems, providing them with knowledge and skills related to languages, environments and programming technologies, programming engineering and specific tools (algorithms, schemes, models, etc.).

COURSE TITLE: MARKETING

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at introducing the basic notions regarding the marketing process so that, following the training activities, the students acquire useful knowledge about the evolution of markets, product policies, promotional activities, pricing and the distribution of products (with an emphasis on IT). The seminar has the role of developing on the theories from the course through analyses and discussions of representative case studies.

COURSE TITLE: ENGLISH3

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of study in the academic curriculum for the afore-mentioned specialisations. It aims at improving language competence by improving the communicational exchange, by developing all the skills involved in using the modern language as a communication device.

COURSE TITLE: PHYSICAL EDUCATION III

ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): the course aims at developing the ability to perform physical exercises correctly and at perfecting teamwork skills.

COURSE TITLE: PHYSICAL EDUCATION 3

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving team work skills in games.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SYSTEMS THEORY

ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): 1) General Objective: The course aims at introducing basic system concepts

(input/ output theory and state-based theory) and their description through specific characteristics. The course creates the necessary openness for the dynamic approach but also the ability to use working tools of automation and mechatronics, being also a first step towards an interdisciplinary approach to engineering problems. 2) Specific objectives: An introduction to signals and systems, analogue signals and systems, discrete signals and systems; input/ output and structural properties; performances and their expression based on system data; intrinsic performance and external signal behaviour. The tutorial classes have the role of consolidating the theoretical knowledge and allowing the understanding of the approaches through practical applications allowing the perception of the actual results. The seminar realizes acquisition of knowledge through exercises, knowledge that will serve to achieve competences.

COURSE TITLE: DIGITAL ELECTRONICS

ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future control engineers and specialists in process control and applied informatics by facilitating the acquisition of knowledge in digital electronics. The course tackles basic concepts used in the design and accomplishment of digital systems by means of digital/numerical integrated circuits.

COURSE TITLE: PROGRAMMING IN JAVA

ECTS CREDITS: 3
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts of the Java programming language. The tutorial classes are designed to enable students to develop low/ medium complexity applications with programming techniques and graphics/ graphical interfaces.

COURSE TITLE: THE BASICS OF MECHATRONIC SYSTEMS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This subject of study contributes to the formation of future engineers in the field of *Mechatronics and Robotics*, providing them with fundamental knowledge in the field of mechatronic systems. Basic concepts related to the components of a mechatronic system, fluid and electrical actuation systems, sensory systems and functional representation techniques are addressed. The course contributes to the formation of students, providing them with knowledge in the field of construction, functional analysis and the exploitation of mechatronic systems. The laboratory activity aims to create practical skills in this field through exercises performed with the teaching equipment existing in the profile laboratory.

COURSE TITLE: THE BASICS OF ROBOTICS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This subject of study contributes to the training of future engineers in the field of *Mechatronics and Robotics*, providing them with the fundamental knowledge in the field of robotics. Basic concepts related to the components of a robot system, geometric, cinematic and dynamic models, sensory systems, actuation systems and the control of a robot on the trajectory are addressed. The course contributes to the formation of students, providing them with knowledge in the field of construction, the functional analysis and exploitation of robotic systems. The laboratory activity aims to create practical skills in this field, through exercises performed with the existing teaching platforms in the laboratory.

COURSE TITLE: COMPUTER ARCHITECTURE

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future graduate engineers of the Robotics programme, a component part of the Mechatronics and Robotics field, an integrated engineering branch, providing them with knowledge in the field of computer engineering and information technology. It introduces basic concepts for understanding how a computer works as a system, beyond operating programs and using peripherals. It is intended to present the coding and manipulation modes of data and programs in a computing system.

COURSE TITLE: COGNITIVE PSYCHOLOGY

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The study of cognitive psychology connects students to the most influential paradigm of contemporary psychology with applications from neuropsychology to artificial intelligence. The course provides students with knowledge about cognitive psychology understood as a detailed study of the human cognitive system and its subsystems, its own language and specific methodology, and the cognitive approach of personality in correlation with the psycho-social environment. The latter refers to a broader way of rethinking new concepts and re-integrating some psychological theories already known to students.

COURSE TITLE: ENGLISH 4

ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): It is one of the mandatory subjects of the curriculum for the specializations mentioned. It aims to improve language skills by

improving the communication flow by practicing all the components involved in using modern language as a communication tool.

COURSE TITLE: PRACTICAL TRAINING
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of software application development. Basic concepts used in designing and implementing computer programs are addressed.

COURSE TITLE: VISUAL PROGRAMMING MEDIA
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: PROGRAMMING IN ASSEMBLY LANGUAGES
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: PHYSICAL EDUCATION 4
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course aims at the correct execution of physical education exercises, improving team work skills in games.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: DRIVE MECHANISMS AND MICROSYSTEMS
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The aim of this course is to develop an application oriented on an overview of intelligent structures and materials. Intelligence describes its own adaptability, its own understanding, the memory and multi-functionality of materials or structures. These features provide many possible applications for these material structures in the industrial environment, civilian infrastructure systems and bio-mechanisms. The tutorial classes have the role of consolidating the theoretical knowledge, explaining and interpreting the basic principles regarding the optimal choice of subsystems and mechatronic components.

COURSE TITLE: AUTOMATA AND MICROPROGRAMMING
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course contributes to the formation of future robotics engineers, specialists in the control of robotic systems, providing them with knowledge in the field of automata theory and microprogramming. Basic concepts used in automata theory, designing micro-programmed systems and automated systems are addressed. Methods of analysis and synthesis of automated systems and industrial control systems will be explored. The laboratories have the role of consolidating the theoretical knowledge and of understanding phenomena through practical applications.

COURSE TITLE: AUTOMATA AND MICROPROGRAMMING – PROJECT
ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project aims at consolidating the theoretical knowledge from the Automata and Microprogramming course and at understanding the phenomena through practical applications. Practical concepts used in the design and implementation of robotic systems/ processes control systems are addressed. Methods of analysis and synthesis of programmable control systems will be further developed.

COURSE TITLE: SMART MATERIALS AND STRUCTURES
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing concepts of intelligent materials and structures, in conjunction with their applicability in engineering, art and medicine. The approach to the theoretical foundation is doubled by case studies for the most important applications of intelligent fluids and shape memory materials. The lab is designed to enable students to experiment directly with the potential of intelligent materials and structures, thereby stimulating their creativity and teamwork.

COURSE TITLE: ROBOT CONTROL SYSTEMS
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This subject of study contributes to the training of future engineers in the field of *Mechatronics and Robotics*, providing them with knowledge in the field of robotics management systems. Basic concepts used in the design and operation of robotic driving systems are addressed and several case studies are developed. The course contributes to the formation of students, providing them with knowledge in the field of design, construction, functional analysis and exploitation of management systems in robotics. The laboratory activity aims to create practical skills in this field through exercises performed with the help of the

didactic platforms and the existing equipment in the laboratory.

COURSE TITLE: SENSORS AND SENSORY SYSTEMS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S) It contributes to the training of future control engineers, process control and applied IT specialists, providing them with basic knowledge and practical skills in the field of measurement systems and instrumentation.

COURSE TITLE: MICROCONTROLLERS AND MICROPROCESSORS

ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the analysis, design and use of microprocessor systems. It is aimed at developing practical competences and skills in the use, design and programming of microprocessor-based or microcontroller systems. Memory interfaces, I/O devices, and interrupt handling are highlighted.

COURSE TITLE: MICROCONTROLLERS AND MICROPROCESSORS – PROJECT

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: FLUID SYSTEMS IN ROBOTICS

ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in mechatronics, providing them with knowledge in the field of robot control. Basic knowledge of hydraulic and pneumatic equipment, as well as fluid conduction techniques, are presented. The tutorial classes are designed to analyse and simulate the systems presented in the course.

COURSE TITLE: ROBOTICS

ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts regarding the design and control of robotic systems, introducing some notions regarding the structure of robotic systems, the integration of the mechanical system with the sensorial, actuation and control system; control systems for robotic systems. The laboratories are designed to provide students with practical skills in the design, use and management of robotic systems in manufacturing processes. Students will control various types of robotic systems in order to use these in processes, they will test and debug control programs.

COURSE TITLE: ROBOTICS – PROJECT

ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project aims at using the basic concepts regarding the design and control of robotic systems. The project aims at using some notions regarding the structure of robotic systems, the integration of the mechanical system with the sensorial, actuation and control system; control systems for robotic systems. The project aims at providing students with practical skills in the design, use and control of robotic systems in manufacturing processes.

3RD YEAR, 2ND SEMESTER

COURSE TITLE: APPLICATIONS OF ROBOTIC SYSTEMS

ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at students' assimilating the knowledge about the problems of different industrial and non-industrial applications using robots in the automated processes, focusing on the analysis of physical structures and the architectures of installations, the modelling of the systems used and the implemented algorithms management systems.

COURSE TITLE: APPLICATIONS OF ROBOTIC SYSTEMS –PROJECT

ECTS CREDITS: 1
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The project has the role of training students in order to enable them to design an automated and robotic industrial application of medium complexity.

COURSE TITLE: REGULATION ENGINEERING

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: DATA TRANSMISSIONS

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the formation of future specialists in mechatronic systems, providing them with knowledge in the field of information transmission theory. Basic concepts used in the design and implementation of data transmission systems are addressed.

COURSE TITLE: INDUSTRIAL SOFTWARE
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and computer scientists, providing them with knowledge in the field of industrial software. Basic concepts used in the design and implementation of data acquisition and control programs in industrial applications are addressed.

COURSE TITLE: PROJECT MANAGEMENT
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, assuring them knowledge of Project Management activities. Basic concepts used in project design and implementation are addressed.

COURSE TITLE: PRACTICAL TRAINING
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the training of future robotics engineers, process control and applied IT specialists, providing them with knowledge in the design and implementation of control systems. Basic concepts used in the design, implementation and operation of control systems are addressed.

COURSE TITLE: ELECTRONIC COMMERCE
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: THE DEVELOPMENT OF NETWORK DISTRIBUTED APPLICATIONS
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: ENTREPRENEURSHIP
CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

4TH YEAR, 1ST SEMESTER

COURSE TITLE: COMPUTER AIDED DESIGN
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the formation of future graduates of the Robotics programme, a component part of the Mechatronics and Robotics field, an integrating engineering branch, providing them with knowledge in the field of computer aided design for parameterized robotic applications. The course aims at introducing basic concepts and skills related to the use of computer aided design environments, focusing on programming in specialized languages (using AutoCAD and AutoLISP as exemplary products) for practical robotic applications.

COURSE TITLE: EMBEDDED SYSTEMS
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the training of future control engineers, process control and applied IT specialists, providing them with knowledge in the field of embedded systems. Basic concepts used in the design and implementation of embedded systems are addressed.

COURSE TITLE: PROGRAMMABLE AUTOMATA
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at introducing basic concepts regarding the programming of programmable logic controllers and control of processes/robotic systems with programmable controllers. It contributes to the formation of future robotics engineers, specialists in the control of robotic systems, providing them with knowledge in the field of processes control using programmable controllers. Practical concepts used in the design and control of robotic processes / robotics systems with programmable controllers are discussed, knowledge of systems control methods and algorithms using programmable logic controllers, ways of interfacing programmable controllers, network communication, design, implementation and testing of processes control applications with programmable logic controllers. The laboratories have the role of consolidating the theoretical knowledge and of enabling the understanding of the methods of control of processes with programmable controllers through practical applications.

COURSE TITLE: PROGRAMMABLE AUTOMATA – PROJECT
ECTS CREDITS: 1
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The project aims at consolidating the theoretical knowledge from the Programmable Logic Controllers Course and at enabling the understanding of the phenomena through practical applications. Practical concepts used in the design and implementation of robotics systems with programmable logic controllers, knowledge of systems control methods and algorithms using programmable logic controllers, of ways of interfacing programmable controllers, of

network communication, of the design, implementation and testing of the robotic systems control applications with programmable controllers.

COURSE TITLE: HUMAN-MACHINE INTELLIGENT SYSTEMS

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Knowledge and application of the primary methods of designing human-machine interfaces; getting used to the use of the software tools designed to develop human-machine interfaces; the development of man-machine interfaced applications based on the Matlab assisted design environment.

COURSE TITLE: ARTIFICIAL VISION

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the formation of future graduates of the Robotics programme, a component part of the Mechatronics and Robotics field, an integrating engineering branch, providing them with knowledge in the field of the acquisition, processing and recognition of images in order to achieve a control loop for robotic applications. The course aims at introducing basic concepts and skills related to the use of the acquisition, processing and recognition of real images for practical robotic applications, other than computer graphics and work with synthesis images.

COURSE TITLE: ARTIFICIAL INTELLIGENCE

ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): It contributes to the formation of future graduates of the Robotics program, a component part of the Mechatronics and Robotics field, an integrating engineering branch, providing them with knowledge in the field of artificial intelligence. The course aims at introducing basic concepts in the field of artificial intelligence, knowledge representation and their use. The students' training is supported in the field of the programming languages with the widest use in Artificial Intelligence (PROLOG).

COURSE TITLE: INFORMATION PROTECTION TECHNOLOGIES

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: FLEXIBLE MANUFACTURING SYSTEMS

ECTS CREDITS: 5
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): This subject of study contributes to the formation of future engineers in the field of "Mechatronics and Robotics", providing them with knowledge in the field of modern manufacturing systems and associated computer technologies. Basic concepts used in the design and implementation of robotic flexible manufacturing systems are addressed. The course contributes to the formation of students, providing them with knowledge in the field of the design, construction, functional analysis and exploitation of flexible manufacturing systems. The laboratory activity aims at creating practical skills in this field through case studies and analyses as well as exercises performed with the help of existing teaching facilities in the laboratory.

COURSE TITLE: COMPUTER NETWORKS

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

4TH YEAR, 2ND SEMESTER

COURSE TITLE: THE TESTING AND RELIABILITY OF MECHATRONIC SYSTEMS

ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): It contributes to the formation of future engineers, specialists in the design and management of mechatronic systems. Basic concepts used in the theory of industrial systems reliability theory are addressed, with diagnosis and decision making techniques applied to mechatronic systems in order to ensure operational safety.

COURSE TITLE: VIRTUAL INSTRUMENTATION

ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course contributes to the training of control and computer science specialists, providing them with knowledge in the field of virtual instrumentation. Basic concepts on designing virtual tools are addressed.

COURSE TITLE: PURCHASING SYSTEMS AND INTERFACES

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: MOBILE ROBOTS AND MICROROBOTS

ECTS CREDITS: 4
TYPE OF COURSE: complementary

COURSE OBJECTIVE(S): This subject of study contributes to the formation of future engineers in the field of *Mechatronics and Robotics*, providing them with knowledge in the field of mobile robotic systems in their operating space and micro-robots. Basic concepts used in the construction, design and range of common applications of these unconventional robotic systems are addressed. The course contributes to the formation of students, providing them with knowledge in the field of the design, construction, functional analysis and exploitation of mobile robotic systems and micro-robots. The laboratory activity aims at creating practical skills in this field through case studies and analyses, as well as exercises with the help of existing teaching equipment in the laboratory.

COURSE TITLE: VIRTUAL MANUFACTURING

ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at introducing basic theoretical concepts of virtual processes and products using the computer. It contributes to the formation of future specialists in the modelling, simulation and management of processes, providing them with knowledge in the field of virtual reality and manufacturing. Basic concepts used in the design and implementation of virtual systems are addressed. The objectives of this subject of study converge towards the use of virtual reality in three directions: virtual production, virtual robotics and collaborative engineering. Laboratories have the role to create practical skills for programming virtual scenes and interacting with the virtual environment.

COURSE TITLE: MACHINE TOOLS WITH NUMERICAL CONTROL

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: PROGRAMMING LANGUAGES FOR ROBOTS

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts for the programming languages of robots. The tutorial classes are designed to enable students to develop applications based on microcontrollers and interfacing them with robot systems.

COURSE TITLE: WEB TECHNOLOGIES

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: NEURAL NETWORKS

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S): The main objectives of this course is to provide the students with the basic understanding of artificial neural networks, applications to robotics, pattern recognition etc., for programming the related algorithms and designing the required and related systems.

COURSE TITLE: MOBILE COMMUNICATIONS

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: REAL-TIME COMPUTING SYSTEMS

CODE:
ECTS CREDITS:
TYPE OF COURSE:
COURSE OBJECTIVE(S):

COURSE TITLE: DIPLOMA EXAM

CODE:
ECTS CREDITS: 10
TYPE OF COURSE: domain
COURSE OBJECTIVE(S):
ASSESSMENT METHOD(S): Exam

FIELD: COMPUTERS AND INFORMATION TECHNOLOGY
PROGRAMME TITLE: SOFTWARE ENGINEERING
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: COMPLEX GRAPHIC SYSTEMS

CODE: D27ISM101
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course contributes to the formation of future IT engineers, specialists in software development, providing them with knowledge in the field of design and implementation of advanced graphic algorithms and complex graphic applications as well as hardware and software architecture of systems graphs intended for the running of these algorithms and applications. Advanced concepts specific to computer graphics are approached, expanding the knowledge gained in the field during the license studies.
COURSE CONTENTS: 1. Complex Graphics Systems: Introduction; Advanced graphing algorithms – global illumination: radiosity; 2. Graphic algorithms – graphical algorithms, Advanced graphing algorithms – modelling: mesh, subdivision and refinement, advanced – pixel processing: texturing and filtering methods, masking operations; 3. 3D printing – generating geometric layout, optimizations, technologies; 4. Architecture of a frame buffer – delimited plans, processing modules, parallelization of pixel processing; 5. Graphics stations – architectures, performance, specifications; 6. Graphic systems for computer animation; distributed resources, rendering farms; 7. Dedicated video postprocessing systems; 8. Dedicated imaging and medical simulation systems; 9. Dedicated systems for static and dynamic vehicle simulators; Real-time digital image generators; Distributed Resource Simulators; 10. Systems Designed for Assisted Design; 11. Computer Graphics and Robotics – Correlations; 12. Virtual reality and augmented reality; Interactive Graphics Considerations on Mobile Devices.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam + homework assessment

COURSE TITLE: MULTI-AGENT SYSTEMS

CODE: D27ISM102
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course introduces the students in the field of multi-agent systems and technologies. It goes from multi-agent systems architectures, multi-agent programming, multi-agent learning algorithms, and multi-agent systems development methodologies, respectively. A component of the course covers the problem of modelling strategic interactions among agents, using game theory
COURSE CONTENTS: 1. Introduction to multi-agent systems; 2. Multi-agent systems architectures; 3. BDI Architecture; 4. Programming Jason/ Agent Speak; 5. Markov decision issues; 6. Learning by rewarding; 7. Introduction to game theory; 8. Extended games; 9. Coalition of agents; 10. Multi-agent methodologies; 11. Methodology of Prometheus; 12. Multi-agent systems *data-driven*; Multi-agent learning elements; 13. Multi-agent learning algorithms in the *deep-learning* sphere; 14. Neural Networks; Computational limits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam and homework

COURSE TITLE: COMPLEXITY OF CALCULATION

CODE: D27ISM103
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): Training and consolidation of knowledge about algorithms and their complexity. It is desirable to develop skills to analyse the performance of algorithms in mathematical terms of the complexity theory of computation. The lab has the role of fixing the theoretical knowledge and creating programming skills through practical applications, exercises and problems.
COURSE CONTENTS: 1. Introduction to algorithm analysis; 2. Automation, computability, complexity; 3. Complexity classes; 4. Complexity of optimization problems; 5. Space complexity classes; 6. Probabilistic algorithms and complexity classes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SOFTWARE METHODS AND QUALITY ENGINEERING

CODE: D27ISM104
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in the field of computers and information technology, specialists in designing and developing software programs, providing them with knowledge in the field of application design and implementation and quality engineering. Basic concepts and advanced concepts specific to software metrics and software engineering of software projects are addressed.
COURSE CONTENTS: 1. Theory of Software Measurement; 2. Methods based on goals for measuring software products; 3. Collecting and analysing software measurement data; 4. Measuring the size of software products; 5. Measuring the structural complexity of software products; 6. Measuring the cost and effort of

software products; 7. Measurement of the quality of software products; 8. Measuring the reliability of software products; 9. Software testing metrics; 10. Object oriented metrics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: IMAGE PROCESSING

CODE: D27ISM105
ECTS CREDITS: 5
DISCIPLINE TYPE: specialty
COURSE OBJECTIVE(S): The course contributes to the formation of future engineers with a master degree in software engineering, providing them with knowledge in the field of artificial vision (acquisition and processing of images, respectively the recognition of forms). The aim is to fix the concepts in the field of artificial vision, the representation of the information contained in the numerical images and their use. Students' training is supported in the use of software technologies for the selection and integration of hardware and software components in the development of practical applications of artificial sight.
COURSE CONTENTS: Acquisition of images (sensors, cameras, specialised plates); Geometric transformations and camera calibration; Histograms; Filtering images in the frequency domain. Filtering images in space; Convolution masks; Labelling regions; Extracting, thinning and closing contours; Descriptors of shapes; Form Recognition; Minimum distance classifiers; Statistical classifiers; Artificial applications; Integration of software and hardware; Using the Image Processing module in the MatLAB environment; Image representation and processing techniques.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: LEGAL, ETHICAL AND SOCIAL PROBLEMS IN SOFTWARE ENGINEERING

CODE: D27ISM106
ECTS CREDITS: 5
DISCIPLINE TYPE: specialty
COURSE OBJECTIVE(S): Present and explain the concepts and elements defining academic ethics and integrity through a quantitative and qualitative analysis of the phenomena specific to this discipline.
COURSE CONTENT: 1. Defining academic deviations – sanctions (Deadlines, Productivity and competition, Collaborative and individual work, Criticism and trust, Lack of information; 2. Problems of Ethics in Academic Research (Collecting, Storing, Retaining Data – A Common Denominator in Most Science Deviation Practices Publication Practices: Authors, Surveillance of Research Staff); 3. Problem of university plagiarism (Lack of quoting, Incorrect source quote, Paraphrasing); 4. Ethics in teaching in the academic environment (Love relations between students and teachers, Ethics in research, Conflict of interests, Honorary code of academic integrity, Instruments of student judicial governance, Incidents of racial and sexual harassment, including sexual orientation); 5. Academic Policies Affecting Academic Environment (General University Policies, Teaching Policy, Responsible Teacher, Policy of Responsible Conduct).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ISM107
ECTS CREDITS: 5
COURSE TYPE: specialty
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Philosophy of research – essence of research philosophy; 2. Types of Research Methods – Applied Research; 3. Types of Research Methods – Fundamental Research; 4. Types of Research Methods – Research Approach; 5. Types of research methods – deductive approach; 6. Types of Research Methods – Inductive Approach.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENGINEERING OF SOFTWARE SYSTEM REQUIREMENTS

CODE: D27ISM208
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in the field of computers and information technology. The course allows students to understand the need to use software development requirements, understand engineering requirements, understand the engineering of object-oriented and goal-oriented requirements, and use CASE tools to manage engineering requirements. The student's ability to write documents related to the specification of software system requirements is also developed.
COURSE CONTENTS: 1. Introduction to engineering requirements; 2. Requirements engineering processes; 3. Requirements extraction; 4. Requirements modelling: Requirements analysis and specification, Functional and non-functional requirements, Modelling of goal-oriented requirements, Object-oriented modelling, User requirements note; 5. Verification and validation of requirements; 6. Requirements management.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: MODELING AND ASSESSMENT METHOD(S) OF PERFORMANCES

CODE: D27ISM209
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): Synthesis of the principles of modelling, simulation and evaluation of the performance of computer systems; the in-depth study of some methods and concepts of modelling computer systems and computer networks and evaluating the performance of these systems and structures; studying stochastic processes, measuring techniques, monitoring tools, statistical analysis of performance experiments, simulation models; analytical modelling and theory of queues and waiting queue networks; characterizing work tasks, formulating and solving performance evaluation problems; Synthesis of a solid mathematical foundation, knowledge of analytical modelling but also of the skills and features of versatility in the use of computational tools.
COURSE CONTENTS: The course is divided into two parts each containing several tutorials presentations. Every presentation is run in 1-2 weeks during the semester and ends with homework. Part I: Statistical Performance (Estimated): 1. Mathematical Fundamentals in Modelling and Assessing Systems Performance; 2. Performance Visualization: Visual Data Representations, Types of graphs; 3. Analytical modelling of discrete systems, Probabilistic Modelling Techniques; 4. Simulation of Dynamic Systems: Experimental Model of Prediction of Model Performance; 5. Accelerate execution: Parallel and distributed simulation, Gradient techniques. Part II: Measured Performance: 6. Performance Measurement, Errors and confidence intervals; 7. Hardware performance metrics; 8. Methods and Techniques for Improving Hardware Performance; 9. Measures for software performance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SOFTWARE ARCHITECTURES

CODE: D27ISM210
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The objective of the course is to present students with software architectures: design templates, architectural analysis, refactoring, software architectural styles, performance analysis. At the end of the course, students will be able to design the components, protocols, topologies, constraints and different architectural styles used in software applications.
COURSE CONTENTS: 1. Introduction, Software Code Quality; 2. Software design templates I; 3. Software design templates II; 4. Reformation I; 5. Reformation II; 6. Architectural Analysis I; 7. Architectural Analysis II; 8. Pipes-Software Architecture Styles, Filters; 9. Object Oriented Architectures; 10. Event-based architectures; 11. Multi-level architectures; 12. Architects collection type; 13. performance analysis; 14. performance analysis II.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: ADVANCED TOPICS IN DATABASES

CODE: D27ISM211
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The objective of the course is to present advanced students in databases: relational-object databases, distributed databases and NoSQL databases, which extend the database concepts presented during the license years. At the end of the course, students will have the necessary knowledge to design and implement these types of databases that are increasingly used in the development of complex computer systems.
COURSE CONTENTS: 1. Object-oriented databases; 2. relational-object databases; 3. Distributed databases; 4. NoSQL databases; 5. XML databases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: WEB APPLICATION ENGINEERING

CODE: D27ISM212
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course aims at deepening the basic concepts of Web applications: architecture, modelling and engineering of Web systems. Through the lab sessions, students gain practical experience with current technologies and frameworks, as well as problem-solving skills. It is also about acquiring skills for analysing requirements, defining specifications, designing, implementing, testing and managing the lifecycle of Web applications, as well as improving its performance.
COURSE CONTENTS: 1. Requirements engineering for web applications; 2. Web application modelling; 3. Architectures for Web applications; 4. Technologies for Web applications; 5. Testing Web Applications; 6. Operation and maintenance of Web applications; 7. Web project management; 8. Web application development process; 9. Usability of Web applications; 10. Performance of web applications; 11. Web application security; 12. Semantic Web; 13. Social and participative Web (Web 2.0).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: SECURITY INSURANCE OF SOFTWARE SYSTEMS

CODE: D27ISM213
ECTS CREDITS: 5
DISCIPLINE TYPE: specialty
COURSE OBJECTIVE(S): The objective of the course is to familiarize students with the problems of ensuring the security of software systems. The course is designed to extend the basic concepts in the field of data security and to complement the computer programming knowledge that was presented during the undergraduate studies. Upon completion of the course, students will have the necessary knowledge to design and implement software systems that take into account current IT security requirements.
COURSE CONTENT: 1. Overview of security of software systems; 2. Steps of developing a secure software product; 3. Data and information protection and security; 4. SD3 security framework for software development; 5. Data security certifications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ISM214
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Carrying out the exploratory research process; 2. Conducting the final research process; 3. Applying methods of collecting research data; 4. Apply quantitative data collection methods to research data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 1ST SEMESTER

COURSE TITLE: FORMAL METHODS IN SOFTWARE ENGINEERING

CODE: D27ISM315
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in the field of computers and information technology. The course allows students to understand the terminology and concepts of formal methods used in specifying and designing software systems, developing the ability to write small- and medium-sized specifications in the language of Event-B and to read and understand large-scale specifications as well as checking automatic accuracy of written specifications in Event-B language
COURSE CONTENTS: 1. Formal methods and requirements specification; 2. Abstract contexts and machines (models); 3. Refining models; 4. Event notation B; 5. The mathematical language used in Event B; 6. The Semantics of Event B; 7. System composition and decomposition; 8. Modularization; 9. Generic Inventory; 10. Record Data Structures; 11. Development of a Sequential Program; 12. UML-B 13. Rodin.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: TEST OF SOFTWARE APPLICATIONS

CODE: D27ISM316
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course contributes to the training of future computer engineers and information technology specialists in the development and testing of software programs, providing them with knowledge in the field of designing of test cases and testing of software applications. Basic concepts and advanced concepts used to determine the quality of software applications are addressed.
COURSE CONTENTS: 1. Quality of software products: Software product quality definition, Particulars of the quality of software products, Methods of inspecting the quality of software products; 2. Quality Features: Reliability, Generality, Compliance, Complexity, Continuity, Global Quality Model; 3. Fundamental Metrics in Software Testing: Metrics for Test Time Measurement, Metrics for Measuring Bugs, Metrics for Measurement of Testing Effort, Metrics for Measuring Test Performance; 4. Testing Principles: Basic Concepts, Testing Process, Testing Analysis; 5. Software Testing Techniques: Empirical Testing, Systematic Testing, Functional and Structural Testing, Software-Oriented Programming Testing, Level Testing, Other Test Methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: ENGINEERING OF DISTRIBUTED SYSTEMS

CODE: D27ISM317
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course objectives are related to the design, development and implementation of the distributed computer applications, as well as to the identification of the requirements for the analysis and verification of these types of applications. The application part presents concrete examples of designing, deploying and troubleshooting distributed applications.

Current technologies are used to design and deploy tools, protocols, or application systems running in distributed environments.
COURSE CONTENTS: 1. Introduction to Distributed Systems Theme; 2. Middleware in Distributed Systems; 3. Distributed Algorithms; 4. Distributed Systems Infrastructure; 5. Data Sharing; 6. Scheduled/ Deployed Distributed Systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral and project presentation

COURSE TITLE: SEMANTIC SYSTEMS

CODE: D27ISM318
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course introduces the students in the field of semantic systems. It is based on the architecture of a system based on knowledge, knowledge representation, ontologies, semantic databases, and Semantic Web, respectively. A component of the course covers the problem of representing and querying knowledge in the Web using Semantic Web technologies. The last part of the course touches on the issue of natural language processing.
COURSE CONTENTS: 1. Introduction to knowledge-based systems; 2. Semantic systems architecture; 3. Representing knowledge using mathematical logic; 4. Automatic Rationalization; 5. Rules-based systems; 6. Representing knowledge using graphs; RDF and RDF (S). 7. Ontologies; 8. Integrating ontologies; 9. Semantic Web; 10. Processing of natural language; 11. Lexical knowledge bases; 12-13. Analysis and mining of texts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam and homework

COURSE TITLE: RECOVERING MULTIMEDIA INFORMATION

CODE: D27ISM319
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course aims at familiarizing students with the methods used to search for text information, visual information based on content according to the colour, texture and shape characteristics of the video and audio information. Existing recovery systems, as well as those developed and researched in the department, will be analysed to make a comparative study of these and the methods used, given that there are no standards yet. The analysis will be made in terms of the quality of retrieval as well as the execution speed of the query. Algorithms studied at the course will be implemented and analysed at laboratory hours. The course aims to give students a detailed view of a new field and in full research and development.
COURSE CONTENTS: 1. Retrieving text information; 2. Retrieval of visual information by low-level features; 3. Retrieve video information; 4. Media retrieval method of audio type; 5. Retrieve information on the WEB.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: E-MARKETING AND BRANDING

CODE: D27ISM320
ECTS CREDITS: 5
COURSE TYPE: complementary
COURSE OBJECTIVE(S): This course explores the basic principles that underlie marketing and how e-business marketing techniques fundamentally change the traditional marketing process. Students are presented a rapidly changing environment of non-linear, online, interactive advertising; new product development and distribution processes; and reliance on databases. Throughout the semester, students will learn how traditional marketing models are translated or modified into the electronic medium of the World Wide Web.
COURSE CONTENTS: 1. e-Marketing Overview; 2. Trends in e-Marketing; 3. Strategic e-Marketing; 4. e-Marketing Planning Process; 5. Customer Relationship Management; 6. Internet Audience; 7. e-Marketing mix; 8. Branding.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ISM321
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Carrying out the exploratory research process; 2. Conducting the final research process; 3. Applying the methods of collecting the research data; 4. Applying the methods of quantitative collection of the research data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH ACTIVITY

CODE: D27ISM322
ECTS CREDITS: 15
COURSE TYPE: synthesis

COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Data analysis in the research of the chosen topic; 2. Validity and ethical considerations in research; 3. Methods of presentation of discovered research; 4. Quantification of data; 5. Quality presentation of the data; 6. Data analysis – Quantitative analysis of the data obtained; 7. Analysis of data – qualitative analysis of the data obtained
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICE FOR THE DISSERTATION PAPER

CODE: D27ISM322
ECTS CREDITS: 15
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The discipline aims to coordinate in a methodical manner the activity of the master student in order to elaborate the final dissertation paper. The student will establish together with his/ her coordinator the objectives to be achieved by the project, select the software tools for the project development, make a bibliographic research on the topic and determine the activities to be carried out in a clear calendar so that resulting in a finite quality and functional product. The student will have to submit the results of the activities carried out at the deadlines.
COURSE CONTENTS: 1. Bibliographic research, establishing the research objectives; 2. Research plan; 3. Requirements analysis; 4. Design; 5. Implementation; 6. Testing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

FIELD: COMPUTERS AND INFORMATION TECHNOLOGY
PROGRAMME TITLE: INFORMATION SYSTEMS FOR E-BUSINESS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MULTIMEDIA DESIGN

CODE: D27ISBM101
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The Graphic Design student will be required to design for focus and flow, achieve balance by inserting and modifying graphics as well as using special characters to - create a graphic design published document throughout the semester. The end product may consist of creating a logo, business card, an advertisement, flyer, brochure, newsletter and designing publications for their digital portfolios. Production projects, class exercises, tests and quizzes will assess the skill and ability level of each student. Students will take their best
work from both semesters to assemble a portfolio.
COURSE CONTENTS: 1. Identify and use the Principles of Design; 2. Evaluate designs for audience, meaning and effectiveness; 3. Distinguish between the types of graphic images used; 4. Use of colour to communicate ideas; 5. Understand the principles of graphic placement; 6. Use typography effectively in a design; 7. Using tools to edit photographs and create artistic imagery, to create publications such as advertisements and brochures, to create to vector images to be used for company logos, promotional uses, both in print and digital form; 8. Explore the field of Marketing, Social Media and Advertising; 9. Create an e-portfolio.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: COMPUTATIONAL METHODS

CODE: D27ISBM102
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The general objective of this course is to develop and enhancing knowledge about algorithms and their complexity. It is desirable to develop skills to analyse the performance of algorithms in mathematical terms of the complexity theory of computation. The lab has the role of fixing the theoretical knowledge and creating programming skills through practical applications, exercises and problems.
COURSE CONTENTS: 1. Mathematical preliminaries and elements of computability theory; 2. Algorithms and their complexity; 3. Complexity classes; 4. The class P; 5. The class NP; 6. The complexity of optimization problems; 7. Space – complexity classes; 8. Probabilistic algorithms and complexity classes.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: MULTI-AGENT SYSTEMS

CODE: D27ISBM103
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course introduces students to multi-agent systems and technologies. It is based on multi-agent systems architectures, multi-agent programming, multi-agent learning algorithms, and multi-agent system development methodologies. A component of the course covers the problem of modelling strategic interactions among agents, using game theory.
COURSE CONTENTS: 1. Introduction to multi-agent systems; 2. Multi-agent system architectures; 3. BDI Architecture; 4. Programing in Jason/ AgentSpeak; 5. Decision problems Markov; 6. Learning by reward; 7. Introduction to game theory; 8. Expanded games; 9. Coalition of agents; 10. Multi-agent methodologies; 11. Prometheus Methodology; 12. Data-driven Multi-agent systems. Multi-agent learning elements; 13. Multi-agent learning algorithms in the "deep-learning" sphere; 14. Neural Networks. Computational limits.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam + homework

COURSE TITLE: SYSTEMS ANALYSIS AND DESIGN

CODE: D27ISBM104
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): To describe a simple process for developing information systems; To enable the students to identify different types of stakeholders who use or develop information systems; To enable the students to understand role of system analysts and designers in the development of information systems; To allow the students to perform the analysis and the design of a simple or medium information system.
COURSE CONTENTS: 1. The Systems Development Environment. Systems Analysis and Design: Core Concepts; Software Engineering Process; A Modern Approach to Systems Analysis and Design; SA role in Systems Development; Alternative Approaches to Development; Approaches to Development; 2. The Sources of Software; Choosing Off-the-Shelf Software; 3. Managing the Information Systems Project; 4. Systems Planning and Selection; Identifying and Selecting Projects; Initiating and Planning System Development Projects; Building the Baseline Project Plan; 5. Determining System Requirements; Requirements: Necessity not Luxury; Performing Requirements Determination;

Traditional Methods for Determining Requirements. Prototyping; 6. Structuring System Requirements: Process Modelling; 7. Structuring System Requirements: Conceptual Data Modelling; The Process of Conceptual Data Modelling; Entity-Relationship Modelling; 8. Designing the Human Interface; Designing Forms and Reports; Designing Interfaces and Dialogues; 9. Designing Databases; Process of Database Design; Normalization; Functional Dependencies and Primary Keys.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Final written exam and two projects during the semester

COURSE TITLE: WEB SYSTEM ENGINEERING

CODE: D27ISBM105
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The course focuses on the methodologies, techniques, and tools that are necessary for Web application development and which support their design, development, evolution, and evaluation.
COURSE CONTENTS: 1. Requirements Engineering for Web Applications; 2. Modelling Web Applications; 3. Web Application Architectures I; 4. Web Application Architecture II; 5. Web presentation patterns I; 6. Web presentation patterns II; 7. Technology-aware Web Application Design; 8. Usability of Web Applications; 9. Technologies for Web Applications; 10. Web Project Management; 11. The Web Application Development Process; 12. Security for Web Applications; 13. Testing of Web Applications; 14. Operation & Maintenance of Web Applications.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: IMAGE PROCESSING

CODE: D27ISBM106
ECTS CREDITS: 5
COURSE TYPE:
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Examination

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ISBM207
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Philosophy of research – essence of research philosophy; 2. Types of Research Methods – Applied Research; 3. Types of Research Methods – Fundamental Research; 4. Types of Research Methods – Research Approach; 5. Types of research methods – deductive approach; 6. Types of Research Methods – Inductive Approach.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: E-BUSINESS INFRASTRUCTURE

CODE: D27ISBM208
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The students will acquire knowledge on the most significant aspects related to e-business infrastructure. Aspects of hardware, server, storage and network virtualization are addressed. Special problems related to backup, recovering, business continuity and high availability are presented. Most significant aspects of a complex product for E-business infrastructure management (IBM Tivoli Storage Productivity) are used as case study.
COURSE CONTENTS: 1. General matters on E-business Infrastructure: definitions; 5-layers model; technological issues, etc.; 2. Hardware virtualization; 3. Server virtualization; 4. Storage virtualization; 5. Network virtualization; 6. Best solutions for backup and recovering; 7. Best solutions for business continuity and high availability; 8. Cloud Storage Services for Backup; 9. Hypervisors; 10. Strategies to improve efficiency in datacenters; 11. Configuring a provisioning plan; 12. IBM Tivoli Storage Productivity, part I: Architecture; Data Manager; Disk Manager; 13. IBM Tivoli Storage Productivity, part II; Best practices for performance management; Managing replication, management servers, SNMP servers, storage subsystems and connections; 14. IBM Tivoli Storage Productivity, part III; Managing logical paths; Copy sessions and sets; Roles of volumes; I/O multipath and providing „High Availability” features.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: E-BUSINESS SECURITY AND RISK MANAGEMENT

CODE: D27ISBM209
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The students will further acquire know how within the topic of data security and protections. The course is meant to extend and complete knowledge from undergraduate studies in the field of data security. Upon completing the course and laboratories the students will be able to

design and implement security controls and policies.
COURSE CONTENTS: 1. General information security overview (Introduction and objectives; Information security issues; Legislation and international standards; Data breaches; Data remanence; Data theft; Digital identity theft; EU legislation; The transition from DPD – Data Protection Directive to GDPR – General Data Protection Regulation); 2. Security risk management (Understanding the threats in the global security landscape (malware, memory abuse and exploitation, etc.); Concepts and theories of risk; Risk assessment basics (phases, project definition, project preparation, data gathering, risk analysis, risk mitigation, risk reporting and resolution); Security risk assessment properties (review business mission, identify critical systems, identify assets, identify threats, determine expected controls); Data gathering (sampling, RIIOT method); Administrative data gathering (threats and safeguards, RIIOT method for administrative data gathering); Technical data gathering (threats and safeguards, RIIOT method for technical data gathering); Risk and Victimisation in Law: Impact on Organisations, Business continuity/crisis management, Instruments for security risk assessment and management); 3. Information security mechanisms (Cryptographic mechanisms, Active data protection, Isolation mechanisms (air gap); Anomaly detection; Backup and recovery; Firewalls; Cloud service gateways; Standard of good practices in information security; ISO/IEC 27005 Information Security Management System standard – part of ISO/IEC 27000 series).
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: MODELING AND PERFORMANCE ASSESSMENT METHOD(S)

CODE: D27ISBM210
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The discipline contributes to the education and training of future MSc specialists in Information Systems for e-Business, synthesizing knowledge and principles of modelling, simulation and performance evaluation of computer systems. It also provides a solid mathematical background, promoting skills and features of versatility in using computer tools and offering an in-depth study for stochastic processes, measuring techniques, monitoring tools, stochastic analysis tools a.s.o.
COURSE CONTENTS: Part I includes: Statistical Performance (Estimated): 1. Mathematical Fundamentals in Modelling and Assessing Systems Performance; 2. Performance Visualization: Visual Data Representations; Types of graphs; 3. Analytical modelling of discrete systems. Probabilistic Modelling Techniques; 4. Simulation of Dynamic Systems: Experimental Model of Prediction of Model Performance; 5. Accelerate execution: Parallel and distributed simulation; Gradient techniques; Part II includes: Measured Performance: 6. Performance Measurement; Errors and confidence intervals; 7. Hardware performance metrics; 8. Methods and Techniques for Improving Hardware Performance; 9. Measures for software performance.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: LEGAL, ETHICAL AND SOCIAL ISSUES

CODE: D27ISBM211
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE OBJECTIVE(S): The discipline contributes to the education and training of future MSc specialists in legal, ethical and social issues raised by IT, by providing advanced knowledge on these issues. The course aims to identify the legal, ethical and social issues and also the principles for conduct that can be used to guide ethical decisions of the IT specialist related to Internet, the protection of individual privacy and intellectual property.
COURSE CONTENTS: 1. European Directive on Data Protection; 2. Internet challenges to privacy; 3. Property right – Intellectual property; 4. Digital Millennium Copyright Act (DMCA); 5. Computer crime and abuse; 6. Accountability, Liability and Control.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SEMANTIC SYSTEMS

CODE: D27ISBM212
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE OBJECTIVE(S): The discipline contributes to the education and training of future MSc specialists in Information Systems for e-Business, by providing advanced knowledge on semantic systems. The course aims to introduce core concepts regarding the semantic Web, standards, ontologies and related applications and technologies.
COURSE CONTENTS: 1. The semantic web vision; 2. Describing Web resources: RDF; 3. Querying the Semantic Web: SPARQL; 4. Web ontology language: OWL2; 5. Ontology engineering; 6. Applications (e.g. FOAF, DBpedia, Linked Open Data, Wikidata, data.gov, schema.org, social networks); 7. Metadata, taxonomies, folksonomies.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: BUSINESS PROCESS MANAGEMENT

CODE: D27ISBM213

ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE OBJECTIVE(S): The discipline introduces students to the basic concepts in Business Process Management and provides a basic understanding of the organisational structure of a company, on why continuous analysis and improvement of business processes is required and constitutes a prerequisite to process automation and how to implement business process automation in a manner that provides value and room for growth. The course lays the foundation for both a better understanding of management issues and business processes within an organisation – and the ability to knowledgeably contribute to writing applications for business process automation.
COURSE CONTENTS: 1. An introduction to Business Process Management: Processes, The Business Process, Process Thinking, BPM Lifecycle; 2. Process Identification within an organization: Key Processes, Understanding and designing Process Architecture; 3. Fundamentals of Process Modelling: Exclusive and Inclusive Decisions, Parallel Execution, Iterations; 4. More on Process Modelling: Process decomposition and reuse, parallel process repetition and uncontrolled repetition; 5. More on Process Modelling: Handling Events, Handling Exceptions, Processes and Business Rules, Process Choreography; 6. Process Discovery: the Process Analyst, Discovery Methods; 7. More on Process Discovery: Process Modelling Method, Process Model Quality Assurance; 8. Basics of Qualitative Process Analysis: Value-Added Analysis, Root Cause Analysis, Documentation and Impact Assessment; 9. Basics of Quantitative Process Analysis: Performance Measures, Balanced Scorecard, Industry Benchmarks, Flow Analysis; 10. More on Quantitative Process Analysis: Queues and Queuing Theory, Process Simulation; 11. Process Redesign: why and how to Redesign, Heuristic Process Redesign, Product-based Design; 12. Process Automation: Automating Business Processes – the BPMS; 13. More on Process Automation: Advantages and Challenges of introducing a BMPS, Executable Process Models; 14. Introduction to Process Intelligence: Automatic Process Discovery, Performance Analysis and Conformance Checking.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Oral examination and homework evaluation

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ISBM214
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Philosophy of research – essence of research philosophy; 2. Types of Research Methods – Applied Research; 3. Types of Research Methods – Fundamental Research; 4. Types of Research Methods – Research Approach; 5. Types of research methods – deductive approach; 6. Types of Research Methods – Inductive Approach.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

2ND YEAR, 1ST SEMESTER

COURSE TITLE: BUSINESS PROCESS MANAGEMENT

CODE: D27ISBM315
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE OBJECTIVE(S): The discipline introduces students to the basic concepts in Business Process Management and provides a basic understanding of the organisational structure of a company, on why continuous analysis and improvement of business processes is required and constitutes a prerequisite to process automation and how to implement business process automation in a manner that provides value and room for growth. The course lays the foundation for both a better understanding of management issues and business processes within an organisation – and the ability to knowledgeably contribute to writing applications for business process automation.
COURSE CONTENTS: 1. An introduction to Business Process Management: Processes, The Business Process, Process Thinking, BPM Lifecycle; 2. Process Identification within an organization: Key Processes, Understanding and designing Process Architecture; 3. Fundamentals of Process Modelling: Exclusive and Inclusive Decisions, Parallel Execution, Iterations; 4. More on Process Modelling: Process decomposition and reuse, parallel process repetition and uncontrolled repetition; 5. More on Process Modelling: Handling Events, Handling Exceptions, Processes and Business Rules, Process Choreography; 6. Process Discovery: the Process Analyst, Discovery Methods; 7. More on Process Discovery: Process Modelling Method, Process Model Quality Assurance; 8. Basics of Qualitative Process Analysis: Value-Added Analysis, Root Cause Analysis, Documentation and Impact Assessment; 9. Basics of Quantitative Process Analysis: Performance Measures, Balanced Scorecard, Industry Benchmarks, Flow Analysis; 10. More on Quantitative Process Analysis: Queues and Queuing Theory, Process Simulation; 11. Process Redesign: why and how to Redesign, Heuristic

Process Redesign, Product-based Design; 12. Process Automation: Automating Business Processes – the BPMS; 13. More on Process Automation: Advantages and Challenges of introducing a BMPS, Executable Process Models; 14. Introduction to Process Intelligence: Automatic Process Discovery, Performance Analysis and Conformance Checking.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Oral examination and homework evaluation

COURSE TITLE: E-MARKETING AND BRANDING

CODE: D27ISBM316
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE GOALS: This course explores the basic principles that underlie marketing and how e-business marketing techniques fundamentally change the traditional marketing process. Students are presented in a rapidly changing environment of non-linear, online, interactive advertising; new product development and distribution processes; and reliance on databases. Throughout the semester, students will learn how traditional marketing models are translated or modified into the electronic medium of the World Wide Web.
COURSE CONTENTS: e-Marketing Overview; Marketing Financials; Internet Audience and Consumer Behaviour; Strategic e-Marketing; e-Marketing Achievement; e-Marketing mix: Product, Place, Price, Promotion; Branding Strategies in e-Marketing; Advertising Networks and Invasive Marketing; Communication Strategies in e-Marketing; Data Mining in e-Marketing; Trust, Reputation and Recommender Systems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam + report

COURSE TITLE: DATA MINING AND DATA WAREHOUSES

CODE: D27ISBM317
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE GOALS: The course will introduce students to the basic concepts and techniques of Data Mining and Data Warehouses. Also, it will develop skills of using recent data mining and data warehouses software for solving practical problems. A data warehouse is a specially prepared repository of data designed to support decision making. Data are extracted from source systems, transformed, and loaded into data stores. Then the data is accessed by users or applications that draw data from the warehouse. Data mining is an important use of a data warehouse. This course is designed to provide a thorough understanding of the business potential of data warehousing, how to build and maintain data warehouses, and how to use data warehouses for business advantage.
COURSE CONTENTS: 1. Data Warehousing Introduction; 2. Data Models; 3. Data structures; 4. Design; 5. Data warehousing process; 6. Online analytical process; 7. Tools and languages; 8. Data mart and practical issues; 9. Data Mining Methods; 10. Algorithms; 11. Mining Databases; 12. Knowledge discovery process; 13. Tools and languages and application issues.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: ENTERPRISE SYSTEMS

CODE: D27ISBM318
ECTS CREDITS: 5
COURSE TYPE: synthesis
DISCIPLINE OBJECTIVES: The students will acquire knowledge on the most significant types of enterprise systems and aspects related to their analysis and design. Special problems related to virtualization (of operating systems, data, applications, computing and files) are addressed. Cloud computing is approached and a brief introduction to standards for information systems management is provided as well.
COURSE CONTENTS: 1. Classification of enterprise systems; 2. Enterprise Resource Planning Systems; 3. Enterprise Content Management Systems; 4. Fundaments on analysis and design of enterprise systems; 5. Case studies for the analysis and design of enterprise systems; 6. Operating system virtualization; 7. Data virtualization; 8. Input-output virtualization; 9. Files virtualization; 10. Applications virtualization; 11. Computing virtualization; 12. Virtualization versus Cloud; 13. Cloud Computing; 14. Standards for information systems management.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SOCIAL INTERACTION AND COLLABORATION SYSTEMS

CODE: D27ISBM319
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE OBJECTIVE(S): The discipline contributes to the education and training of future MSc specialists in Information Systems for e-Business, by providing advanced knowledge on computer-supported collaboration and social interaction. The course aims to introduce core concepts regarding social computing, computer-supported cooperative work, computer-supported collaborative learning, social media mining, interaction models and techniques.
COURSE CONTENTS: 1. Interaction models, theories, techniques and tools; 2. Interfaces for collaborative work and social interaction; 3. Social computing; 4. Computer-supported cooperative work; 5. Social design of technical systems; 6. Social media for collaborative learning; 7. Social

media mining; 8. Emerging interaction techniques and communication approaches.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: SYSTEMS FOR INFORMATION RETRIEVAL

CODE: D27ISBM320
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The discipline aims to familiarize students with the basic technologies used in retrieving multimedia information: retrieving using meta data, retrieving textual information, retrieving content, automatic annotation of images, fingerprinting, audio. It will study the architecture of such a system, how to extract and represent the features used in search based on the content, the distances used for comparison. Algorithms studied at the course will be implemented and analyzed at project hours. The course aims to give students a detailed view of a new field and in full research and development.
COURSE CONTENTS: 1. Introduction to information retrieval; 2. Basic technologies in retrieving multimedia information: 2.1 Getting back using meta data; 2.2 Retrieving text information; 2.3 Retrieval based on content; 2.4 Automatic Image Annotation; 2.5 Shooting images, audio; 3. Retrieve multimedia content based on content: 3.1 System Architecture; 3.2 Characteristics (colour, texture, shape, etc.); 3.3 Distances; 3.4 Indexing, 3.5 Interrogation results; 4. Additional issues: 4.1 Video; 4.2 Paradigms of information visualization; 4.3 Visual and relevant feedback; 4.4 Geo-temporal aspects; 5. Representing and managing multimedia data; 6. Digital libraries; 7. Metadata and annotation automatically; 8. User needs and evaluation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Examination

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ISBM321
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Carrying out the exploratory research process; 2. Conducting the final research process; 3. Applying the methods of collecting the research data; 4. Applying the methods of quantitative collection of the research data.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

2ND YEAR, 2ND SEMESTER

COURSE TITLE: RESEARCH ACTIVITY

CODE: D27ISBM422
ECTS CREDITS: 15
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Data analysis in the research of the chosen topic; 2. Validity and ethical considerations in research; 3. Methods of presentation of discovered research; 4. Quantification of data; 5. Quality presentation of the data; 6. Data analysis – Quantitative analysis of the data obtained; 7. Analysis of data – qualitative analysis of the data obtained.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICAL STAGE FOR DISSERTATION PROJECT

CODE: D27ISBM423
ECTS CREDITS: 15
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The discipline aims to coordinate in a methodical manner the activity of the master student in order to elaborate the final dissertation paper. The student will establish together with his / her coordinator the objectives to be achieved by the project, select the software tools for the project development, make a bibliographic research on the topic and determine the activities to be carried out in a clear calendar so that resulting in a finite quality and functional product. The student will have to submit the results of the activities carried out at the deadlines.
COURSE CONTENTS: 1. Bibliographic research, establishing the research objectives; 2. Research plan; 3. Requirements analysis; 4. Design; 5. Implementation; 6. Testing.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification

FIELD: COMPUTERS AND INFORMATION TECHNOLOGY
PROGRAMME TITLE: COMPUTER AND COMMUNICATIONS ENGINEERING
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ARCHITECTURE OF MICROCALCULATORS
CODE: D27ICCM101
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course contributes to deepening the knowledge of computer engineers and information technology, providing them with new knowledge in the design and implementation of microcontroller systems. Basic concepts and advanced concepts specific to modern micro-computers are addressed.
COURSE CONTENTS: 1. Architecture and design of the set of instructions for a simple processor; 2. RISC processors; 3. Design for low energy consumption; 4. ARM processor architecture; 5. Organizing pipelines on 3 and 5 levels; 6. Execution of ARM instructions; 7. ALU structure; 8. Design of the multiplier; 9. Structure of the control unit; 10. Block of registers; 11. Memory interface; 12. DRAM memory; 13. Advanced data bus architectures; 14. Caches.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SECURITY AND DATA PROTECTION
CODE: D27ICCM102
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The objective of the course is to familiarize the students with the issues of data security and protection. The course is designed to expand and complement the basic concepts in the field of data security that were presented during the undergraduate studies. At the end of the course, the students will have the necessary knowledge to design and implement these types of databases that are increasingly used in the development of complex computer systems.
COURSE CONTENTS: 1. Overview of data security (introduction and motivation, issues, international legislation and standards, breach of data security and leakage, data retention, data theft, digital identity theft, transition from DPD legislation to GDPR); 2. Risk management for IT security (understanding threats, risk management issues, control types, treatment of different types of risks, loss estimates); 3. Data and information protection and security (cryptographic mechanisms, active data protection in storage, isolation mechanisms, anomaly detection, redundancy and recovery mechanisms, firewall mechanisms, cloud protection mechanisms, good practice in computer security); 4. Data security certifications (CISSP, CISM, CISA, CompTIA + Security, CEH, OSCP).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: TESTING AND QUALITY ASSURANCE
CODE: D27ICCM103
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course contributes to the training of future computer engineers and information technology specialists in the development and testing of software programs, providing them with knowledge in the field of designing of test cases and testing of software applications. Basic concepts and specific advanced concepts used to determine the quality of software programs are addressed.
COURSE CONTENTS: 1. Quality of software products: Software product quality definition, Particulars of the quality of software products, Methods of inspecting the quality of software products; 2. Quality Features: Reliability, Generality, Compliance, Complexity, Continuity, Global Quality Model; 3. Fundamental Metrics in Software Testing: Metrics for Test Time Measurement, Metrics for Measuring Bugs, Metrics for Measurement of Testing Effort, Metrics for Measuring Test Performance; 4. Testing Principles: Basic Concepts, Testing Process, Testing Analysis; 5. Software Testing Techniques: Empirical Testing, Systematic Testing, Functional and Structural Testing, Software-Oriented Programming Testing, Level Testing, Other Test Methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DATA COMMUNICATIONS BASED ON THE QUALITY OF SERVICES
CODE: D27ICCM104
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts regarding the design of the applications to be used in the Internet. Concepts of service quality, traffic congestion and waiting queues, data flow management, service quality management, etc. are presented. The lab has the role of fixing the theoretical knowledge and creating programming skills for serial interfaces through practical applications, exercises and problems.
COURSE CONTENTS: 1. Service quality concepts (QoS) ; 2. QoS architecture; 3. QoS within a network element; 4. Classification – flow identification; 5. Differentiated quality services; 6. Methods of traffic congestion management; 7.

Administration of queues; 8. Trafficking Policies; 9. Connectivity efficiency mechanisms; 10. Service quality management; 11. QoS applications
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: OBJECT-ORIENTED NETWORKING

CODE: D27ICCM105
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: WIRELESS TECHNOLOGIES AND MOBILE NETWORKS

CODE: D27ICCM106
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course aims at introducing basic concepts on wireless technologies, mobile networks and data security in such networks. Concepts are presented about smart client applications and wireless applications used in the Internet. The lab has the role of fixing the theoretical knowledge and creating skills for designing and managing mobile networks through practical applications, exercises and problems.
COURSE CONTENTS: 1. Introduction to mobile networks; 2. Mobile equipment; 3. Wireless networks; 4. Mobile application architectures; 5. Mobile and Wireless Messaging; 6. Data Security in Mobile and Wireless Networks; 7. Designing "Smart Client" applications; 8. Designing wireless applications on the Internet; 9. Date of the level of an organization.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ICCM107
ECTS CREDITS: 5
COURSE TYPE: specialty
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Philosophy of research – essence of research philosophy; 2. Types of Research Methods – Applied Research; 3. Types of Research Methods – Fundamental Research; 4. Types of Research Methods - Research Approach; 5. Types of research methods – deductive approach; 6. Types of Research Methods – Inductive Approach.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ADVANCED ARCHITECTES FOR CALCULATION SYSTEMS

CODE: D27ICCM208
ECTS CREDITS: 5
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course aims to introduce the basic concepts of advanced computing systems, hierarchical and non-linear switches and parallel programming. The lab is designed to fix the theoretical knowledge and to create application design/ programming skills while utilizing parallel programming through practical applications, exercises and problems.
COURSE CONTENTS: 1. Computing System; 2. Structure Description of Numerical Systems; 3. Hierarchical Switches; 4. Unrearching Switches; 5. Parallel Processing Levels; 6. Flynn Taxonomy; 7. SIMD Structure; 8. MIMD Architectures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: WEB SERVICE TECHNOLOGIES

CODE: D27ICCM209
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The course offers advanced concepts on Web applications: architecture, modelling and engineering of Web systems. Through the lab sessions, students gain practical experience with current technologies and frameworks, as well as problem-solving skills. It is also about acquiring skills for analysing requirements, defining specifications, designing, implementing, testing and managing the lifecycle of Web applications, as well as improving its performance.
COURSE CONTENTS: 1. Requirements engineering for web applications; 2. Web application modelling; 3. Architectures for Web applications; 4. Technologies for Web applications; 5. Testing Web Applications; 6. Operation and maintenance of Web applications; 7. Web project management; 8. Web application development process; 9. Usability of Web applications; 10. Performance of web applications; 11. Web application security; 12. Semantic Web; 13. Social and participative Web (Web 2.0).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: MODELING AND SIMULATION OF DISTRIBUTED SYSTEMS

CODE: D27ICCM210
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): Synthesis of the principles of modelling and simulation of distributed computing systems; the in-depth knowledge of

discrete systems (with events) that delimit them from a systemic point of view, as well as associated processes; studying patterns and fitting them into model classes; developing skills to build analytical models that take into account the specificity of a system and less the degree of detail required; introducing the general simulation methodology as a *unifying study mode*; developing practical skills to design and use simulation tools.
COURSE CONTENTS: The course is divided into two parts each containing several tutorials presentations. Every presentation is run in 1-2 weeks during the semester and ends with homework. Part I: Statistical Performance (Estimated): 1. Mathematical Fundamentals in Modelling and Assessing Systems Performance; 2. Analytical modelling of dynamic systems with discrete events; 3. Statistical methods for dynamic systems with discrete events; 4. Simulation of dynamic systems with discrete events. Acceleration of execution: Parallel and distributed simulation. Gradient techniques. Part II: Measured Performance: 5. Performance Measurement. Errors and confidence intervals; 6. Hardware performance metrics; 7. Methods and Techniques for Improving Hardware Performance; 8. Measures for software performance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: NUMERICAL DRIVING ALGORITHMS OF PROCESSES

CODE: D27ICCM211
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the formation of future engineers, computer specialists and information technology, by acquiring and using the fundamentals of numerical automation: analysis, design and implementation of numerical management systems. The aim is to consolidate the concepts of the theory of discrete and sampling regulation systems, to deepen some methods of design and implementation of numerical driving algorithms, as well as of the numerical algorithms obtained by meshing the continuous algorithms over time.
COURSE CONTENTS: 1. Definition and structure of discrete systems in time: continuous functions and discrete functions over time, definition of discrete time systems, purely discrete systems and systems with sampling; 2. Z direct and inverse transformation; 3. Numerical automatic regulation systems; 4. Discrete systems in the time domain; 5. Discretization of continuous systems; 6. Examples of Matlab implementation of conventional control systems; 7. Numerical control systems with finite duration of the transient regime; 8. Method of direct design of numerical control algorithms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: NETWORK SERVICES MANAGEMENT

CODE: D27ICCM212
ECTS CREDITS: 5
COURSE TYPE:
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: GRID SYSTEMS

CODE: D27ICCM213
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course aims at introducing basic concepts on GRID systems and parallel calculus. Mathematical models of parallel calculus and its limits are presented. The lab has the role of fixing the theoretical knowledge and creating parallel programming skills through practical applications, exercises and problems.
COURSE CONTENTS: 1. The concept of parallelism; 2. General characteristics of parallel calculation models; 3. Performance indicators of parallel calculation; 4. Mathematical models of parallel computation; 5. The Law of Amdahl; 6. Limits of parallel calculation; 7. Levels of parallelism; 8. Control of competing processes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ICCM214
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Carrying out the exploratory research process; 2. Conducting the final research process; 3. Applying methods of collecting research data; 4. Apply quantitative data collection methods to research data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: APPLICATIONS FOR GRID STRUCTURES

CODE: D27ICCM315
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The course aims to introduce the basic concepts regarding the design

and implementation of the applications to be run in Grid structures. The laboratory has the role of fixing the theoretical knowledge and creating the design/ programming skills of the applications used in grid structures through practical applications, exercises and problems.
COURSE CONTENTS: 1. Evolution of Grid Systems; 2. High performance computing infrastructure; 3. Implementation of Grid Production Systems; 4. Anatomy of Grid Systems; 5. Open Grid architecture; 6. Grid Structures; 7. Grid Web Services and Applications; 8. Databases and Grid; 9. Data Grid systems; 10. Virtualization of "Data Grid" services; 11. Peer-to-peer Grid Systems; 12. Grid databases; 13. Grid computing environments; 14. Classify Grid Applications; 15. Middleware for Grid computing; 16. Allocating and controlling Grid resources; 17. Storage systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SERVICE-ORIENTED ARCHITECTS

CODE: D27ICCM316
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course introduces the students in the field of multi-agent systems and technologies. It goes from multi-agent systems architectures, multi-agent programming, multi-agent learning algorithms, and multi-agent systems development methodologies, respectively. A component of the course covers the problem of modelling strategic interactions among agents, using game theory
COURSE CONTENTS: 1. Introduction to multi-agent systems; 2. Multi-agent systems architectures; 3. BDI Architecture; 4. Programming Jason/ AgentSpeak; 5. Markov decision issues; 6. Learning by rewarding; 7. Introduction to game theory; 8. Extended games; 9. Coalition of agents; 10. Multi-agent methodologies; 11. Methodology of Prometheus; 12. Multi-agent systems "data-driven"; Multi-agent learning elements; 13. Multi-agent learning algorithms in the "deep-learning" sphere; 14. Neural Networks. Computational limits.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam and homework

COURSE TITLE: SENSORS AND ACTUATORS

CODE: D27ICCM317
ECTS CREDITS: 5
COURSE TYPE: optional
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: CRITICAL INFORMATION SYSTEMS

CODE: D27ICCM318
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The objective of the course is to introduce students to the principles of specification and development of critical information systems, acquisition of key processes associated with their life cycle, knowledge of programming engineering standards for critical information systems. Upon completing the course, students will have the necessary knowledge of how complex computer critical systems can be developed by software engineers, applying industry standards.
COURSE CONTENTS: 1. Introduction to critical information systems; 2. Software development processes for critical information systems: 2.1 Lifecycle model; 2.2 Software Engineering and Development Process; 3. Generic software development standards for critical information systems: 3.1 European Space Agency Standard; 3.2 American Standard MIL-STD-498; 4. Standards for Critical Information Systems in Aeronautics: DO 178B.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: DEVELOPMENT OF APPLICATIONS FOR INCORPORATED SYSTEMS

CODE: D27ICCM319
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the expansion of the knowledge of programming engineering with emphasis on highlighting the specific application development elements for the embedded systems. The specific objectives pursued are: development of program units and elaboration of related documentation for different embedded systems identification of appropriate methodologies for the development of embedded systems software systems, use of methodologies, specification mechanisms and development environments for the implementation of information systems applications incorporated.
COURSE CONTENTS: 1. Introduction: Defining embedded systems, Embedded system characteristics, Embedded systems examples, Typical architecture of embedded system, Embedded system design stages; 2. Embedded Systems Interface Systems: Interface Levelling Layout Principles, Interface Level 1 Interface Transfer, Interface Level 2 Interface Transfer - Numeric Input Modules, Numeric Output Modules, Analogue Input Modules, analogue output modules, Applications – design of interfaces specific to embedded systems; 3. Applications: Step-by-step motors control, DC drive control, LCD display control.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: TESTING INCORPORATED SYSTEMS

CODE: D27ICCM320
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the training of future computer engineers and information technology specialists in the development of embedded systems, providing them with knowledge in the field of embedded systems testing. Basic concepts and advanced concepts in techniques and unit testing methods for embedded systems are addressed.
CONTENTS OF THE COURSE: 1. Introduction: Definitions, Terminologies; 2. Test Types: Smoke Testing, Exploratory Testing, Black Box Testing, White Box Testing; 3. Testing situations: Test unit, Subsystem test, System integration test, Regression test, Acceptance test, Beta test.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: APPLICATION OPTIMIZATION IN DISTRIBUTED INFORMATION SYSTEMS

CODE: D27ICCM321
ECTS CREDITS: 5
COURSE TYPE: optional
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING (EDUCATION, RESEARCH AND DOCUMENTATION)

CODE: D27ICCM322
ECTS CREDITS: 5
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Carrying out the exploratory research process; 2. Conducting the final research process; 3. Applying the methods of collecting the research data; 4. Applying the methods of quantitative collection of the research data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 2ND SEMESTER

COURSE TITLE: RESEARCH ACTIVITY

CODE: D27ICCM423
ECTS CREDITS: 15
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Data analysis in the research of the chosen topic; 2. Validity and ethical considerations in research; 3. Methods of presentation of discovered research; 4. Quantification of data; 5. Quality presentation of the data; 6. Data analysis - Quantitative analysis of the data obtained; 7. Analysis of data - qualitative analysis of the data obtained.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICAL STAGE FOR DISSERTATION PROJECT

CODE: D27ICCM424
ECTS CREDITS: 15
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The discipline aims to coordinate in a methodical manner the activity of the master student in order to elaborate the final dissertation paper. The student will establish together with his / her coordinator the objectives to be achieved by the project, select the software tools for the project development, make a bibliographic research on the topic and determine the activities to be carried out in a clear calendar so that resulting in a finite quality and functional product. The student will have to submit the results of the activities carried out at the deadlines.
COURSE CONTENTS: 1. Bibliographic research, establishing the research objectives; 2. Research plan; 3. Requirements analysis; 4. Design; 5. Implementation; 6. Testing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

FIELD: MECHATRONICS AND ROBOTICS
PROGRAMME TITLE: MANAGEMENT SYSTEMS IN ROBOTICS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ARCHITECTURE AND SYSTEMS IN ROBOTICS AND MECHATRONICS

CODE: D35SCRM101
ECTS CREDITS: 5
TYPE OF COURSE: compulsory, advanced knowledge
COURSE OBJECTIVE(S): Study of methods and principles of design of robotic systems; Developing skills for designing advanced robotic systems.
COURSE CONTENTS: 1. Introduction to the subject of the course; 2. Methods and techniques of kinematic and dynamic analysis of robots; 3. Sensor and measurement systems for industrial robots; 4. Conventional and advanced robot drive systems; 5. Man-robot interfaces; 6. Artificial vision systems for robots; 7. Algorithms for the management of robotic and mechatronic systems under the influence of the external environment; 8. Advanced robot industrial structures; 9. Non-conventional mechatronic structures based on biological models.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (80% of the final grade), laboratory assessment and homework (20% of the final grade)

COURSE TITLE: BIONICS

CODE: D35SCRM102
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Study of methods and principles of design of bionic systems; Developing skills for designing advanced mechatronic systems based on biomimetics.
COURSE CONTENTS: 1. Introduction to the subject of the course; 2. Methods and techniques of sensory interaction with the virtual and real environment; 3. Psychophysics of haptic perception of mechanical properties; 4. Self-acceptance and reaction of force type; 5. Simulation of deformable objects; 6. Structures and mechanical architectures of bionic devices; 7. Algorithms for designing a haptic interface; 8. Algorithms for designing a bionic interface for human-robot communication; Bionic interfaces for interaction with biological environments; 9. Bionic systems for people with disabilities and the elderly
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (80% of the final grade), laboratory assessment and homework (20% of the final grade)

COURSE TITLE: APPLICATIONS WITH NUMERICAL COMMANDS

CODE: D35SCRM103a
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The discipline contributes to the mastering of numerical control, the execution of the programs in the manual language and assisted language. The course aims to develop concepts on: manual and assisted programming, assimilation of different types of assisted languages. The laboratory has the role of fixing the theoretical knowledge and of creating practical skills in the programming of numerically controlled machines.
COURSE CONTENTS: 1. Machine tools with subtraction processing: Principles of substractive processing. Scissors; MUCN Elements; Technological information; Types of machining: Line point, linear, contouring, choice of cutting tool; Tool correction; Adaptive Advance Programming in G-Code Language – Common Instructions; Structure of a program written in G-Code; Simulation of the execution of programs written in the G-Code and debugging the program code; Programming principles for grapes; Programming principles for milling machines; 2. Machine tools with additional processing: Principles of additive processing; Addition MUCNs; Technological information; Making parts by depositing molten material; Making parts by successive deposition of cut layers; Design strategies for the parts to be achieved by additive processing technologies; Generating STL and AMF files Production planning to optimize material consumption, based on available technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): The final grade is 50% continuous laboratory assessment, 50% grid exam.

COURSE TITLE: VIRTUAL ROBOTICS AND MANUFACTURING

CODE: D35SCRM103b
ECTS CREDITS: 5
TYPE OF COURSE: specialty, optional
COURSE OBJECTIVE(S): The course aims at introducing theoretical basic concepts for virtual processes using the computer. It contributes to the formation of future specialists in modeling, simulation and processes control, providing them with knowledge in the field of robotics and virtual manufacturing. Basic concepts used in the design and implementation of virtual systems are addressed.
COURSE CONTENTS: 1. Introduction to virtual reality; 2. Basic concepts of VRML; 3. Other programming languages for describing virtual reality; 4. Applications of virtual reality. Equipment; 5. Virtual robotics; 6. Virtual manufacturing.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): The final grade is 30% continuous laboratory assessment, 70% written exam.

COURSE TITLE: MICROCONTROLLERS AND INTEGRATED SYSTEMS

CODE: D35SCRM104
ECTS CREDITS: 3
TYPE OF COURSE: knowledge, compulsory
COURSE OBJECTIVE(S): Knowledge of architecture (hardware/ software) and the operation of typical embedded systems; Knowledge of architecture and specific peripheral resources for representative microcontroller families and development and testing environments (software, hardware, simulation); Developing the capability and choice of a microcontroller (computing power, resources, software, other criteria) as a platform for a built-in system.
COURSE CONTENTS: 1. Integrated Development Environment (IDE) programming environment, GCC Toolchains, (Re)introduction to C language, standards; 2. Re (introduction) in the architecture of computer systems: Von Neumann, Harvard, memory systems, microprocessors, microcontrollers, digital signal processors, I/O management; 3. Architecture of a built-in system, software and hardware levels, microcontrollers, and several associated concepts: models, functions, benefits, constraints. Other built-in systems: PC/ COTS, SOC, functions and subsystems, ETX/ COM, PC-104; 4. Microcontrollers: introduction, overview, applications, features, representative families; 5. Microchip AVR/ XMEGA family 8 bits: central unit architecture, registers, instructions, memories (program and data), clock generation system, fuses; 6. Microchip AVR/ XMEGA 8 bits: reset, input-outputs (I / O ports), interrupts; 7. 8 bit AVR/ XMEGA microchip: Timer/ counting system, external interrupts, use of interrupts with WinAVR compiler; Analog inputs, analog-to-digital conversion system 8. Microchip AVR/ XMEGA 8 bits: serial communication; RS-232, RS422/ 485, U (S) ART and asynchronous serial communication; SPI, TWI (I2C), USI, serial synchronous communication; 9. Integrated software development (IDE) environment for the 8 bit AVR/ XMEGA family; Programming methods (hardware interfaces) for 8-bit ATMEL AVR microcontrollers; 10. ARM center family of families: introductory notions, ARM-Cortex-M.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination with argumentation (100% of the final grade).

COURSE TITLE: MICROCONTROLLERS AND INTEGRATED SYSTEMS – PROJECT

CODE: D35SCRM105
ECTS CREDITS: 2
TYPE OF COURSE: knowledge, compulsory
PROJECT OBJECTIVE(S): The project aims to apply the basic concepts of designing and implementing a built-in system application, familiarizing with some of the typical means used to develop and test such an application. The project has the role of fixing some theoretical knowledge and of understanding the design and realization of a simple embedded system application.
PROJECT CONTENTS: The project consists of an application that manages numerical inputs and outputs (switches, LEDs, 7-segment displays) for a 8-bit Microchip AVR microcontroller, written in C language, with an imposed individual theme (hardware and software behavior); application functionality is/ must be demonstrated by integrating the microcontroller system and the software application using a system simulator (Proteus VSM).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Presentation/ public defence of the project

COURSE TITLE: CRITICAL INFORMATION SYSTEMS

CODE: D35SCRM106
ECTS CREDITS: 5
COURSE TYPE: advanced knowledge
COURSE OBJECTIVE(S): The objective of the course is to introduce students to the principles of specification and development of critical information systems, acquisition of key processes associated with their life cycle, knowledge of programming engineering standards for critical information systems. Upon completing the course, students will have the necessary knowledge of how complex computer critical systems can be developed by software engineers, applying industry standards.
COURSE CONTENTS: 1. Introduction to critical information systems; 2. Software development processes for critical information systems: 2.1 Lifecycle model; 2.2 Software Engineering and Development Process; 3. Generic software development standards for critical information systems: 3.1 European Space Agency Standard; 3.2 American Standard MIL-STD-498; 4. Standards for Critical Information Systems in Aeronautics: DO 178B.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: INDIVIDUAL TRAINING (1)

CODE: D35SCRM107
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): The individual training course must be done by each student on the basis of his individual studies on various aspects of engineering related to the direction of study of the chosen Masterate, respectively the robot

management systems and their applications. The bibliographic sources used are books, specialty journals, information on the Internet and in the media that were individually studied by the student during the semester to deepen the Master's field without the direct coordination of a teacher. The aim of this activity is to develop and maintain individual bibliographic exploration skills, continuous information and scientific research.
COURSE CONTENTS: The course consists of an individual paper of the student with the following characteristics: the paper will have an estimated 25-30 page number, will be printed and will have a scientific character corresponding to the level of training acquired through the subjects studied previously and in parallel. The report will be publicly defended. In this regard, each student will prepare a Power Point presentation for approx. 15 minutes that will be exposed to colleagues and the discipline manager.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): This is done in view of the quality of the edited scientific material, the quality of the open presentation using Power Point and videoprojection as well as the way in which the audience questions are answered.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: NON-CONVENTIONAL ROBOTIC ARCHITECTURES
CODE: D35SCRM201
ECTS CREDITS: 5
TYPE OF COURSE: compulsory, advanced knowledge
COURSE OBJECTIVE(S): Description of the principles of unconventional robot architecture; Study of methods and design principles of robots with unconventional architectures.
COURSE CONTENTS: 1. Introduction to the subject of the course; 2. Methods and techniques of analysis and design of robots with unconventional architectures; 3. Standard families of unconventional architectures; 4. Methods of dynamic investigation of robots with unconventional architectures; 5. Sensory systems; 6. Drive systems; 7. Man-robot interface systems; 8. Strategies for managing unconventional robots.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (80% of the final grade), laboratory assessment and homework (20% of the final grade)

COURSE TITLE: ADAPTIVE CONTROL OF ROBOTIC STRUCTURES
CODE: D35SCRM202
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims at presenting the main methods and algorithms for the adaptive control of the robotic structures. It aims to develop the ability to systematically analyze robotic structures in order to implement adaptive leadership. The lab is designed to fix the techniques and methods of designing adaptive systems by simulation in the Matlab environment.
COURSE CONTENTS: 1. Adaptive adjustment structures; Introduction; 2. Adaptive systems with programmable parameters; 3. Structure of adaptive systems with programmable parameters; 4. Adaptive structure with parameter compensation in relation to a disturbance; 5.Adaptive structure with parameter compensation in relation to command sizes; 6. Adaptive adjustment control pattern with reference model; 7. Adaptive adjustment control with self-regulating regulators; 8. Reference model adaptive systems (MRSA); 9. Adjustment mechanisms; 10. Structure of the adjustment mechanism; 11. Methods for solving optimal synthesis problems; 12. Adaptive adjustment systems with self-adjusting regulators; 13. Example of adaptive automatic adjustment systems; 14. Monovariable and multivariable extreme systems; 15. Expose application of adaptive control to robots with mobile robots and passive robots.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: DATABASE PROGRAMMING LANGUAGES
CODE: D35SCRM203
ECTS CREDITS: 3
TYPE OF COURSE: DI
COURSE OBJECTIVE(S): It contributes to the formation of future engineers by providing them with knowledge in the field of organizing information theory through databases. Theoretical knowledge is fixed allowing students to understand the phenomena through various applications. They acquire practical skills in using SQL, PL/ SQL and a suitable SGBDR.
COURSE CONTENTS: 1. Introduction; 2. Relational database management systems (SGBDR); 3. Data Definition Language (DDL) sub-language; 4. Data Manipulation Language (DML) sub-language; 5. SQL data query language (DQL) – Data Query Language; 6. SQL Data Control Language (DCL); 7. SQL Functions; 8. Database Management Elements; PL/ SQL language PL/ SQL Presentation; 10. PL/ SQL functions stored and embedded PL/ SQL procedures Packages, errors, exceptions, cursors, triggers; 11. Administration of transactions and blocking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (80% of the final grade), homework (20% of the final grade)

COURSE TITLE: DATABASE PROGRAMMING LANGUAGES – PROJECT
CODE: D35SCRM204

ECTS CREDITS: 2
TYPE OF COURSE: DI
PROJECT OBJECTIVE(S): Contributes to the formation of future engineers by providing them with knowledge in the field of information organization theory through databases. It aims at introducing basic concepts related to the design of a relational database and assimilating knowledge on the use of BD (SQL, PL/ SQL) specific language and a SGBDR for implementation and management. There are fixed theoretical knowledge that allows students to understand phenomena through various applications. They acquire practical skills in using SQL, PL/ SQL and SGBDR languages suitable.
PROJECT CONTENTS: 1. Analysis of application specifications and requirements; 2. Conceptual schemes (entity-link diagrams) for different scenarios. Specifying entities, attributes, and links between tables. Representation conventions, symbols. Establishment of cardinality, unique identifiers and mandatory attributes; 3. Realization of logical schemes, physical projects and determination of sets of tables for different conceptual schemes. Issues of M-M and Type 3 links are solved. Foreign keys are placed; 4. Presentation and discussion of special situations: recursive relationships, superregions, master entities, relationships, temporal sequencing, historical data etc.; 5. Perform the normalization of the database. For each table it is checked and eventually solved the fulfillment of the requirements of the 6 normal forms, observing the 3 levels is obligatory. Examples of situations requiring a denormalization are given; 6. Implementing, testing and correcting the database. Tables are created, primary keys, foreign keys and restrictions are established. Correct links are checked, data is extracted from multiple tables; 7. Consult the database using different SQL and PL/ SQL commands.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Appreciation by a grade from 1 to 10 of the presentation of the project with video projector and laptop and solving the requirements of the teacher.

COURSE TITLE: MODERN PRODUCTION AND TEHNOLOGIES
CODE: D35SCRM205
ECTS CREDITS: 5
TYPE OF SUBJECT: complementary, compulsory
COURSE OBJECTIVE(S): Contributes to the formation of future mastering engineers in the field of "Control systems in Robotics", specialists in the field of robotics and related computer technologies. Basic concepts used in the design and implementation of robotic production systems are addressed. Theoretical and practical notions related to production systems theory, fundamental control concepts, production control hierarchy structures, distributed control structures in production, supervising flexible manufacturing workshops, manufacturing orders and performance evaluation of production systems are provided.
COURSE CONTENTS: 1. Introductory aspects of the concept of manufacturing; 2. Examples of virtual studies visualized by GUI graphical interfaces; 3. CAR software platforms. CAR ROBOT STUDIO-S4 LITE system; 4. Concepts of fundamental control in production; 5. Hierarchical production control structures; 6. Distributed control structures in production; 7. Supervision of flexible manufacturing workshops; 8. Execution of manufacturing orders; 9. Evaluation of performance of production systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: AUTOMOTIVE CONTROL
CODE: D35SCRM206
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the improvement of engineers in the mechatronics and robotics field, as well as related fields, by providing them with knowledge in the field of automotive regulation systems. Basic concepts used in modeling control systems and computer-aided design of control systems are also addressed. The course aims at introducing the basic concepts regarding the implementation of automotive control systems: general presentation of the main control systems, AUTOSAR as a standard in the automotive industry, detailing the AUTOSAR components, Matlab/Simulink for the design and implementation of control systems, automatic code generation for electronic control units.
COURSE CONTENTS: 1. Automotive control systems; 2. Overview of automotive software architectures; 3. Automotive Open System Architecture; 4. Microcontroller Layer. Role and functionality; 5. ECU Abstraction Layer. Role and functionality; 6. Services Layer. Role and functionality; 7. RTE (Run Time Environment). Application Layer; 8. Implement automation systems in automotive.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: INDIVIDUAL TRAINING (2)
CODE: D35SCRM207
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): The individual training course must be done by each student on the basis of his individual studies on various aspects of engineering related to the direction of study of the chosen Masterate, respectively the robot management systems and their applications. The

bibliographic sources used are books, specialty journals, information on the Internet and in the media that were individually studied by the student during the semester to deepen the Master's field without the direct coordination of a teacher. The aim of this activity is to develop and maintain individual bibliographic exploration skills, continuous information and scientific research.
COURSE CONTENTS: The course consists of an individual paper of the student with the following characteristics: the paper will have an estimated 25-30 page number, will be printed and will have a scientific character corresponding to the level of training acquired through the subjects studied previously and in parallel. The report will be publicly held. In this regard, each student will prepare a Power Point presentation for approx. 15 minutes that will be exposed to colleagues and the discipline manager.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): This is done in view of the quality of the edited scientific material, the quality of the open presentation using Power Point and videoprojection as well as the way in which the audience questions are answered.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ROBUS ROAD DRIVING

CODE: D35SCRM301
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): It contributes to the formation of future engineers in the mechatronics and robotics field, specialists in the analysis, design and management of complex processes, providing them with knowledge in the field of robust systems. Basic concepts used in analyzing and designing robust systems are addressed.
COURSE CONTENTS: 1. Introduction to Robust Systems Theory; 2. Modeling uncertainties; 3. Simulation of uncertainty systems; 4. Robust stability study; 5. Define robust performance; 6. Analysis of robustness of systems; 7. Design robust systems; 8. Analysis of parametric uncertainties; 9. Modern methods of synthesis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam (80% of the final grade), on-the-spot check (20% of the final grade).

COURSE TITLE: MEDICAL ROBOTIC STRUCTURES

CODE: D35SCRM302
ECTS CREDITS: 5
SPECIALTY COURSE OBJECTIVE(S): Study of robotic systems and medical devices. Ability to use medical devices by training technical, medical and computer skills for the design, development, monitoring, use and maintenance of medical devices used in medicine as well as integration of subsystems and component systems.
COURSE CONTENTS: 1. Introduction to medical robotic systems; 2. The kinematics of medical robotic systems; 3. Dynamics of medical robotic systems; 4. Teleoperation of medical robotic systems; 5. Cooperative handling; 6. Medical imaging and guided intervention; 7. Virtual Reality in Medicine; 8. Robots for Physical Assistance; 9. Robots for rehabilitation; 10. Prostheses and orthotics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): oral exam (60% of the final grade), laboratory assessment (10% of the final grade) and individual homework (30% of the final grade)

COURSE TITLE: COMPUTER ASSISTED ENGINEERING

CODE: D35SCRM303a
ECTS CREDITS: 3
TYPE OF COURSE: deepening
COURSE OBJECTIVE(S): The course is based on the skills of using the computer assisted design systems acquired during the Bachelor's degree course. It aims to develop the skills of using the programming environments to assist engineering applications.
COURSE CONTENTS: 1. Introduction to computer-assisted engineering; 2. Physical Reality vs. virtual reality; 3. Scanning technologies with and without contact; 4. Reverse engineering.; 5. Mathematical modeling of curves and 3D surfaces; 6. Laser scanning; 7. Using cameras in scanning applications; 8. Practical problems in processing numerical data from scanning; 9. 3D printing; 10. Examples of scanning equipment; 11. Examples of scanning applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Grid exam

COURSE TITLE: COMPUTER ASSISTED ENGINEERING – PROJECT

CODE: D35SCRM304a
ECTS CREDITS: 2
TYPE OF COURSE: deepening
PROJECT OBJECTIVE(S): The project is based on the skills of using the computer assisted design systems acquired during the Bachelor's degree period. It aims to develop the skills of using the programming environments to assist engineering applications.
PROJECT CONTENTS: 1. Introduction to computer-assisted engineering. Reverse engineering; 2. Laser scan for small objects. Use of own software to process results; 3. Laser scanning for large objects. Extracting dimensional information. Obtaining surfaces; 4. Techniques for Microsoft VBA for AutoCAD; 5. Making routines for creating 2D and 3D pieces; 6. Making Windows Interfaces in Microsoft VBA; 7. 3D printing.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Presentation and project defence

COURSE TITLE: SCADA APPLICATIONS

CODE: D35SCRM303b
ECTS CREDITS: 3
TYPE OF COURSE: specialty, optional
COURSE OBJECTIVE(S): The course aims at introducing basic theoretical concepts regarding SCADA applications. It contributes to the training of future specialists in monitoring, data acquisition and processes and robots control, providing them with knowledge in SCADA (Supervisory Control and Data Acquisition) applications. Basic concepts used in designing and implementing SCADA applications are addressed.
COURSE CONTENTS: 1. Introduction to SCADA; 2. Basic concepts of SCADA applications; 3. Real-time systems; 4. Remote control. Communications; 5. Master Unit MTU. RTU units; 6. Sensors, actuators and connections; 7. OPC Server; 8. Development of SCADA applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam

COURSE TITLE: SCADA APPLICATIONS – PROJECT

CODE: D35SCRM303b
ECTS CREDITS: 2
TYPE OF COURSE: specialty, optional
PROJECT OBJECTIVE(S): The project aims to apply the basic concepts for the design and implementation of SCADA (Supervisory Control and Data Acquisition) applications. The project has the role of applying the theoretical knowledge and of understanding the design and realization of SCADA applications. It contributes to the training of future specialists in monitoring, data acquisition and processes and robots control, providing them with knowledge in the field of SCADA applications.
PROJECT CONTENTS: development of SCADA software
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Public defence of the project

COURSE TITLE: MEDIA AND ADVANCED SOFTWARE TECHNOLOGIES

CODE: D35SCRM305
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Study of the methods and principles of designing a desktop application – using user interfaces. Practical applications will be deployed using .Net Framework technology and dynamic databases stored in the MS SQL Server management system; Developing skills for designing advanced software systems.
COURSE CONTENTS: 1. Introduction to the subject of the course; 2. Oriented Object Programming (POO) in C#; 3. The .NET platform; 4. Visual programmingl; 5. ADO.NET; 6. ADO.net architecture; 7. MS SQL Server; 8. Extensible Application Markup Language (XAML).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam (50% of the final grade), practical project evaluation – C# and MS SQl Server (50% of the final grade)

COURSE TITLE: VIRTUAL INSTRUMENTATION

CODE: D35SCRM306
ECTS CREDITS: 5
COURSE OBJECTIVE(S):
COURSE CONTENTS:
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: INDIVIDUAL TRAINING

CODE: D35SCRM307
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): The individual training course must be done by each student on the basis of his individual studies on various aspects of engineering related to the direction of study of the chosen Masterate, respectively the robot management systems and their applications. The bibliographic sources used are books, specialty journals, information on the Internet and in the media that were individually studied by the student during the semester to deepen the Master's field without the direct coordination of a teacher. The aim of this activity is to develop and maintain individual bibliographic exploration skills, continuous information and scientific research.
COURSE CONTENTS: The course consists of an individual paper of the student with the following characteristics: the paper will have an estimated 25-30 page number, will be printed and will have a scientific character corresponding to the level of training acquired through the subjects studied previously and in parallel. The report will be publicly held. In this regard, each student will prepare a Power Point presentation for approx. 15 minutes that will be exposed to colleagues and the discipline manager.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): This is done in view of the quality of the edited scientific material, the quality of the open presentation using Power Point and videoprojection as well as the way in which the audience questions are answered.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH ACTIVITY

CODE: D35SCRM401
ECTS CREDITS: 15
COURSE TYPE: synthesis

COURSE OBJECTIVE(S): The goal is to develop a step by step research project applying research methodology.
COURSE CONTENTS: 1. Data analysis in the research of the chosen topic; 2. Validity and ethical considerations in research; 3. Methods of presentation of discovered research; 4. Quantification of data; 5. Quality presentation of the data; 6. Data analysis – Quantitative analysis of the data obtained; 7. Analysis of data – qualitative analysis of the data obtained.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

COURSE TITLE: DEPARTMENT WORKSHOP - PRACTICE

CODE: D35SCRM402
ECTS CREDITS: 15
COURSE TYPE: synthesis
COURSE OBJECTIVE(S): The discipline aims to coordinate in a methodical manner the activity of the master student in order to elaborate the final dissertation paper. The student will establish together with his / her coordinator the objectives to be achieved by the project, select the software tools for the project development, make a bibliographic research on the topic and determine the activities to be carried out in a clear calendar so that resulting in a finite quality and functional product. The student will have to submit the results of the activities carried out at the deadlines.
COURSE CONTENTS: 1. Bibliographic research, establishing the research objectives; 2. Research plan; 3. Requirements analysis; 4. Design; 5. Implementation; 6. Testing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination

FIELD: SYSTEM ENGINEERING
PROGRAMME TITLE: EMBEDDED CONTROL SYSTEMS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: EMBEDDED SYSTEMS ARCHITECTURES

CODE: D28SAIM101
ECTS CREDITS: 3
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The course contributes to the training of engineers from the domain of systems engineering, ensuring their knowledge in the field of embedded systems. The concepts needed to design, implement and program embedded systems, mainly with the help of microcontrollers, are addressed.
COURSE CONTENTS: 1. IDE programming media, GCC Toolchains, (Re)introduction to standard C language; 2. Re(introduction) in the architecture of computer systems, memory, microprocessors, microcontrollers, I/O management; 3. The architecture of an embedded system, software and hardware level, microcontrollers, systems with several associated concepts: models, functions, benefits, constraints; 4. Microcontrollers: introduction, overview, applications, features, representative families; 5. Family Introduction – ATMEL AVR 8 bits: central unit architecture, registers, instructions, memories, clock generation system, fuses; 6. ATMEL AVR 8 bits: initialization (reset), digital inputs/ outputs (I/O ports), interruption system (1); 7. ATMEL AVR 8 bits: Timing/ counting system, interruption system (2): external interruptions, use of interrupts with WinAVR compiler; 8. ATMEL AVR 8 bits: analogue inputs, analogue-to-digital conversion system; 9. ATMEL AVR 8 bits: serial communication, RS-232, RS422/ 485, U (S) ART and serial asynchronous communication, SPI, TWI (I2C), USI, synchronous serial communication; 10. ATMEL AVR 8-bit: XMEGA family; 11. Embedded application development software (IDE) for the 8-bit AVR family, programming methods for 8-bit ATMEL AVR microcontrollers; 12. CAN Area Controller (CAN), introduction, applications in automotive industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: EMBEDDED SYSTEMS ARCHITECTURES – PROJECT

CODE: D28SAIM102
ECTS CREDITS: 2
TYPE OF COURSE: advanced knowledge
PROJECT OBJECTIVE(S): The project consists of an application that manages digital inputs and outputs (switches, LEDs, 7-segment displays) for an 8-bit ATMEL AVR microcontroller, written in C, with an individual theme; functionality must be demonstrated by fully simulating the system and application using a system simulator (Proteus VSM).
COURSE CONTENTS: 1. Using AVR STUDIO 4 programming environment and WinAVR compiler – Introduction to C programming of AVR micro-controllers; Using the Proteus VSM system simulator (ISIS 7) with a microcontroller from the AVR family, introduction; 2. AVR Studio, WinAVR, AVR ATiny, Proteus VSM (ISIS 7): digital inputs and outputs, LEDs and switches, software delays; 3. AVR Studio, WinAVR, AVR ATiny, Proteus VSM (ISIS 7): digital inputs and outputs, 7-segment LED displays, software decoders (search tables), timing/ counting system; 4. AVR Studio, WinAVR, AVR ATMega, Proteus VSM (ISIS 7): analog digital conversion system of an AVR microcontroller, serial asynchronous interface (AVR UART) and virtual terminal; 5. AVR Studio, WinAVR, AVR ATMega, Proteus VSM (ISIS 7): ATMEGA88, LCD alphanumeric (HD44780 compatible) modules, modular programming, user libraries.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: ADVANCED PROGRAMMING TECHNIQUES

CODE: D28SAIM103
ECTS CREDITS: 3
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The course contributes to the specialization of automatic control engineers, providing them with knowledge in the field of programming techniques. Advanced programming concepts of microcontrollers and microprocessor systems are addressed. The main objectives of this course are the following: knowledge of advanced programming techniques; learning how to use technologies based on the problem to be solved; to learn the methodology of developing the applications specific to each technology.
COURSE CONTENTS: 1. Introduction; 2. Introduction to assembly languages; 3. Development of a program in assembly language; 4. Techniques for debugging programs; 5. Techniques to work with time; 6. Interfacing; 7. Using Capture/ Compare/ PWM modules; 8. Serial communication; 9. Data acquisition and processing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ADVANCED PROGRAMMING TECHNIQUES – PROJECT

CODE: D28SAIM104
ECTS CREDITS: 2
TYPE OF COURSE: advanced knowledge
PROJECT OBJECTIVE(S): The objective of the project is to apply the theoretical knowledge

acquired during the Advanced Programming Techniques course to the students.
COURSE CONTENTS: 1. PIC18F microcontrollers – general description; 2. Using PICDEM™ PIC18 Explorer Demonstration Board; 3. Use of interruptions; 4. Use of external interruptions; 5. Synchronous serial communication. Master synchronous serial port module (MSSP); 6. analogue Digital Conversion. The analogue to digital converter module (A/D); 7. analogue Digital Conversion. Temperature measurement; 8. Compare/ Capture/ PWM (CCP) module; 9. DC motor control using the CCP module.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: EMBEDDED SYSTEMS FOR PROCESS MONITORING

CODE: D28SAIM105
ECTS CREDITS: 3
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course contributes to the specialization of the engineers from the domain of systems engineering (control systems), providing them with knowledge in the field of embedded structures and their integration into dedicated industrial equipment. The course and laboratory aim to acquire knowledge to: identify areas of use of embedded systems; the appreciation of the technical characteristics imposed on embedded systems to meet specific requirements; choosing and testing embedded systems to optimize implementation of process monitoring applications.
COURSE CONTENTS: 1. Introduction (Processes and their monitoring, specific functions of process monitoring systems, information processing in process monitoring systems, trends in process monitoring); 2. Modules specific to embedded structures for process monitoring (Overview, central processing and communication units, electronic modules for the local user interface, data acquisition interfaces, conditioning circuits, field communication); 3. Application software for embedded process monitoring systems (Requirements for processing the acquired signals, specific processing methods, software tools and development application, development environments); 4. Examples of process monitoring applications using embedded systems (System for monitoring and recording of transient phenomena in control systems, system for monitoring and recording of stationary and transient modes of a control system).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: SOFTWARE TESTING

CODE: D28SAIM106
ECTS CREDITS: 4
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course contributes to the specialization of control engineers in the field of software engineering quality testing. Basic concepts used for software testing in embedded systems are addressed: testing of individual modules, testing of module integration, testing of the entire software on the development board. The course also aims to introduce the basic concepts of embedded system-specific software testing. We review the main test techniques: static testing (without code execution)/ dynamic testing (through code execution), formal testing against MISRA (QAC) rules, functional testing of component modules (with code complexity testing, grade code execution), functional testing of Simulink models (MIL, Model-in-the-loop), hand-generated or automated C code from Simulink (SIL) or PIL (processor- in-the-loop).
COURSE CONTENTS: 1. Paradigms and methods of software testing in embedded systems; 2. Testing standards in embedded systems: metrics used in software testing (SW module testing, equivalence classes, domain limit testing, metrics, module integration testing, software testing, system testing; 3. Presentation of specialized testing tools (Tessy for handwriting C code testing, TPT for code testing from Simulink, automatic reporting of test results).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ELECTRONICS AND INTERFACES FOR INCORPORATED SYSTEMS

CODE: D28SAIM107
ECTS CREDITS: 3
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): Dissemination to system engineers of a basic knowledge package in the field of electronics specific to embedded control systems: basic circuits and commercial modules for the acquisition, conditioning, primary processing of analogue and logic signals and transmission of commands to the execution devices. The objectives are: The theoretical and experimental study of the typical structures of the input circuits and of some analogous interfaces dedicated to embedded systems; Theoretical and experimental study of software tools associated with the sampling and processing of analogue and digital signals specific to embedded control systems.
COURSE CONTENTS: 1. Sensors used for analogue and digital signals from controlled physical processes (general purpose sensors for primary measurements; automotive specific sensors); 2. Signal conditioning circuits for sensors (input conditioning adapters, sensor conversion circuits); 3. Professional inputs for electrical and non-electric inputs and outputs for embedded systems (hot-wire control, cold thread control, push pull outputs, SPIs, Control Basic System Chip).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: NUMERICAL CONTROL ALGORITHMS

CODE: D28SAIM108
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The course contributes to the formation of systems engineers, specialists in control systems, assisting them in the field of designing numerical algorithms and their implementation on microprocessors/ micro-controllers/ digital signal processors. Students will learn to: design numerical control algorithms, starting from the requirements imposed on a microprocessor-based management system; to use modelling and simulation methods for numerical control systems; to implement the computed algorithms on numeric devices and to evaluate their performance.
COURSE CONTENTS: 1. Discrete systems; 2. Sampling systems; 3. Z Transform; 4. Stability of discrete systems; 5. Numerical control systems; 6. Numerical control algorithms; 7. Discretization of continuous systems; 8. Finite length words and the structure of the compensator.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: RESEARCH 1

CODE: D28SAIM109
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in embedded control systems and consists in the development of specific research and development activities in a chosen theme at the beginning of semester 1.
COURSE CONTENTS: Students will learn to carry out research and design activities; develop a research plan; perform advanced individual documentation using internationally indexed databases; perform a preliminary study; use computer applications to carry out complex projects for embedded systems; use design, modelling and simulation methods for control systems; implement and evaluate embedded control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: SOFTWARE STRUCTURES FOR REAL TIME APPLICATIONS

CODE: D28SAIM201
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the training of specialists in embedded control systems, by acquiring and using real-time executions and real-time application programming and programming techniques, and presents the basic concepts on the real time management of processes in the following directions: methods and possibilities of realization of a real time executive, the structure of the embedded control systems, the organization of some applications for the management of the processes under the command of a real time executive.
COURSE CONTENTS: 1. Real time computing systems; 2. Basic concepts in real time programming; 3. Real Time Primitives for Resource Management; 4. Software structures specific to real-time control applications; 5. Numerical control algorithms; 6. Schedule real-time applications using a real-time executive.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: AUTOMOTIVE CONTROL

CODE: D28SAIM202
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the specialization of control engineers and process engineers, providing them with knowledge in the field of automotive control systems. Basic concepts used in modelling, control systems and computer-aided design of control systems are addressed. The course aims at introducing the basic concepts regarding the implementation of automotive control systems: general presentation of the main control systems, AUTOSAR as a standard in the automotive industry, detailing the AUTOSAR components, Matlab/Simulink for the design and implementation of control systems, automatic code generation for electronic control units.
COURSE CONTENTS: 1. Automotive control systems; 2. Overview of automotive software architectures; 3. Automotive Open System Architecture; 4. Microcontroller Layer. Role and functionality; 5. ECU Abstraction Layer. Role and functionality; 6. Services Layer. Role and functionality; 7. RTE (Run Time Environment). Application Layer; 8. Implementation of control systems in automotive.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DIGITAL SIGNAL PROCESSORS

CODE: D28SAIM203
ECTS CREDITS: 5
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course contributes to the training of systems engineers as specialists in embedded control systems, providing them with knowledge in the field of digital signal processing, both at software level and at hardware level. Basic concepts used in the design and implementation of embedded control systems are addressed. Master students will learn to: formulate the requirements imposed on a digital signal processing system for use in process management; use design, modelling

and simulation methods for digital signal processing systems at both hardware and software levels; evaluate the performance of structures used in digital signal processing.
COURSE CONTENTS: 1. Introduction to digital signal processors; 2. Digital signal processing systems; 3. Texas Instruments hardware architecture; 4. Hardware architecture of Microchip processors; 5. Hardware design with processors in the Texas Instruments and Microchip families; 6. Real-time embedded applications developed using CompactRio embedded systems with FPGA from National Instruments.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DRIVE SYSTEMS

CODE: D28SAIM204
ECTS CREDITS: 3
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course contributes to the deepening of knowledge of control engineers, assuring them knowledge in the field of drive systems. The basic concepts and methods used in the design and implementation of drive systems are addressed. Students will learn to: formulate requirements for a process management system; use design, modelling and simulation methods for drive systems; to evaluate the performance of the structures used in the drive systems.
COURSE CONTENTS: 1. Structure and functions of drive systems used in automotive industry; 2. Command, Protection and Monitoring Schemes for Drive Systems – Conventional Synthesis and Implementation Methods and Programmable Controllers; 3. DC drive control systems; 4. Static converters for drive systems; 5. Control systems for motor drive; 6. Hydraulic and electrohydraulic drive control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: DRIVE SYSTEMS – PROJECT

CODE: D28SAIM205
ECTS CREDITS: 2
TYPE OF COURSE: thoroughgoing study
PROJECT OBJECTIVE(S): The project has the role of fixing the theoretical knowledge and of understanding the phenomena through practical applications.
COURSE CONTENTS: 1. Control system design for the speed of the D.C. motor; 2. Designing the asynchronous motor speed control system at constant U/f; 3. Design and simulation of the inverter (rectifier + inverter) system of an asynchronous motor; 4. Direct field adjustment methods with field orientation of the asynchronous machine; 5. Indirect field control methods with field orientation of the asynchronous machine; 6. Controlling the synchronous machine by using the field orientation principle; 7. Nonlinear control algorithms for electric machines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: COMMUNICATION SYSTEMS AND NETWORKS

CODE: D28SAIM206
ECTS CREDITS: 3
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course contributes to the formation of control systems engineers, assisting them with knowledge in the field of communication systems and networks, as well as the transmission of information. Basic concepts used in the design and implementation of data transmission systems are addressed. Students will learn to: formulate the requirements imposed on a system for data transmission with applications; use design, modelling and simulation methods for data transmission systems; to evaluate the performance of structures used in data transmissions.
COURSE CONTENTS: 1. Broadband transmission systems; 2. Disturbance-rejection transmission systems; 3. Baseband transmissions; 4. Data compression techniques; 5. Local networks for data transmission; 6. Ethernet network; 7. Wireless networks; 8. Advanced communication systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMMUNICATION SYSTEMS AND NETWORKS – PROJECT

CODE: D28SAIM207
ECTS CREDITS: 2
TYPE OF COURSE: thoroughgoing study
PROJECT OBJECTIVE(S): The project has the role of fixing the theoretical knowledge and of understanding the phenomena through practical applications.
COURSE CONTENTS: Basic Modulations Used in TSI (Amplitude Modulation, Frequency and Phase Modulation; Data Transmissions Using Pulse Modulation); Communication channels; Line equalizers; Data compression techniques; Software applications; Wireless networks; Applications in e-Health, smart homes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: RESEARCH 2

CODE: D28SAIM208
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the formation of future specialists in embedded control systems and consists in the development of specific research and development activities in a chosen theme at the beginning of semester 2.
COURSE CONTENTS: Students will learn to carry

out research and design activities; develop a research plan; perform advanced individual documentation using internationally indexed databases; perform a preliminary study; use computer applications to carry out complex projects for embedded systems; use design, modelling and simulation methods for control systems; implement and evaluate embedded control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 1ST SEMESTER

COURSE TITLE: NETWORKED CONTROL SYSTEMS
CODE: D28SAIM301
ECTS CREDITS: 3
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the specialization of control engineers and process engineers, providing them with knowledge in the field of networked control systems. Basic concepts used in the modelling of communication networks, real time executives and their influence on the performance of control systems are addressed. The course aims at introducing basic concepts for the implementation of distributed control systems in networks: general presentation of industrial networks, delays introduced by control networks, simultaneous design of the task scheduler and the controller.
COURSE CONTENTS: 1. Paradigms and methods of designing networked control systems; 2. Sharing computing resources (static tasks planners, dynamic task planners, TrueTime Kernel for modelling the dynamics of multitasking control systems); 3. Sharing communication resources, Industrial networks (Ethernet, CAN and LIN networks); 4. Sharing of computing and communication resources; 5. Network distributed control (TrueTime Network for modelling the dynamics of multitasking control systems implemented in the network, hybrid system dynamics, simultaneous design of task scheduler and controller for multitasking network control systems).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: NETWORKED CONTROL SYSTEMS – PROJECT
CODE: D28SAIM302
ECTS CREDITS: 2
TYPE OF COURSE: synthesis
PROJECT OBJECTIVE(S): The project allows to test the concepts presented in the course in real time and in real Ethernet networks and fixes the concepts presented in the course by practical applications or by modelling and simulation.
COURSE CONTENTS: 1. Installing TrueTime under Matlab/Simulink; 2. Modelling a multitasking control system with 2 DC motors (DCM) using the TrueTime Kernel; Comparative study of the influence of the different scheduling policies (in the case of the 2 DCMs) on the dynamic performance of the control system; 3. Modelling a control system of 2 distributed DC motors; Comparative study of the influence of different communication networks (on the 2 DCMs) on the dynamic performance of the control system; 4. Implementation of real-time xPC operating system under Matlab/ Simulink/ RTW; Real-time xPC operating system testing; 5. Network Communication Testing (UDP) under xPC; Remote control for 2 DCMs distributed in different network nodes under xPC.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: EMBEDDED SYSTEMS DESIGN USING MATLAB-SIMULINK
CODE: D28SAIM303
ECTS CREDITS: 3
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the specialization of control and process engineers, providing them with knowledge in the field of embedded systems designed under Matlab/ Simulink. Basic concepts used in Model Based Design, specific code generation from Simulink models are addressed. The course aims at introducing basic concepts for the implementation of embedded control systems using Matlab/ Simulink: general presentation of Matlab/ Simulink/ Stateflow, Model-in-the-loop (MIL), Hardware-in-the-loop (HIL), or Rapid prototyping.
COURSE CONTENTS: 1. Programming, modelling and simulation environment Matlab/ Simulink/ Stateflow; 2. Model Based Design (MBD) as the design, testing and code generation standard for embedded control applications; 3. Automatic Code Generators: TargetLink (dSpace)/ RealTime Workshop (RTW)/ Embedded Coder; MIL/ SIL/ PIL/ HIL; 4. Configuring code generators for specific microcontrollers; Using dedicated dsPIC libraries under Simulink.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: EMBEDDED SYSTEMS DESIGN USING MATLAB-SIMULINK – PROJECT
CODE: D28SAIM304
ECTS CREDITS: 2
TYPE OF COURSE: synthesis
PROJECT OBJECTIVE(S): The project allows to test the concepts presented in the course in real time and on development boards with PIC18 or dsPIC microcontrollers and fixes the concepts presented in the course through practical applications.
COURSE CONTENTS: 1. Installation of SW Matlab/ Simulink/ Stateflow chain; 2. Basic Matlab features: working with complex array matrix; 3. Matlab modelling extension: Simulink, Basic features; 4.

Stateflow for deploying state machines; 5. dsPIC and PIC18 driver libraries under Simulink, Installation and use; 6. Implementing an angular position control system of a DC motor using Matlab/ Simulink and dsPIC development boards.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: CONTROL SYSTEMS IN AVIATION

CODE: D28SAIM305
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the training of control and process engineers, and of computer scientists, providing them with knowledge in the field of flight control. Basic concepts used in the design and implementation of control systems used in aviation are addressed. Students will learn to: use specific flight control methods; formulate a control problem with aviation applications; use design, modelling and simulation methods for continuous and discrete control systems with aviation applications; to evaluate the performance of control structures.
COURSE CONTENTS: 1. Elements of flight dynamics; 2. Flight with ceded orders; 3. Helicopter (side harness asymmetry, side asymmetry mitigation, helicopter command, flight regimes: fixed flight, horizontal flight, downhill flight); 4. Structure of control systems (conventional control structures – Typical control laws, particularities of dead-time control systems, predictive control, Smith predictor, synthesis of MIMO control systems; Case analysis, aircraft stabilization, status response, LQR algorithm, case study; 5. Automatic Pilot (Vertical Control, Horizontal Control).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: CRITICAL INFORMATION SYSTEMS

CODE: D28SAIM306
ECTS CREDITS: 3
TYPE OF COURSE: advanced knowledge
COURSE OBJECTIVE(S): The objective of the course is to introduce students to the principles of specification and development of critical information systems, acquisition of key processes associated with their life cycle, knowledge of programming engineering standards for critical information systems. Upon completing the course, students will have the necessary knowledge of how complex critical information systems can be developed by software engineers, applying industry standards.
COURSE CONTENTS: 1. Introduction to critical information systems; 2. Software development processes for SIC; 3. Generic software development standards for SICs; 4. Standards for Critical Information Systems in Aeronautics: DO 178B.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: CRITICAL INFORMATION SYSTEMS – PROJECT

CODE: D28SAIM307
ECTS CREDITS: 2
TYPE OF COURSE: advanced knowledge
PROJECT OBJECTIVE(S): The project allows to test the concepts presented at the course and fixes the concepts presented at the course through practical applications.
COURSE CONTENTS: 1. Definition of roles and responsibilities in the team (responsible for the project/ specifications/ development/ verifications and tests); 2. Definition of high level software requirements (HLR) and verification (standard project compliance); 3. Defining the basic architecture; 4. Definition of low-level software requirements (LLR) and verification (standard project compliance); 5. Coding (Java, C++ or C#) and verification (standard project compliance); 6. Unit testing and verification (standard project compliance); 7. Integration/ validation + verification tests (project standard compliance).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: MANAGEMENT OF SOFTWARE PROJECTS

CODE: D28SAIM308
ECTS CREDITS: 5
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): The course contributes to the formation of future master degree engineers, specialists in embedded control systems, providing them with knowledge in the field of development and management of software projects. Basic concepts used in designing, developing and managing software projects are addressed. Students will learn to: formulate the requirements imposed on a system, project or software application; use management, design, modelling and development methods for software systems; to evaluate software project management metrics.
COURSE CONTENTS: 1. Software requirements; 2. Software concept and design; 3. Software implementation; 4. Software testing; 5. Software maintenance; 6. Software Configuration Management; 7. Software Engineering Management; 8. Process engineering software; 9. Software Engineering Models and Methods; 10. Software quality.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: RESEARCH 3

CODE: D28SAIM309
ECTS CREDITS: 5
TYPE OF COURSE: synthesis

COURSE OBJECTIVE(S): Contributes to the formation of future specialists in embedded control systems. The course consists of conducting research-development activities specific to the master program within a chosen theme at the beginning of the semester 3.
COURSE CONTENTS: Students will learn to carry out research and design activities; develop a research plan; perform advanced individual documentation using an internationally indexed database; perform a preliminary study; use computer applications to carry out complex projects for embedded systems; use design, modelling and simulation methods for automated systems; implement and evaluate embedded control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 2ND SEMESTER

COURSE TITLE: RESEARCH 4

CODE: D28SAIM401
ECTS CREDITS: 15
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): Contributes to the formation of future specialists in embedded control systems. The course consists of conducting research-development activities specific to the master program within a chosen theme at the beginning of the semester 4.
COURSE CONTENTS: Students will learn to: carry out research and design activities; develop a research plan; perform advanced individual documentation using an internationally indexed database; perform a preliminary study; use computer applications to carry out complex projects for embedded systems; use design, modelling and simulation methods for automated systems; implement and evaluate embedded control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICE FOR THE DISSERTATION PAPER

CODE: D28SAIM402
ECTS CREDITS: 15
TYPE OF COURSE: synthesis
COURSE OBJECTIVE(S): Contributes to the formation of future specialists in embedded control systems. The course consists of conducting research-development activities specific to the master program within a chosen theme at the beginning of the semester 3.
COURSE CONTENTS: Students will learn to carry out research and design activities; develop a research plan; perform advanced individual documentation using an internationally indexed database; perform a preliminary study; use computer applications to carry out complex projects for embedded systems; use design, modelling and simulation methods for automated systems; implement and evaluate embedded control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

FIELD: SYSTEM ENGINEERING
PROGRAMME TITLE: INFORMATION TECHNOLOGIES IN SYSTEM ENGINEERING
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: OPERATING SYSTEMS

CODE: D28TISM101
ECTS CREDITS: 3
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course aims at understanding the main functions of the operating system and how it performs the abstraction of the computing machine.
COURSE CONTENTS: Introduction; Process management; Process synchronization; Virtual memory; Deploying file systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: EMBEDDED SYSTEMS ARCHITECTURES

CODE: D28TISM102
ECTS CREDITS: 3
TYPE OF COURSE: knowledge
COURSE OBJECTIVE(S): The course contributes to the training of engineers from the domain of systems engineering, ensuring their knowledge in the field of embedded systems. The concepts needed to design, implement and program embedded systems, mainly with the help of microcontrollers, are addressed.
COURSE CONTENTS: 1. IDE programming media, GCC Toolchains, (Re)introduction to standard C language; 2. Re(introduction) in the architecture of computer systems, memory, microprocessors, microcontrollers, I/O management; 3. The architecture of an embedded system, software and hardware level, microcontrollers, systems with several associated concepts: models, functions, benefits, constraints; 4. Microcontrollers: introduction, overview, applications, features, representative families; 5. Family Introduction – ATMEL AVR 8 bits: central unit architecture, registers, instructions, memories, clock generation system, fuses; 6. ATMEL AVR 8 bits: initialization (reset), digital inputs/ outputs (I/O ports), interruption system (1); 7. ATMEL AVR 8 bits: Timing/ counting system, interruption system (2): external interruptions, use of interrupts with WinAVR compiler; 8. ATMEL AVR 8 bits: Analog inputs, analog-to-digital conversion system; 9. ATMEL AVR 8 bits: serial communication, RS-232, RS422/ 485, U (S) ART and serial asynchronous communication, SPI, TWI (I2C), USI, synchronous serial communication; 10. ATMEL AVR 8-bit: XMEGA family; 11. Embedded application development software (IDE) for the 8-bit AVR family, programming methods for 8-bit ATMEL AVR microcontrollers; 12. CAN Area Controller (CAN), introduction, applications in automotive industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: EMBEDDED SYSTEMS ARCHITECTURES – PROJECT

CODE: D28TISM103
ECTS CREDITS: 2
TYPE OF COURSE: knowledge
PROJECT OBJECTIVE(S): The project has the role of illustrating the development of simple embedded system applications with an 8-bit AVR microcontroller, which involves familiarity with typical means of development, testing and validation.
COURSE CONTENTS: The project consists of an application that manages digital inputs and outputs (switches, LEDs, 7-segment displays) for an 8-bit Atmel AVR microcontroller, written in C language, with an imposed individual theme; functionality must be demonstrated by integrating system and application simulation using a system simulator (Proteus VSM). Development tools are required and are provided on a DVD at the beginning of the semester.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: ADVANCED PROGRAMMING TECHNIQUES

CODE: D28TISM104
ECTS CREDITS: 3
TYPE OF COURSE: knowledge
COURSE OBJECTIVE(S): The course presents useful programming techniques especially in the field of embedded systems and digital control systems. The main objectives are: to know the advanced programming techniques, to learn the use of technologies according to the problem to be solved, to learn the methodology of developing the applications specific to each technology.
COURSE CONTENTS: Introduction; Introduction to assembly languages; Developing a program in assembly language; Techniques for debugging programs; Techniques to work with time; Interfacing; Using Capture/ Compare/ PWM modules; Serial communication; Data acquisition and processing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ADVANCED PROGRAMMING TECHNIQUES – PROJECT

CODE: D28TISM105
ECTS CREDITS: 2
TYPE OF COURSE: knowledge
PROJECT OBJECTIVE(S): The project presents useful programming techniques especially in the field of embedded systems. The main objectives are: to

know the advanced programming techniques, to learn the use of technologies according to the problem to be solved, to learn the methodology of developing the applications specific to each technology.
COURSE CONTENTS: PIC18F Microcontrollers – general description; Using *PICDEM™PIC18 Explorer Demonstration Board*; Using interruptions; Using external interruptions; Synchronous serial communication; Master synchronous serial port module (MSSP); Digital Analog Conversion; The analog to digital converter (A/D) module; Analog Digital Conversion; Temperature measurement, Compare/ Capture/ PWM (CCP) module, DC engine control using the CCP module.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: IMAGE PROCESSING SOFTWARE
CODE: D28TISM106
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course contributes to the training of control engineers, applied computer scientists, providing them with knowledge in the field of artificial vision (image acquisition and processing, respectively pattern recognition). The aim is to fix the concepts in the field of artificial vision, the representation of the information contained in the digital images and their use. Students' training is supported in the use of software technologies for the selection and integration of hardware and software components in tl development of practical applications.
COURSE CONTENTS: Image acquisition (sensors, cameras, specialized plates); Geometric transformations and camera calibration; Histograms; Filtering images in the frequency domain; Filtering images in space domain; Convolution masks; Labeling regions; Extracting, thinning and closing contours; Descriptors of shapes; Pattern recognition; Minimum distance classifiers; Statistical classifiers; Artificial applications; Integration of software and hardware; Using the Image Processing module in the MatLAB environment; Image representation and processing techniques.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: HUMAN MACHINE INTERFACES IN AUTOMOTIVE
CODE: D28TISM107
ECTS CREDITS: 4
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course aims to study the methods and principles of human-machine interfaces design, as well as the development of skills for the design of multimodal communication systems.
COURSE CONTENTS: Historical and architectural perspective; Principles, aspect and behavior; The life cycle of human-machine interfaces (Cascade model, V model, Spiral model, IOM models, IOM specific requirements, Star model, Collins model, Curtis & Hefley model, Nabla model, Approaches to designing assisted interface); Ergonomic criteria.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: MANAGEMENT OF RESEARCH AND DESIGN
CODE: D28TISM108
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Contributes to the formation of control engineers, process engineers and applied IT specialists, providing them with knowledge in the field of management of research and design activities. The following aspects are considered: research activity; research stages; research management; developing design activities; design stages; design management.
COURSE CONTENTS: Research and development – introductory notions, classifications, its importance in the national economic and social system; The basics of research; Management of scientific research; Research projects; Design management; EU Research Framework Programs; Designing complex systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING
CODE: D28TISM109
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): as appropriate
COURSE CONTENTS: as appropriate
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: SOFTWARE STRUCTURES FOR REAL TIME APPLICATIONS
CODE: D28TISM201
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course presents the basic concepts regarding the real time management of the processes in the following directions: methods and possibilities of realization and implementation of a real time executive, design and implementation of numerical algorithms of process management, organization of applications for management under command of a real time executive.

COURSE CONTENTS: 1. Real time computing systems; 2. Basic concepts in real time programming; 3. Real Time Primitives for Resource Management; 4. Software structures specific to real-time control applications; 5. Numerical control algorithms; 6. Schedule real-time applications using a real-time executive.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: AUTOMOTIVE CONTROL

CODE: D28TISM202
ECTS CREDITS: 5
TYPE OF COURSE: Specialty
COURSE OBJECTIVE(S): The course aims at introducing the basic concepts regarding the implementation of automotive control systems: general presentation of the main control systems, AUTOSAR as a design standard in the automotive industry, detailing AUTOSAR, Matlab / Simulink components for design and control of control systems, automatic code generation for electronic control units.
COURSE CONTENTS: 1. Automotive control systems; 2. Overview of automotive software architectures; 3. Automotive Open System Architecture; 4. Microcontroller Layer. Role and functionality; 5. ECU Abstraction Layer. Role and functionality; 6. Services Layer. Role and functionality; 7. RTE (Run Time Environment). Application Layer; 8. Implementation of control systems in automotive.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ADVANCED TECHNIQUES FOR DIGITAL SIGNAL PROCESSING

CODE: D28TISM203
ECTS CREDITS: 5
TYPE OF COURSE: knowledge
COURSE OBJECTIVE(S): The discipline contribut to the formation of future engineers, specialists in systems engineering, providing advanced knowledge in the field of digital signal processing for applications in multimedia, biomedical, communications, automotive, etc. The course presents basic concepts and techniques for digital processing of single- and bi-dimensional signals by transformation-based methods, model-based methods and artificial neural network methods.
COURSE CONTENTS: Introduction; Fourier analysis and synthesis; Main Component Analysis (PCA); Adaptive and neural systems; Artificial Neural Networks (RNA) in Signal Processing; Applications of digital signal processing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: VIRTUAL REALITY AND MANUFACTURING

CODE: D28TISM204
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course aims at introducing basic theoretical concepts for virtual manufacturing using the computer. It contributes to the formation of future specialists in modeling, simulation and process management, providing them with knowledge in the field of virtual reality and manufacturing. Basic concepts used in the design and implementation of virtual systems are addressed. The objectives of the discipline converge to the use of virtual reality in three directions: virtual production, virtual robotics and collaborative engineering.
COURSE CONTENTS: Introduction to virtual reality; Basic concepts of VRML; nodes; Prototypes and event processing; Other languages for describing virtual reality; Applications of virtual reality and manufacturing; Equipment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: VIRTUAL REALITY AND MANUFACTURING – PROJECT

CODE: D28TISM205
ECTS CREDITS: 2
TYPE OF COURSE: specialty
PROJECT OBJECTIVE(S): The project has the role of fixing the theoretical knowledge and allowing the understanding of virtual modeling and design through practical applications. Project hours create practical skills for virtual scenes programming and interact with the virtual environment.
PROJECT CONTENTS: Making virtual applications: modeling of production systems; virtual robotics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): project

COURSE TITLE: COMMUNICATION SYSTEMS AND NETWORKS

CODE: D28TISM206
ECTS CREDITS: 3
TYPE OF COURSE: thoroughgoing study
COURSE OBJECTIVE(S): The course contributes to the formation of control systems engineers, assisting them with knowledge in the field of communication systems and networks, as well as the transmission of information. Basic concepts used in the design and implementation of data transmission systems are addressed. Students will learn to: formulate the requirements imposed on a system for data transmission with applications; use design, modeling and simulation methods for data transmission systems; to evaluate the performance of structures used in data transmissions.
COURSE CONTENTS: 1. Broadband transmission systems; 2. Disturbance-rejection transmission

systems; 3. Baseband transmissions; 4. Data compression techniques; 5. Local networks for data transmission; 6. Ethernet network; 7. Wireless networks; 8. Advanced communication systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMMUNICATION SYSTEMS AND NETWORKS – PROJECT

CODE: D28TISM207
ECTS CREDITS: 2
TYPE OF COURSE: thoroughgoing study
PROJECT OBJECTIVE(S): The project has the role of fixing the theoretical knowledge and of understanding the phenomena through practical applications.
PROJECT CONTENTS: Amplitude modulation (carrier and two side strips, suppressed carrier and two side strips, single sideband, quadrature and polar); Frequency and phase modulation; Data transmissions using pulse modulation; Communication channels; Line equalizers; Data compression techniques; Software applications; Wireless networks; Applications in e-Health, smart homes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING

CODE: D28TISM208
ECTS CREDITS: 5
TYPE OF COURSE: specialty
DISCIPLINARY OBJECTIVES: as appropriate
CONTENT: as appropriate
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 1ST SEMESTER

COURSE TITLE: NETWORKED CONTROL SYSTEMS

CODE: D28TISM301
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course contributes to the specialization of control engineers and process engineers, providing them with knowledge in the field of networked control systems. Basic concepts used in the modeling of communication networks, real time executives and their influence on the performance of control systems are addressed. The course aims at introducing basic concepts for the implementation of distributed control systems in networks: general presentation of industrial networks, delays introduced by control networks, simultaneous design of the task scheduler and the controller.
COURSE CONTENTS: Paradigms and methods of designing networked control systems; Sharing of multitasking resources; Sharing communication resources; Industrial networks; Sharing of computing and communication resources; Distributed network control.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: NETWORKED CONTROL SYSTEMS – PROJECT

CODE: D28TISM302
ECTS CREDITS: 2
TYPE OF COURSE: specialty
PROJECT OBJECTIVE(S): The project allows to test the concepts presented in the course in real time and in real Ethernet networks.
COURSE CONTENTS: 1. Installing TrueTime under Matlab/ Simulink; 2. Modeling a multitasking control system with 2 DC motors (DCM) using the TrueTime Kernel. Comparative study of the influence of the different scheduling policies (in the case of the 2 DCMs) on the dynamic performance of the control system; 3. Modeling a control system of 2 distributed DC motors. Comparative study of the influence of different communication networks (on the 2 DCMs) on the dynamic performance of the control system; 4. Implementation of real-time xPC operating system under Matlab/ Simulink/ RTW. Real-time xPC operating system testing; 5. Network Communication Testing (UDP) under xPC. Remote control for 2 DCMs distributed in different network nodes under xPC.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: EMBEDDED SYSTEMS DESIGN USING MATLAB-SIMULINK

CODE: D28TISM303
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S) The course contributes to the specialization of control and process engineers, providing them with knowledge in the field of embedded systems designed under Matlab/ Simulink. Basic concepts used in Model Based Design, specific code generation from Simulink models are addressed. The course aims at introducing basic concepts for the implementation of embedded control systems using Matlab/ Simulink: general presentation of Matlab/ Simulink/ Stateflow, Model-in-the-loop (MIL), Hardware-in-the-loop (HIL), or Rapid prototyping.
COURSE CONTENTS: 1. Programming, modeling and simulation environment Matlab/ Simulink/ Stateflow; 2. Model Based Design (MBD) as the design, testing and code generation standard for embedded control applications; 3. Automatic Code Generators: TargetLink (dSpace)/ RealTime Workshop (RTW)/ Embedded Coder; MIL/ SIL/ PIL/ HIL; 4. Configuring code generators for specific microcontrollers. Using dedicated dsPIC libraries under Simulink.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: EMBEDDED SYSTEMS DESIGN USING MATLAB-SIMULINK – PROJECT

CODE: D28TISM304
ECTS CREDITS: 2
TYPE OF COURSE: specialty
PROJECT OBJECTIVE(S): The project allows to test the concepts presented at the course in real time and on development boards with PIC18 or dsPIC microcontrollers.
COURSE CONTENTS: 1. Installation of SW Matlab/ Simulink/ Stateflow chain; 2. Basic Matlab features: working with complex array matrix; 3. Matlab modeling extension: Simulink. Basic features; 4. Stateflow for deploying state machines; 5. dsPIC and PIC18 driver libraries under Simulink. Installation and use; 6. Implementing an angular position control system of a DC motor using Matlab/ Simulink and dsPIC development boards.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: CONTROL SYSTEMS IN AVIATION

CODE: D28TISM305
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course contributes to the training of control and process engineers, and of computer scientists, providing them with knowledge in the field of flight control. Basic concepts used in the design and implementation of control systems used in aviation are addressed. Students will learn to: use specific flight control methods; formulate a control problem with aviation applications; use design, modeling and simulation methods for continuous and discrete control systems with aviation applications; to evaluate the performance of control structures.
COURSE CONTENTS: 1. Elements of flight dynamics; 2. Flight with ceded orders; 3. Helicopter (side harness asymmetry, side asymmetry mitigation, helicopter command, flight regimes: fixed flight, horizontal flight, downhill flight); 4. Structure of control systems (conventional control structures – Typical control laws, particularities of dead-time control systems, predictive control, Smith predictor, synthesis of MIMO control systems; Case analysis, aircraft stabilization, status response, LQR algorithm, case study; 5. Automatic Pilot (Vertical Control, Horizontal Control).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: CRITICAL INFORMATION SYSTEMS

CODE: D28TISM306
ECTS CREDITS: 3
TYPE OF COURSE: knowledge
COURSE OBJECTIVE(S): The objective of the course is to introduce students to the principles of specification and development of critical information systems, acquisition of key processes associated with their life cycle, knowledge of programming engineering standards for critical information systems. Upon completing the course, students will have the necessary knowledge of how complex critical information systems can be developed by software engineers, applying industry standards.
COURSE CONTENTS: 1. Introduction to critical information systems; 2. Software development processes for SIC; 3. Generic software development standards for SICs; 4. Standards for Critical Information Systems in Aeronautics: DO 178B.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: CRITICAL INFORMATION SYSTEMS – PROJECT

CODE: D28TISM307
ECTS CREDITS: 2
TYPE OF COURSE: knowledge
PROJECT OBJECTIVE(S): The project allows testing the concepts presented in the course on how complex computer critical systems can be developed by teams of software engineers, applying industry standards.
COURSE CONTENTS: 1. Definition of roles and responsibilities in the team (responsible for the project/ specifications/ development/ verifications and tests); 2. Definition of high level software requirements (HLR) and verification (standard project compliance); 3. Defining the basic architecture; 4. Definition of low-level software requirements (LLR) and verification (standard project compliance); 5. Coding (Java, C++ or C#) and verification (standard project compliance); 6. Unit testing and verification (standard project compliance); 7. Integration/ validation+ verification tests (project standard compliance).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project

COURSE TITLE: QUALITY STANDARDS IN INFORMATION SYSTEMS

CODE: D28TISM308
ECTS CREDITS: 5
TYPE OF COURSE: knowledge
COURSE OBJECTIVE(S): The course aims at introducing and assimilating the basic concepts, methods and tools in the field of software quality assurance, necessary for taking the leading roles in the development, management and software maintenance processes.
COURSE CONTENTS: Introduction to software quality assurance; Components of the quality assurance system and software quality factors; Pre-project software quality components; Software

quality components during project life; Software testing – strategies; Software testing – implementation; Ensuring the quality of software maintenance components; CASE (Computer Assisted Software Engineering) tools; Infrastructure components for software quality assurance; Controlling the progress/ evolution of the software project; Metrics and software quality costs; Standards, certifications and software quality evaluations; Organization of personnel to ensure software quality.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: UNASSISTED INDIVIDUAL TRAINING

CODE: D28TISM309
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): as appropriate
COURSE CONTENTS: as appropriate
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH ACTIVITY

CODE: D28TISM401
ECTS CREDITS: 15
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): as appropriate.
COURSE CONTENTS: as appropriate.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: PRACTICE FOR DISSERTATION PREPARATION

CODE: D28TISM402
ECTS CREDITS: 15
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): as appropriate.
COURSE CONTENTS: as appropriate.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

Faculty of Electrical Engineering

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Bachelor's Degree

Duration: 4 years
No. of credit points: 240

Field: *Electrical Engineering*
Programme title:
Electrical and Computer Engineering
Electrical Engineering and Computer Science
Electro-mechanics (full-time and part-time programmes)

Field: *Energy Engineering*
Programme title: Electro-energetic Systems Engineering

Field: *Aerospace Engineering*
Programme title: Aviation Systems and Equipment

Field: *Environment Engineering*
Programme title: Environment Engineering and Protection in Industry

Master's Degree

Duration: 2 years
No. of credit points: 120

Field: *Electrical Engineering*
Programme title:
Energy Quality and Electromagnetic Compatibility in Electrical Systems
Advanced Electrical Systems (English-taught programme)
Applied Electrical Engineering in Environmental Protection and Management
Complex Electromechanical Systems

Field: *Energy Engineering*
Programme title: Automated Energy Systems

Field: *Aerospace Engineering*
Programme title: Complex Systems for Aerospace Engineering

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: ELECTRICAL AND COMPUTER ENGINEERING
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY

COURSE OBJECTIVE(S): Acquire by students of knowledge of theoretical background of linear algebra and analytical geometry, as well as skills training in the use of dedicated computing techniques.

COURSE CONTENTS: Vector spaces; Linear applications; Bilinear forms; Euclidean spaces; Euclidean spaces: Cases E2 and E3; Analytical geometry of space E3; Quadric surfaces. Quadric curves (recapitulation from high school).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MATHEMATICAL ANALYSIS I

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.

COURSE CONTENTS: Course: Elements of multimillion theory (multitudes, functions). Space Rn; Strings and vector vectors in Rn; Continuous functions of several real variables; Different functions and applications at the extremes of functions; Default functions and applications; Applications on curves and surfaces; Power series; Fourier series. Seminar: Exercises for mathematical analysis - recapitulation of the notion of string limit and properties fixed in high school; Exercises with strings and vector vectors in Rn; Exercises with continuous functions of several real variables; Exercises with differentiable functions and applications at extremes of functions; Exercises with default functions and applications; Applications on curves and surfaces; Exercises with series of powers; Exercises with Fourier series.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER ARCHITECTURE

COURSE OBJECTIVE(S): Introduction and understanding of the basic concepts of computer operation and use.

COURSE CONTENTS: Course: Description of algorithms: Data types: whole, real, boolean, character. Examples; Fundamental control structures: sequence, selection, repetition - IF, SWITCH, WHILE, DO-WHILE and FOR instructions; in-out operations. Examples; Functions. Examples; Text files: file label, file object, file processing rules; predefined text file processing functions. Editing strings. Representing numbers in the computer: Representation of natural numbers on any base. The size of a natural number in the base 10. Conversion from any base to base 10, decimal-binary conversion, binary-hexadecimal conversion, binary-octal conversion, hexadecimal-binary conversion, octal-binary conversion. Examples; Representation of binary digit numbers: representation in size and sign, representation in complement of 1, representation in complement of 2; Examples; Moving sign binary numbers. Examples; Representation of real numbers: fixed-floating representation, floating-point representation. Perform operations with real floating point numbers. Examples. Assembly languages: Generalities, advantages and disadvantages of assembly languages; Types of microprocessor registers, assembly instructions - general format, LDA, STA, ADD, SUB, CPA, JMP, and STOP instructions, END and DATA directives. Examples. Operating systems: General, types of operating systems; Key operating system functions: Input-Output Operations - Programmed Transfer, Direct Access to Memory (DMA) Transfer; interrupt management, process management; memory management, file management; providing a user interface; error handling; MS-DOS and Windows operating systems: general; MS-DOS and Windows File and Folder System. The name and path of a file or directory; MS-DOS directory management commands: MKDIR, RMDIR, CHDIR, XCOPY, DIR, TREE. Examples; MS-DOS command files: COPY, RENAME, DEL, TYPE, MOVE. Examples; Command interpreter. Command files. Examples; MS-DOS commands: ECHO, FOR, GOTO, IF. Examples; Definition of a logical unit. Launching programs from the command line. Examples. Communication between computers: Computer network, communication medium, network card. Advantages of using a computer network. Classification of computer networks by size; Structure of a computer network: network topology. Communication protocol; OSI reference model: Physical levels, data link, network, transport, session, presentation, application; TCP/ IP model; Internet addresses. Address classes; Communication equipment: hub, switch, router, modem, cable, connector; Domain Name System (DNS). IPCONFIG, PING and TRACERT commands. Internet browsing: browser, web page, URL, server and FTP client. Laboratory: Paint, Notepad applications; The Wordpad application; Convert numbers from one base to another. The Calculator application; Windows – Files; Windows – Interface; Windows – Internet; Windows – Resources.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: CHEMISTRY

COURSE OBJECTIVE(S): Acquisition of fundamental notions and dimensions of chemistry, explanation and understanding of the principles that control the reactivity of chemical elements and combinations. Structure and substance properties, notions of thermochemistry, chemical kinetics, notions of electrochemistry and electrochemical conversion of energy; corrosion and corrosion protection methods, materials used in the electrotechnical industry.

COURSE CONTENTS: Course: Periodic system and structure of electronic envelopes. Structure of molecules. Properties of substances; Chemical bonds: ionic bonding; the covalent bond; metal bond (electron gas theory, energy band theory, valence bond theory); Characteristic properties of metals (optical, physico-mechanical and chemical). The ability of metals to form alloys; Representative types of alloys. Amalgams; Electrochemistry and electrochemical conversion of energy (potential of electrode, electrical cells, electrolysis, electrochemical conversion of energy); Corrosion and corrosion protection (chemical corrosion, electrochemical corrosion, methods of metal protection against corrosion); Macromolecular compounds (structure, classification, properties, types of polymers used in electrotechnics). Laboratory: Labor protection rules in the chemistry laboratory and presentation of laboratory work; Protection of metallic surfaces against corrosion by copper; Determination of Diesel fuel index; Determining the viscosity of a lubricant with the Engler viscometer; Determination of metal corrosion rate; Analysis of alloys by electrographic method.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERAL ECONOMY

COURSE OBJECTIVE(S): The general economy course contributes to the formation of future electrical engineers, familiarizing them with the main theoretical, legislative and practical aspects related to the composition and functioning of an economy as a whole.

COURSE CONTENTS: Economy; Economy market; Factors of production; Productivity of production factors; Cost and Profitability; Fundamental Income; Main macroeconomic indicators; Economic indicators of investment projects; Cost issues for the decision-making process; The technique of updating money.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION I

COURSE OBJECTIVE(S): Acquiring the theoretical, practical and methodological skills of practicing physical exercise in an organized or independent manner in order to acquire a healthy lifestyle.

COURSE CONTENTS: Gymnastics: basic exercises, aerobic gymnastics; Application paths combined with running, jumps, equilibrium exercises, escalation, climbing skills, etc; Main sports skills of football game (boys), basketball (girls); Bilateral games under similar competition conditions; Evaluation tests.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ASSISTED GRAPHICS I (TECHNICAL DRAWING)

COURSE OBJECTIVE(S): It is one of the basic disciplines of basic engineering training of the curriculum of these specializations, having the role of presenting to the students the theoretical and applied bases of the spatial and spatial representations of the bodies. At the same time, it aims to familiarize students with the main rules of representation in technical and industrial design.

COURSE CONTENTS: Course: Introduction to the study of the technical drawing; Representation of projections; Representation of views and sections; Quotation in the technical drawing; Representing, quoting and marking the threads; The overall drawing. Seminar: Clamp, indicator, composition table; Representation of the geometric figures (square, rectangle, circle, oval, diamond, parallelogram, triangle, trapezoid) at 1:10 scale; Representation of projections; The representation of geometric bodies (cube, rectangular parallelepiped, hexagonal prism, square pyramid, square pyramid trunk, cylinder); Representation of geometric body purgatives (cube, rectangular pyramid, cone, cylinder, square pyramid trunk, hexagonal prism); 3D representation of a piece; View and section of a 3D piece; Quotation; Electrical and Thermal Symbols and Schemes; Representation and quotation of hexagonal threaded parts; Represents a threaded piece; Assembling two pieces with nut with nut; Section through valve with valve.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties:

Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools; application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics: Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.

LANGUAGE OF INSTRUCTION: English

COURSE TITLE: PROFESSIONAL COMMUNICATION

COURSE OBJECTIVE(S): Developing the communication and interaction skills (oral and written) of the students required for adequate communication in the field of qualification and socially accepted, acquiring specific knowledge, skills and attitudes in professional environments and communities.

COURSE CONTENTS: Course: Definitions, models and theories of communication; Professional abstracts and papers; Telephone communication;

IT-assisted communication; The Art of Taking an Interview; Professional and scientific presentations; Preparation of a professional file - CV, letter of intent. Seminar: Inaugural speech; The professional project; The professional poster; Presentation of research results - poster exhibition; Presentation of research results – public presentation of the professional project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNOLOGY OF MATERIALS

COURSE OBJECTIVE(S): Contributes to the formation of future engineers s, familiarizing them with the main theoretical and practical aspects related to the characteristics and operation of the material production facilities.
COURSE CONTENTS: Course: General considerations. The object and importance of the technology of materials. Structure of technological processes. Design of technological processes. Technical and economic indicators. Structural balance charts; Technology of manufacturing of products made of metallic materials. Ferrous and Non-Ferrous Metals Technology; Powder technology; Technology of manufacturing of composite materials. General notions on composite materials. Reinforcing fiber manufacturing technologies; Technologies for the manufacture of metal matrix composites. Technologies for the manufacture of polymeric matrix composite; Ceramics products manufacturing technologies; Technologies for manufacturing intelligent materials. Laboratory: Preparation and expression of the results obtained in the practical works; Experimental determinations for lengths and diameters; Study of the Fe-C diagram; Experimental determination of the properties of foundries alloys; Experimental Determination of the Mixture of Powder Particles Properties; Evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS II

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.
COURSE CONTENTS: Course: Riemann Integrity and its Extensions (Incorrect Integral with Parameters) and Applications (Functions G and b); Integrated curvilinear of the first type and applications; Double Integral and Applications; Triple Integral and Applications; Surface integrity and applications; Field theory elements; operators of field theory; particular fields; Field integration and integral formulas; The reverse of field theory. Seminar: Exercises with integral Riemann and its extensions (incomplete integral with parameters) and applications (functions G and b); Exercises with integral curves of the first type and applications; Exercises with double integers and applications; Exercises with triple integers and applications; Exercises with surface integrals and applications; Exercises with field theory elements, field theory operators and particular fields; Exercises with integral formulas; The reverse of field theory.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNICS

COURSE OBJECTIVE(S): Students acquire the knowledge and skills necessary to acquire professional skills to understand and manage the electromagnetic field phenomena and electric circuits on which the operation of electrical engineering equipment is based. Laboratory work develops practical skills (reading an electrical scheme, making an electrical installation, using measuring instruments) through experimental observations that allow qualitative interpretations and quantit.
COURSE CONTENTS: Course: Electrostatic: Electric charge. Conservation and quantification of electric charge. The Coulomb Theorem. The electric field. Electrical field strength. Electrical flux law. Gauss' theorem. Electrical voltage. Link law between D, E and P. Electrical capacitors. The theorems of equivalent capacity transfiguration. The energy of the electrostatic field. Generalized forces theorems in electrostatic field; Electrokinetic: Electricity. Electricity Conservation Law. The Law of Electric Driving. Dividing circuit elements. The ideal resistor. Ideal power supply. Electric power transfer at the electric current flow (Joule-Lentz effect). Transformation theorems of the resistors connected in series and parallel. Voltage and current resistor divider. DC circuits. Topology. Methods of resolving DC circuits; Electromagnetism: The magnetic field. Magnetic sizes. Magnetization. Magnetic Flow Law. Magnetic circuit law. Ampere's theorem. The Law of Electromagnetic Induction. Magnetic properties of electrotechnical amaterials; Sinusoidal mode: Variable sizes. Complex representation of sinusoidal quantities. Ideal circuits in the c.a. Power in the c. Seminar: The electrostatic field. The Coulomb Theorem. Explanation calculation; Gauss's theorem. Examples of calculation; Electrical capacitor. Examples of calculation; Electrical induction law. Explanation of calculation; The Ampere theorem. Examples of calculation; Circuits of c. Calculation methods; Final evaluation of student activity at the seminar. Laboratory: Instruction on PM standards and tremendous earthquakes. Presentation of papers; Experimental study of some phenomena in electrostatic field;

Resistors. Electrical resistance. Connecting the resistors to cc circuits; Condensers; apacities. Connecting capacitors; Coils. Inductances. The principle of electromagnetic induction law; Electronic circuits; Verifying testimonies. Final assessment of student activity at the lab
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION II

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Aerobics/ Fitness Gymnastics; Application trails combined with treadmills, jumps; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports: Football; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MECHANICAL ENGINEERIG ELEMENTS I

COURSE OBJECTIVE(S): Knowledge, understanding and deepening of the basic notions of mechanics. Learning by students of the knowledge and skills necessary to acquire professional skills for understanding and managing the essential aspects of mechanics regarding statics, kinematics and system dynamics.
COURSE CONTENTS: Course: The theory of sliding vectors; Geometry of the masses; The kinematics of the material point; The solid rigid kinematics and rigid systems kinematics; Dynamics of the material point; Methods of study in dynamics of solid rigid and rigid systems. Getting analytical mechanics. Reduced models of mechanical systems. Laboratory: The theory of sliding vectors; Mass centers; Moments of inertia; The kinematics of the material point; The solid rigid kinematics; Dynamics of the material point; Dynamics of solid rigid
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICS

COURSE OBJECTIVE(S): Acquiring necessary knowledge and familiarization of students with the theoretical methods which describes, at the fundamental level, physical phenomena involving in applications of electrical, energy, aerospace engineering. Formation of skills and abilities necessary to manipulate calculus techniques used in theoretical models which describe physical systems with applicability in electrical, energy, aerospace engineering.
COURSE CONTENTS: Course: Classical (Newtonian) mechanics. Mechanics of a point-particle. Dynamics of a system of particles. Non-inertial frame. Inertial forces; Notions of the mechanics of fluid. Dynamics of ideal fluids. Dynamics of real fluids; Elements of analytical mechanics. The Lagrangian formalism. The Hamiltonian formalism; Elements of classical electrodynamics. The Maxwell equations in vacuum. Electrostatics and magnetostatic of vacuum. Electromagnetic wave in vacuum; Thermodynamics. Principles. Thermodynamics potentials. Equilibrium and phase transition. Elementary notions of classical statistical physics; Elements of relativistic mechanics. Relativistic kinematics and relativistic dynamics. Relativistic energy and Einstein's formula; Introduction to quantum mechanics. Pre-quantum physics. Wave quantum mechanics. Schrödinger equation; Elementary notions of nuclear physics. Nuclear fission and nuclear fusion. Seminar: Elements of vector algebra; Elements of vector calculus; Applications of Newtonian classical mechanics; Usually applications of fluid mechanics in different engineering fields; Applications of Lagrangian mechanics. Applications of Hamiltonian method; The fundamental problem of electrostatics and magnetostatic of vacuum. Applications; Simple thermodynamic systems. Perfect gas and real van der Waals gas. Applications; Applications of relativistic dynamics; Applications of quantum mechanics. Potential barrier. Tunnelling effect.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED DESIGN II

COURSE OBJECTIVE(S): Students training for understanding and acquiring the theoretical concepts of geometrical modeling and their implementation in SolidWoks system.
COURSE CONTENTS: Course: The importance of the CAD system in a manufacturing cycle; CAD system's components; the functionality of CAD software; GEOMETRICAL MODELING FUNDAMENTALS: Methods and techniques of geometrical modeling; 3D geometric modeling. General considerations; INTRODUCTION TO SKETCHING IN SOLIDWORKS 2016: frameworks and sketching methods; geometric navigation; drawing tools; INTRODUCTION TO SKETCHING IN SOLIDWORKS 2016: tools for editing sketches;

FEATURE MODELING: extrude, revolve, sweep, loft, , fillet, chamfer, rib, shell, draft, hole; ASSEMBLY DRAWING. Modeling of the parts in the context of the assembly; 2D DOCUMENTATION 2D: views, sections, details, drawing designs. Laboratory: SOLIDORKS BASICS AND THE USER INTERFACE; INTRODUCTION TO SKETCHING: Applying the theoretical knowledge to create a new part; insert a new sketch, add sketch geometry, establish sketch relations between pieces of geometry, extrude the sketch into a solid; FEATURE MODELING. Achieving the proposed parts by applying the theoretical notions; EXAMPLE OF SHEET METAL MODELING PART; ASSEMBLY MODELING consisting of a subassembly and six other components; GENERATION OF 2D DOCUMENTATION for the parts made during the previous seminar.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties: Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools; application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics: Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.

LANGUAGE OF INSTRUCTION: English

COURSE TITLE: SPECIAL MATHEMATICS I

COURSE OBJECTIVE(S): Ordinary differential equations, fundamental topics and solving such equations. Fundamentlat topics in Statistics;

COURSE CONTENTS: Course: Fundamental topics for differential equations; First order differential equation. General form, normal form. General, particular, singular solution. Cauchy problem. Geometric interpretation of a differential equation, of the solution of a differential equation, of the Cauchy problem solution; First order differential equations integrable by elementary methods. Differential equations with separable variables. Homogenous differential equations. Linear differential equations. Bernoulli, Riccati, Clairaut, Lagrange differential equations. Exact differential equations. Integrating factor. Finding line fields; Existence and uniqueness theorems for Cauchy problem of first order. Stability theorems for differential equations of first order; Linear differential equations of higher order, homegenous and nonhomogenous. Linear independence. Fundamental solution systems. Linear differential equations with constant coefficients. Euler equations; Linear systems of differential equations of first order. Fundamental solution matrix. General solution for a homogenous, nonhomogenous linear system. Linear systesm with constant coefficients; Basic topics in statistics. Random variables. Characteristiv values of a statistical series. Statistical indicators. Variation indicators. Correlation and regression. Regression analysis. Linear Regression. Laboratory: Equations with separable variables. Homogenous equations and reducible to homogenous equations; Linear differential equations. Bernoulii and Riccati equations. Implicit differential equations, Clairaut and Lagrange equations. Exact differential equations and integrating factor method. Finding line fields. Equations that can be reduced to lower order equations; Existence and uniqueness problems for Cauchy problem of first order. Solution dependence problems. Stability problems for differential equation of first order; Solving differential equations of higher order. Finding a fundamental solution system for linear differential equations with constant coefficients. Euler linear differential equations; Linear systems of differential equations of first order. Computing fundamental matrix for linear sistems with constant coefficients. Euler's method to determine a fundamental solution matrix; Study of concrete statistical phenomenon, using characteristic values of statistical generated series, statistical indicators and variation indicators. Making prediction for further behavior of such phenomenon, by using corelation, regression and linear regression.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of fundamental control structures and computer programming.

COURSE CONTENTS: Course: Fundamental types of data: Fundamental, constant, variable types; Arithmetic phrases. Pictures; Attribution instructions; Operations with full bit numbers. Travel operators. Logical operators. Fundamental control structures – algorithms: Relative phrases. Boolean phrases; Operators while, do-while, for; Operators if,?, Switch. Functions: Definition of functions; Passing function parameters; Recursion - Functions templates. Pointers, references, drawings, type C strings: Pointers; References Pointers and one-dimensional paintings; Pointers and multidimensional paintings; Type C strings. Type C files: Text files - Binary files. Structures and unions type C: Structures and unions; Apps: time functions. Classes: The concepts of object programming; Defining a class. Pointerul this. Namespaces - Builders and destroyers; Friendly functions; Standard C ++ files - C ++ standard strings. Overloading operators. Overloading the assignment operator - Overloading arithmetic operators - overloading the incoming/ outgoing operators. Inheritance: Pointers to objects; Inheritance; Types of access; Virtual Functions. Polymorphism; Data and static functions. C ++ files: Text files; Binary files. Treating exceptions: Exceptions; Functional exceptions; Standard exceptions. Standard Template Library: Generic functions; Lists. Vectors. Working with complex

numbers. Laboratory: Fundamental types of data; Arithmetic phrases. Attribution Instruction; Accuracy of calculations. Travel operators. Operators ++ and -. Bit logic operators; Fundamental control structures; Functions; Pointers and references. Operations with type C strings; Processing files in C language; Classes. Operations with C ++ strings; Inheritance; Virtual Functions. Polymorphism; Processing files in C ++; Standard Template Library.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: DATABASE

COURSE OBJECTIVE(S): Students training in the field of database design: familiarizing with the possibilities of using databases regardless of their type and acquiring the ability to design relational databases.
COURSE CONTENTS: Course: DATABASES - FUNDAMENTAL KNOWLEDGE; Concepts; Fundamental objectives of a database; The architecture of a database system; Database management systems; MODELING DATABASES; Concepts; classifications; The relational model. Relational system operators; Examples; RELATIONAL DATABASES DESIGN; Achieving the conceptual scheme of database (entity-link model); Achieving the logical schema (design, diagram) of a database; Physical design of the database; Database Implementation; DATABASES NORMALIZATION; Getting Started. Types of canonical forms; Constraints of integrity; SQL LANGUAGE; Introduction to SQL; Commands to define data; Commands for querying data; SQL functions; COMPETITIVE ACCESS TO DATA AND CONSERVATION OF THEIR CONSISTENCY; THE SECURITY OF ORACLE DATABASE. Laboratory: ORACLE database management system; SQL - structured, universal language for querying databases; Populate the database with tables. CREATE, ALTER TABLE, DROP, RENAME commands; Insert data into tables. INSERT command; Modify the data in the tables. UPDATE, DELETE, TRUNCATE commands; Insert data into tables. MERGE command; Data query. SELECT command; Sorting data. ORDER BY clause; Filtering the table lines. WHERE clause. Use of logical operators; SQL functions. Functions for a single record; SQL functions. Functions for multiple records; Grouping Records. GROUP BY and HAVING clauses; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION III

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Athletics: The long jump technique in place; Utility-application paths; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALOGUE ELECTRONICS

COURSE OBJECTIVE(S): The students will get the fundamental knowledge of analogical electronics, from the main functional and constructive characteristics point of view, but also from practical use posibility point of view. It will also be developed simulation abilities in the electronics domain, but also practical abilities.
COURSE CONTENTS: Course: Fundamentals regarding the continuous current, alternative current, sound waves and complex waves, parameters; Passive circuit components. Matrices of passive components. The transformer and auto-transformer; Amplitude modulation and frequency modulation; Semi-conductive diode; Bipolar transistor with jonctions. Amplifiers with TBJ; Transistors with field effect; Semi-conductive photoelectrical devices and multi-junction semi-conductive devices; Operational amplifiers. OA circuits; Rectifiers; Stabilizing circuits; Oscilators and signal generators; Filters. Laboratory: Labor rules. Presentation and use of the electronical equipment necessary for practical experiments; Presentation of the simulation programs and of the main analysis that will be done during the laboratory; Circuits with semi-condictive diods – simulation; Circuits with semi-condictive diods – practice; Amplifier circuits with bipolar transistors – simulation; Amplifier circuits with bipolar transistors – practice; Amplifier circuits with OA – simulation; Amplifier circuits with OA – practice (it will use the platform Lab Kit PRO); Linear stabilizer – simulation; Linear stabilizer – practice; Signal generators – simulation; Signal generators – practice (it will use the platform Lab Kit PRO); Final eveluation of the laboratory activitie.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTRODUCTION TO ELECTRICAL ENGINEERING

COURSE OBJECTIVE(S): The students acquire competences on basic theory to understand technical subjects taught during the next years of study (electrical machines, electrical measurements, electrical equipment, static converters, electric drives).

COURSE CONTENTS: Course: Role of the engineer in electrical engineering; Electrical measurements. Measurements devices, construction and working principles of analogue devices; Electrical machines. Transformer, asynchronous machine, synchronous machine, DC machine; Electrical apparatus. Switching apparatus (power circuit breaker, disconnector, contactor); Electrical drives. Structure, choice of the driving motor, mechanical loads; Generation of electric energy. Overview on energy generation, thermal power plants, renewable resources (wind, solar, hydraulic); Power electronics. Static converters: types, classification, operation principles. Seminar: Mathematical tools for engineering. Vector algebra; Measurement of electrical quantities; Aplications; Design of a low power transformer; Special transformers; Protection electrical equipment (fuses, relays, surge arresters); Building, reading and understanding of electrical diagrams; Final evaluation of students

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering ; Unit 2. Materials and Technology (Production phase, usage, recycling), Present Simple and Continuous; Unit 3. The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Unit 4. Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; Unit 5. High voltage cables (description, materials, uses), means of expressing the Future; Unit 6. Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Unit 7. Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Unit 8. Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Unit 9. Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice; Unit 10. Engineering design - working with drawings (plan, crosssection, exploded view, elevation, schematic, specification), describing details; Unit 11. Inventions: the incandescent lamp, present and past tenses revision; Unit 12. Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Unit 13. Final revision; Unit 14. Final Evaluation.

LANGUAGE OF INSTRUCTION: English

COURSE TITLE: SPECIAL MATHEMATICS

COURSE OBJECTIVE(S): Intoduction to signal Fourier analysis, applications of fundamental transforms Laplace and Fourier, study of physics experiments using partial differential equations.

COURSE CONTENTS: Course: Complex Analysis. Exponential function; Fourier analysis, Fourier series. Periodic functions. Odd and even functions, periodic extensions. Trigonometric orthonormal system. Fourier coefficients, Fourier series of a function. Parseval formula. Bessel inequality. Fourier series expansion, sine and cosine expansion; Laplace and discrete Laplace (z) tranforms. Fundamental theorems. Laplace transforms of elementary functions. Applications to differential and integral equations. Elementary discrete signals. Detrmine signals obtained by superposing their delayed signals; Fourier transform. Integrable functions (signals). Inverse Fourier and Laplace transforms. Convolution, Parseval and Borel formulas. Sine and cosine transforms. Solving some integral equations, representation as Fourier integral; Linear partial differential equations of order II. Differential equations, initial conditions, boundary problems, Cauchy problem. Clasification of linear partial differential equations, canonical form; Main differential equations of mathematical physics. Separating variables method and superposing effects principle, applied to some fundamental equations, Dirichlet problem for a disk, vibrating string equation, heat equation in an infinite bar. Laboratory: Complex exponential function, properties; Odd and even extension of a function, computing Fourier coefficients, Fourier expansion, sine and cosine expansion, computing the sum of some numerical series; omputing Laplace transforms, finding the original, solving differential and integral equations. Discrete signals. Reccurence relations, superposing delayed signals; Computing Fourier transforms, sine and cosine transforms. Solving integral equations, representation as Fourier integral; Classification of linear partial differential equations of order II, canonical form; Using separating variables method and superposing effects to solve Dirichlet problem for a disk, vibrating string equation and heat in an infinite bar.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: NUMERICAL METHODS FOR ENGINEERS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental notions regarding numerical algorithms with applications in systems engineering.

COURSE CONTENTS: Course: Getting Started. The importance of studying numerical methods. Types of errors; Generate and propagate errors; Using the elementary transformation method and the iterative method; Numerical methods in linear algebra. Numerical solving of equation systems; Linear. Direct methods. The Gauss method; Pivot techniques. Solving linear systems by matrix factorization; Numerical methods for calculating determinants. Finding the inversion of a matrix; The method of successive approximations. Numerical solving of linear equation systems through iterative methods; Separating the roots of a nonlinear equation. Approximate solving equations and systems of nonlinear equations; Numerical methods for determining the characteristic polynomial, its vectors and its own values; Approximate functions. Polynomial interpolation of functions; Lagrange interpolation polynomial; Differential differences; Newton interpolation polynomial; Interpolation using spline functions. The least squares method; Numerical derivation. Finite difference method; Numerical evaluation of the integrals by the trapezium method; Numerical evaluation of integrals by Simpson method and Newton method; Numerical approximation of solutions of differential equations; Presenting mathematical software packages. Laboratory: Getting Started. The importance of studying numerical methods. Types of errors; Generate and propagate errors; Numerical methods in linear algebra. Numerical solving of linear equation systems. Direct methods. The Gauss method; Pivot techniques. Solving linear systems by matrix factorization; Numerical methods for calculating determinants.Finding the inversion of a matrix using the elemental transformation method and the iterative method; The method of successive approximations. Numerical solving of linear equation systems by iterative methods; Separating the roots of a nonlinear equation. Approximate solving equations and systems of nonlinear equations; Numerical methods for determining characteristic polynomial, vectors and of their own values; Approximate functions. Polynomial interpolation of functions. The polynomial of Lagrange interpolation. Differentiated divisions. Newton interpolation polynomial; Interpolation using spline functions. The least squares method; Numerical derivation. Finite difference method; Numerical evaluation of the integrals by the trapezium method; Numerical evaluation of integrals by Simpson method and Newton method; Numerical approximation of solutions of differential equations; Presenting mathematical software packages

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: NUMERICAL PROCESSING OF THE SIGNALS

COURSE OBJECTIVE(S): The students in the electrical field should become familiar with the main aspects related to signals and systems, as well as various techniques used for signal processing.

COURSE CONTENTS: Course: Introduction. Signals and systems. Operations applied to signals; Concepts and basic operations in analog/ numeric and numeric/ analog conversions. The notion of frequency. Sampling of the analog signals. Interpolation; Sinusoidal signals. Operations applied to sinusoidal signals; Harmonic analysis of periodic signals. Spectrum of frequency; Analysis of non-periodic continuous signals. Fourier integral and Fourier transform; Analysis of discrete signals. Discrete Fourier Transform for a finite sequence; Signal filtering. Analog filters. Digital filters. Laboratory: Presentation of safety rules. Presentation of laboratory works; Introduction to Matlab. Matrix calculation. Basic functions; Types of signals; Operations applied to signals; Sinusoidal signals. Characteristic quantities; Operations applied to sinusoidal signals; Finalizing the lab activity. Final test.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROMAGNETIC FIELD THEORY

COURSE OBJECTIVE(S): Introduction and thoroughgoing understanding of the main notions of electromagnetic phenomena with applications in electrical engineering.

COURSE CONTENTS: Course: Introduction. Generalities on the electromagnetic phenomena; Electrostatic field - Coulomb's theorem. Electric field strength. Electric flux density. Electric voltage. Electric potential. Electric flux. Electric flux law. Gauss's theorem. Polarization of bodies. Temporary polarization law. Conductors in electrostatic field. Electrical capacitors. Capacitor networks. Electrical energy. Forces in electric field; Electro-kinetic field - Electric current of conduction, current density. The law of electrical charge conservation. The law of electric conduction. The law of electric energy transformation in electrical conduction process. The theorem of the current line refraction; Stationary magnetic field - The state of magnetization of the bodies. Magnetic flux density. Magnetic field strength. The law of temporary magnetization. Magnetic flux. Magnetic flux law. Biot - Savart - Laplace's formula. Refraction of the magnetic field lines; General laws and theorems of the electromagnetic field - The law of magnetic circuit. The law of electromagnetic induction. The theorem of electromagnetic energy; Magnetic circuits.

Inductances. The magnetic field energy. Forces in magnetic field; General notions of electromagnetic waves. Maxwell's equations. Plane wave. Seminar: Introduction. The electric field created by point charges; The electric field created by different charge distributions. The elementary method; The electric field created by different charge distributions. Electric flux law. Electric potential; Polarization of bodies. Polarization charges. The calculation of the capacity of some capacitors; Electrical capacitors. Capacitor networks; Partial capacities. Energy and forces in the electric field; The electro-kinetic regime; Calculation of the magnetic field. Biot - Savart- Laplace's formula. Ampere's theorem; The law of electromagnetic induction; General laws and theorems of the electromagnetic field; Calculation of inductances; Magnetic circuits; Energy and forces in magnetic field. Laboratory: Specific rules on safety and labor protection. Organizing the working groups. Presentation of lab. Knowing and using the devices and the equipments in the laboratory. Rules in making the wiring; Experimental study of the forces manifesting in the magnetic field; Experimental verification of the electromagnetic induction law; Experimental verification of the magnetic circuit law; Study of magnetically coupled coils; Recovery and guidance session in understanding the concepts and correct interpretation of experimental data; Evaluation of the acquired knowledge and skills.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 2ND SEMESTER

COURSE TITLE: APPLICATIONS IN MATHCAD AND MATLAB

COURSE OBJECTIVE(S): Presentation and analysis of Mathcad and Matlab program products and detailing working possibilities for modeling and solving various electrical engineering applications.
COURSE CONTENTS: Course: Introduction to Mathcad. Computational possibilities in Mathcad; Graphics in Mathcad: 2D graphics. 3D graphics; Editing documents in Mathcad; Vectors and arrays. Operations with vectors and array; Functions and operators in Mathcad. Data files; Introduction to Matlab. Matlab functions of general interest; Numerical and symbolic calculation with Matlab; 2D and 3D graphics in Matlab. Laboratory: Introduction to using Mathcad. Calculation of numerical expressions; Graphical representation of real functions of a real variable. 3D graphic representations; Defining and using vectors and matrices. Making calculations and evaluating expressions; Solving equations and systems of algebraic equations; Interpolation and extrapolation of the functions of a variable; Considerations about symbolic computation. Programming in Mathcad; Laboratory testing: Mathcad; Introduction to the use of MATLAB. Calculation of numerical expressions; Defining and using vectors and matrices; Applications using Matlab control instructions and functions; Solving equations and systems of algebraic equations; Interpolation and extrapolation of the functions of a variable; 2D, 3D graphic representation of real functions; Laboratory testing: Matlab.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION IV

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Fitness - optimizing your physical condition; Utility-applicative skills; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL ELECTRONICS

COURSE OBJECTIVE(S): In-depth knowledge of the operation and parameters of elementary logic circuits; realization of applications with simple combinational and sequential logic circuits
COURSE CONTENTS: Course: Representation of data in digital systems; Theoretical notions, conversions, codes, problem/ examples; Logical gates; Theoretical notions, problems/ examples; Veitch-Karnaugh diagrams; Theoretical notions, problems/ examples; Synthesis of combinational logic circuits; Theoretical notions, problems/ examples; Analysis of Combined Logic Circuits; Theoretical notions, problems/ examples; Encoders and decoders; Theoretical notions, problems/ examples; Multiplexing and demultiplexers; Theoretical notions, problems/ examples; Combinable programmable devices; Theoretical notions, problems/ examples; Latch and bistable; Theoretical notions, problems/ examples; Registers and counters; Theoretical notions, problems/ examples; Synchronous machines; Theoretical

notions, problems/ examples; Memories; Theoretical notions, problems/ examples; Design of digital systems; Exam subjects. Laboratory: Swinging circuits; Inverters, NAND, J-K master-slave; Registers and counters; Monostable, BCD-decimal decoders.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties: Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools; application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics: Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and

colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: MANAGEMENT

COURSE OBJECTIVE(S): To familiarize students with the main concepts and practices in the field of management. To develop organizational and decision-making skills.
COURSE CONTENTS: Course: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Methods and techniques used in decision-making; Process organization; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Information management system: concept, components, functions; Principles of design and improvement of the management information system. The main shortcomings; General management methods and techniques; Specific management methods and techniques; Human resources management: concept and component activities; Managers: definition, features, types of managers, and managerial styles. Seminar: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Methods and techniques used in decision-making; Process organization; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Information management system: concept, components, functions; Principles of design and improvement of the management information system. The main shortcomings; General management methods and techniques; Specific management methods and techniques; Human resources management: concept and component activities; Managers: definition, features, types of managers, and managerial styles.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNICAL MATERIALS

COURSE OBJECTIVE(S): Learning outcomes of the course unit. Students acquire basic knowledge necessary to acquire skills in understanding and explaining chemical, physical, electrical and mechanical phenomena related to electrotechnical materials. Getting started with the application of electrotechnical materials to the electrotechnical and energy industry.
COURSE CONTENTS: Course: Introduction. Theoretical and practical importance of studying the properties of electrotechnical materials and their use in the electrotechnical, electronics, energy, etc. Industries; Structure of electrotechnical materials. Electronic structure of the atom. The effects of crystalline networks. Technical and technological properties of electrotechnical materials; Electrical conduction. Electric conduction in conductive, semiconductor and insulating materials. Superconductivity; Insulation of materials (solid, liquid, gaseous); Electrical polarization. Types of polarization. Dielectric gratings; Magnetization. General magnetic properties. Ferromagnetism. Iron losses; Industrial uses of electrotechnical materials. Laboratory: PM training and emergency situations. Presentation of the laboratory's electrical installation. Working in teams; Analysis of crystalline structures; Roentgen structural analysis of materials; Computation of roentgenogram Debye-Scherrer; Non-destructive methods for analysis of electrotechnical materials; Determination of dielectric rigidity of solid electro-insulating materials; Study of electrical characteristics of brushes of electrical machines; Determination of volume and surface resistivity in solid materials; Determination of capacitance, permittivity and loss factor of solid and liquid dielectric materials; Grapho-analytical determination of permeability variation in the core of a magnetic amplifier; Determination of characteristics of magnetic materials with the Ferrotester; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC CIRCUITS THEORY

COURSE OBJECTIVE(S): The topic specific to the Electrical Engineering is aiming to present the students the main aspects related to the functioning of the electric circuits in different operating regimes, single- or three-phased, normal or abnormal, sinusoidal and/or non-sinusoidal, symmetrical and/or non-symmetrical and transient regimes.
COURSE CONTENTS: Course: Direct current circuits: Generalized Ohm’s law; Kirchhoff’s theorems, powers in dc current; The theorem of maximum power transfer a.s.o; Circuits in sinusoidal regime: Sinusoidal quantities, root mean

square value; Passive linear dipole in sinusoidal regime – parameters; Theorem of maximum active power transfer; Symbolic loop and mesh currents method; Symbolic method of node potentials; Theorems of equivalent voltage and current generators; Matrix equations of circuits; Circuits with or without magnetic couplings; Non-sinusoidal periodic regime of electric circuits: Decomposition in Fourier series, calculation of linear circuits in non-sinusoidal periodic regime with Fourier series; Factors characteristic to the non-sinusoidal periodic waveforms; Power factor in non-sinusoidal periodic regime a.s.o; Electric multi-poles: Equations relating voltages and currents; The equations of the linear two-port four-pole; Reciprocal four-poles; Symmetrical four-poles; Equivalent diagrams of the four-poles a.s.o. Seminar: Direct current circuits; Circuits in sinusoidal regime; Non-sinusoidal periodic regime of electric circuits; Electric multi-poles. Laboratory: The experimental study of linear electric circuits in dc current : theoretical aspects, numerical computations; The experimental study of linear dc electric circuits: experimental results, analyzes, comparisons; The experimental study of the theorems of equivalent generators (Thevenin, Norton) in dc current: theoretical aspects, numerical computations; The experimental study of the theorems of equivalent generators (Thevenin, Norton) in dc current: experimental results, analyzes, comparisons; The experimental study of the R,L, C series circuit in ac current: theoretical aspects, numerical computations; The experimental study of the R,L, C series circuit in ac current: experimental results, analyzes, comparisons; The experimental study of simple circuits with non-linear elements: theoretical aspects, numerical computations; The experimental study of simple circuits with non-linear elements : experimental results, analyzes, comparisons; The experimental study of the passive linear two-port: theoretical aspects, numerical computations; The experimental study of the passive linear two-port: experimental results, analyzes, comparisons.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS THEORY AND AUTOMATIC CONTROL

COURSE OBJECTIVE(S): Introduction of the basic concepts of systems theory (the input-output theory) and of their description through specific characteristics, as well as of the basic issues of automated control. This creates the necessary openness for the dynamic-based approach, as well as the ability to use the automatic control tools – being a first step towards an interdisciplinary approach to engineering problems.
COURSE CONTENTS: Course: Introduction in Systems and signals theory; Input-output transfer of linear dynamical systems: mathematical description, properties; Structural block diagrams, systems output for typical input signals, stability of linear and time-invariant systems; Frequency characteristic and stability of feedback systems. Nyquist criterion; Control systems. Introduction in Control theory; Qualitative indices of step response. Exact synthesis of the controller based on imposed performances; The control problem. The precision of control systems. Stabilization by dynamical compensation; Typical transfer elements. PID control laws. Seminar: Direct and indirect Laplace transforms. Differential equations solving by means of Laplace transform; Transfer functions for linear, invariant and continuous-time technical-physical systems; Block diagrams. The method of elementary transformation of block diagrams; Computing step and impulse responses; The linear systems stability. Algebraic stability criteria; Nyquist criterion for stability of negative feedback systems; Controller conventional synthesis based on the placement of poles and zeros.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 1ST SEMESTER

COURSE TITLE: ELECTROMECHANICAL CONVERTERS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of electromechanical converters, very much used in systems engineering applications. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: General concepts of electric cars; Electric transformer. Constructive elements, operating principle and transformer equations, phasorical diagrams and equivalent schemes. Transformer operating queens: naked, short circuit and load. Parallel coupling and operation of transformers. Operation in non-symmetrical load of transformers; Asynchronous machine. Elements constructive principle and operating regimes. Equations of the asynchronous machine, phasor diagrams and equivalent schemes. Mechanical characteristics, start, speed control and braking of asynchronous motors; Synchronous machine. Constructive elements, principle of operation, equations and phasorical diagrams of synchronous generators. Electromagnetic torque and static angular characteristic. Coupling and parallel operation of synchronous generators. Synchronous motors: equations, operating characteristics and starting methods; DC machine.Constructive components, Generator c.c. derivation. Cc motors: mechanical characteristics, starting, adjusting speed and braking. Laboratory: Work safety training. Presentation of the laboratory; Study of three-phase electric transformers: schemes and groups of connections; The efficiency of the transformer determined by the direct method; Coupling and parallel operation of three-phase transformers; The

three-phase asynchronous motor operating characteristics (direct method); Determination of the asynchronous motor efficiency by the indirect method; Adjusting the speed of asynchronous motors by the rheostatic method; Self Synchronous Generator Study; Start-up and V-sync features of the synchronous engine; Coupling and parallel operation of synchronous generators; Study of the c.c. with separate excitation; Study of the c.c. with excitation bypass; Study of the c.c. with series excitation; Final assessment of laboratory activity
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STATIC CONVERTERS

COURSE OBJECTIVE(S): Acquiring basic knowledge on the principles, operation, performances and design of the static power converters, as well as acquiring skills in their use in the electrical engineering applications.
COURSE CONTENTS: Course: The place of the static converters in the energy flow. Classification of the static converters. Applications of power static converters; Power semiconductor devices: characteristics and control; losses; choice and verification; protection; (Alternating Current) AC/(Direct Current) DC static converters (rectifiers): general theory, practical schemes of single-phase and three-phase rectifiers; bidirectional rectifiers; AC voltage controllers: principle, basic power circuit; control; operation; characteristic quantities; performances; practical schemes; Direct AC/AC frequency converters with natural commutation (cycloconverters): principle; control; operation; performances; practical schemes; DC/DC static converters (DC voltage controllers/ choppers): principle; control; operation; characteristic quantities; performances; practical schemes; Indirect AC/AC frequency converters: classification; particularities; DC/AC static converters (inverters): single-phase voltage source inverters with square wave output; three-phase voltage source inverter with square wave output; three-phase current source inverter with square wave output; Pulse Width Modulation (PWM) inverters. Laboratory: Study of the control circuit and switching characteristics of the Gate Turn-Off thyristor (GTO); Study of the control circuit and switching characteristics of the Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET); Study of the phase angle *control of the rectifiers;* Study of the three-phase bridge controlled rectifier; Study of the buck DC voltage controller; Study of an indirect frequency converter with voltage source inverter and pulse width modulation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL EQUIPMENT I

COURSE OBJECTIVE(S): The discipline purpose is presenting the theoretical basics of electrical equipments functioning , regarding the transient regimes, thermal regimes, electrodynamics and insulation of electrical equipment.
COURSE CONTENTS: Course: Electrical equipment: Classification. Definitions. Rated parameters. Operating regimes; Thermal, dielectric and electrodynamic stresses; Environmental streses. Electrical circuits commutation. Transient regimes: Electrical circuits (RC,RL, RLC) connecting at dc and ac power supply sources; Electrical circuits disconnecting. Transient recovery voltage. Parameters; Three phase shortcircuits disconnecting; Small inductive and capacitive currents disconnecting; Long power transmission lines disconnecting; Disconnecting of phase opposition. Electrodynamic forces: Electrodynamic forces between threadlike and coplanar conductors; Electrodynamic forces in mono phase and three phase a.c. circuits; Steady state and transient regime; 3. Electrodynamic stability of electrical circuits; 4. Forces shielded bars. Thermal regime of electrical equipment: Heat sources. Ways of heat transmitting; Laws of heat transmitting. General equation of heat transmitting; Spatial distribution of temperature in flat walls with losses and no losses; Thermal resistance of a planar wall; thermal resistance of a cylindrical wall; Uniform heating and cooling of current paths. Thermal time constant; Heating in intermittent regime; heating in short-circuit regime. Electrical contacts: Contact resistance. Dependence of contact resistance, the contact pressing force, the temperature of contact point and the voltage drop across the contact; Thermal regimes of the electricl contacts; The electrical contacts vibration; Migration of electrical contact material . Materials and constructive principles. Electrical equipment insulation: Overvoltages. Basic insulating level. Behavior ai short and long-term overvoltages; Liquid , gaseous and solid insulation. Vacuum insulation; Overvoltages protection; Surge arreters with metal oxides; Coordination of insulation; Composite insulation. Seminar: Shortcircuit simulation. Circuit breakers selection; The simulation of the recovery overvoltages; Shortcircuit disconnecting. Circuits with two oscillation frequencies; The computation of electrodynamic forces between filiform and threadlike circuits; busbars. Electrodynamic stability; Transmitting of heating through the planar and cylindrical walls- numerical applications. Thermal stability computation; The computation temperature in electrical contacts. Force rejection in electrical contacts. Laboratory: Study of electromagnetic relays and triggers construction; Study of contactors and low voltage circuit breakers construction; Study of medium and high voltage circuit breakers construction; Study of fuses, disconnectors and surge arreters construction; Study of thermal regimes of iron core coils and current paths of electrical equipment; The simulation of transient regimes; Experimental study of electrical

contacts; Experimental study of electrodynamic forces; Final students evaluation
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC AND ELECTRONIC MEASUREMENTS

COURSE OBJECTIVE(S): The discipline aims at defining and deepening the knowledge regarding the methods and means of measuring the voltages, currents, powers, and energy and non-electric quantities.

COURSE CONTENTS: Course: Physical size and measurement; Measuring electrical means - ways of describing performance; Evaluation of measurement errors; Current measurement; Measurement of electrical voltages; Measurement of power and electricity; Measurement of resistances, inductivities and capacities; Measuring non-electrical quantities. Laboratory: Work safety training. Presentation of the laboratory and the works; Measurement of electrical currents and voltages; Verification of ammeters and voltmeters; Measurement of active power in single-phase AC circuits; Measurement of active power in three-phase circuits without neutral conductor; Measurement of active electrical energy in single-phase AC circuits. Checking the electricity meter; Verification and recovery session.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: OPTIMIZATION TECHNIQUES IN ELECTRICAL ENGINEERING

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the basic concepts of optimization algorithms used in electrical equipment design.

COURSE CONTENTS: Course: The optimization concept. Types of problems; Minimum global. Local minimum. The Weirstrass theorem. Problem size; Classification of optimization methods. Example of minimization - chart drawing between points; gradient vector. The Hessian Matrix. Taylor series development. Examples; Patterns and matrices defined as a sign. Examples; Methods for checking the definition/ semi-determination as a sign: verification of own values; checking the main minors. Examples; Exploration methods and removal methods to resolve unrestricted optimization issues. Examples; Analytical methods to solve optimization problems without restrictions. Necessary and sufficient conditions of extreme freedom. Examples; Search methods for resolving unrestricted optimization issues. Conditions for convergence of search procedures. Stop Criteria; Optimal gradient method to resolve optimization issues without restrictions. Examples; Conjugate direction method to resolve optimization issues without restrictions. Examples; Conjugate gradient method to resolve optimization issues without restrictions. Examples; The Newton-Raphson method for resolving unrestricted optimization issues. Examples; Analytical methods for solving optimization problems with equality restrictions. Lagrange's synthetic function. Lagrange multipliers; Lagrange's multiplier theorem. Sufficient conditions for the extreme. Examples; Analytical methods for solving optimization problems with inequality restrictions. The Fritz-John theorem. Examples; Analytical methods for solving optimization problems with inequality restrictions. The Kuhn-Tucker theorem. Examples; Analytical methods to solve optimization problems with mixed restrictions. Examples; Necessary and sufficient second order conditions to resolve optimization problems with mixed restrictions. Examples; Kuhn-Tucker conditions with ecart variables to resolve optimization problems with mixed restrictions; Convex programming. Crowds and convex functions. Properties of convex functions. Examples; Post-optimal analysis. Examples; Linear programming. Standard form, canonical form and types of solutions of a linear programming problem. Examples; SIMPLEX method for solving linear programming problems. Examples of graphic resolution; SIMPLEX algorithm for solving linear programming problems. Examples; Linear programming in integers. Definitions. General remarks. Methods for solving entire programs. Examples; Programming experiments. Screening technique; Programming experiments. Response Area Methodology; Optimization based on experiment programming. Zoom optimization methods. Planning drag optimization methods. Exhaustive optimization methods. Laboratory: Nonlinear adjustment patterns: plotting a graph between points using the least squares method; Nonlinear adjustment models: Optimization problems in transformer design: optimal design of magnetic cores; Linear programming; Nonlinear programming. Minimize without restrictions; Nonlinear programming. Minimize with restrictions; Programming of experiments: Screening technique; Experiment Programming: Response Area Methodology; Optimization based on experiment programming: Zoom optimization methods; Optimization based on experiment programming: optimization methods by sliding planes; Optimization based on experiment programming: Exhaustive optimization methods.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: THE THEORY OF ELECTRIC CIRCUITS II

COURSE OBJECTIVE(S): It is a field discipline (electrical engineering) with the role of ensuring: Acquiring knowledge of the main aspects related to the operation of electric circuits in various operating regimes: mono/ triphasic in normal and abnormal, sinusoidal and/ or non-sinusoidal, symmetrical and/ or non-symmetrical regimes and in transient

regimes; Students acquire knowledge of non-linear electrical circuits - in terms of operation and equivalent schemes, taking into account the various losses that occur.
COURSE CONTENTS: Course: Methods for the analysis of electrical circuits in transient regime in time-domain: the direct integration method; the transient answer method; the state variable method; Methods for the analysis of electrical circuits in a transform domain: the method based on Laplace transform; the method based on Fourier transform; Three-phase electric circuits. Connections of three-phase circuits. The solving of analysis problems for three-phase circuits with balanced receivers supplied from symmetrical voltage sources; Three-phase electric circuits under non-symmetrical voltages. Non-symmetrical three-phase circuits. Three-phase circuit breakdowns; Periodic non-sinusoidal regime of electrical circuits: three-phase linear circuits balanced under non-sinusoidal symmetrical voltages; Permanent periodic nonlinear circuits: coil with iron core; condenser with losses; Considerations about electromagnetic radiation. Seminar: The method of solving the problems of transient regime; Three-phase electric circuits. Connections of three-phase circuits: connection Y with and without null wire;
connection. Mono-phase calculus scheme; Three-phase electric circuits under non-symmetrical voltages. Three-phase circuit breakdowns; Three-phase electrical circuits in periodic non-sinusoidal regime; The coil with iron core under sinusoidal voltage; The condenser with losses. Laboratory: Presentation of safety and labor safety rules, P.S.I rules and Emergency Rules. Presentation of laboratory work; Experimental study of electric circuits in transient regime; Experimental study of three-phase circuits in star connection in permanent sinusoidal regime; Experimental study of three-phase circuits in periodic non-sinusoidal regime star connection; Experimental study of three-phase circuits in periodic permanent non-sinusoidal triangular connection; Experimental study of three-phase circuits supplied by non-symmetrical voltages; Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 2ND SEMESTER

COURSE TITLE: ELECTRIC DRIVES
COURSE OBJECTIVE(S): Acquiring basic notions about electric drives using power electronics.
COURSE CONTENTS: Course: Elements of electric drives; Mast. with separate excitation; Mast Drive Systems and static converters; Drives with three-phase asynchronous motors; Drive systems with three - phase asynchronous motors and Static converters; Choice and testing of electric motors. Laboratory: Work safety rules. Presentation of the laboratory; The M.c.c drive study with separate engine excitement; The M.c.c drive study with separate braking excitation; The study of driving with M.A. with the rotor in short-circuit in engine mode; The study of driving with M.A. with the rotor wound in engine mode; The study of driving with M.A. with the rotor wound in brake mode; Study of the drive system with M c.c. and rectifier ordered; Study of the drive system with M c.c. and V.T.C; Cascade-driven accelerator motor with unassembled rectifier and DC machine; Drive system study with M.A. and Frequency Modulation Voltage Inverter; Drive system study with M.A. and PWM Modulation Inverter (ALTIVAR); Drive system study with M.A. and voltage inverter with sinusoidal modulation; Drive system study with M.A. and the vectorial modulation tensiunecu inverter; The final lab test
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: QUALITY AND RELIABILITY
COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts regarding the quality and reliability of electrical systems.
COURSE CONTENTS: Course: The concepts of quality and reliability. Definitions. Elements of Boolean algebra. Axioms. Properties. Examples of Boolean algebras; Stochastic experience. Events. Definitions. Independent Events Probabilities. Probability properties. Complete system of events. Total probability formula. Bayes formula; Random variables. Distribution function. Density of distribution. Numeric characteristics of random variables: initial moment (mean, median, fashion, quantum), centered moment (dispersion, mean square deviation, coefficient of variation, asymmetry, excess). Cebashev's inequality; Random vector. Multidimensional distribution function and density. Systems of two random variables. Initial and centered moments. Covariance. Correlation coefficient. Regression function. Matrix of covariance. Matrix of correlation; Reliability theory. Reliability indicators. Statistical Definitions. Probabilistic definitions. Relationship between reliability ratios; Reliability of systems. Serial and parallel systems with independent and dependent elements. Systems of any structure; Repairs used in reliability. Discrete distributions: binomial, hypergeometric, polynomial, Poisson, geometric. Continuous distributions: normal, normal multidimensional, normal truncated, generalized gamma; The theory of estimation. Estimators. Required conditions. Estimating the parameters of a distribution. Reliable interval. Threshold of confidence. Determining the confidence interval; Reliability tests. Determination of average running time by experimental way. Checking statistical assumptions. Glivenko's theorem. Kolmogorov's theorem and test; Classification of quality characteristics. Quality documents: standard, technical norm, specification, analysis bulletin,

approval certificate, warranty certificate, quality certificate; Spiral of quality. Quality costs. Quality assessment. Loss function; Quality tools: histogram, cause-effect diagram, Pareto diagram, cause-effect diagram, regression analysis, control diagram; Statistical quality control. Static stability of manufacturing processes. Dynamic iteration verification of manufacturing processes. Statistical process control by measuring quality characteristics. Statistical process control through attributes; Statistical reception control. Operational feature (CO). Acceptable level of quality (AQL). Control plans for batches with attributive features. Sequential control plans. Statistical reception control for lots with measurable characteristics. Seminar: Combination elements. The basic principle of combinatorics. Description of events. Probability. Applications of the classic definition; Conditional probabilities. Complete system of events. Total probability formula. Bayes formula; Random variables. Distribution function. Density of distribution; Statistical calculation of reliability indicators; Serial, parallel, structured systems; Repairs used in reliability; Descriptive statistics in Mathcad.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL EQUIPMENT II

COURSE OBJECTIVE(S): The discipline aims at presenting the theoretical bases of electrical equipment operation (continuation of those presented in Part I), the constructive principles of the main equipment classes, the elements of modernity in the development of electrical equipment. The presentation of the equipment construction will be correlated with the main achievements of the prestigious construction companies in the field.

COURSE CONTENTS: Course: Systemic structure of electrical equipment. Basic components. Construction materials.Principles.of constructive solutions; The electric arc. Extinguishing methods and devices; Insulating systems of electrical equipment. Performances. Specific materials; High-voltage circuit breakers. Constructive solutions. The principle of oil switching. Switching principle in SF6. Specific materials and technologies. The SF6 switching. The principle of vacuum switching. Vacuum circuit breaker. Specific materials and technologies. Technical specifications. Criteria of circuit breaker selection; Driving mechanisms; Automatic low-voltage circuit breaker (ex. Oromax, or Moller type); Fuses. Operating. Discrimination. Specific materials and technologies. Technical specifications. Criteria of selection; Surge arreters-clasical and modern constructions. Criteria of selection; Conventional and digital protection systems; Medium voltage metal clad switchgear. Recloser. Criteria of selection; Gas insulated switchgear (SF6 GIS). Laboratory: Experimental study of high voltage distributions along the insulators chain, using a physical model of low voltage; Experimental study of electromagnetic relays (maximum current and minimum voltage); Study of induction disk relay; Experimental study of minimum frequency relay; Experimental study of electromagnetic contactors; Experimental study of electric arc; Experimental study of oil medium voltage circuit breaker; Experimental study of low voltage and high switching power circuit breaker types Oromax and Moller; Experimental fuses characteristics study; Experimental study of medium voltage metal clad switchigear and of surge arreters; Experimental study of directional relay; Final evaluation of students.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNOLOGIES

COURSE OBJECTIVE(S): It is one of the specialty disciplines of the SE specialization curriculum, aiming to present students with the issues of unconventional technologies - electrotechnologies, which, in the current economic context, have a significant impact. Problems concerning theoretical bases, specfic equipment and industrial applications and in medicine are addressed. The implications of electrotechnologies for the quality of the environment, both in terms of the perturbations introduced by technology and in terms of the environmental impact of processed products or services, are also addressed.

COURSE CONTENTS: Course: Electrotechnologies; Electroerosion; Plasma technique; Laser; Ultrasound; Dielectric heating in radiofrequency; Microwave; Magnetic formation; Optical fiber. Laboratory: Laboratory presentation. Labor protection.Organization activities; Didactic installation for electro-erosion processing; Numeric applications in Matlab. Calculation of technological parameters; Plasma welding equipment. Numerical applications for Matlab calculation of technological parameters; Experimental study of ultrasound production with magnetostrictive and piezoelectric transducers; Experimental study of magnetron function. Determination of the magnetron's duty cycle for power adjustment; Study of the construction and operation of the microwave oven. Experimental study of heating of dielectric materials in the microwave field. Numerical applications - radiofrequency heating; Study of magnetic deformation. Experimental installation. • • • • Numeric Applications in Matlab; Starting the asynchronous motor in the fiber optic control scheme. Laboratory colloquy.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INDUSTRIAL INFORMATICS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the basic concepts of industrial informatics. Students acquire the knowledge and skills necessary to acquire professional skills to understand and manage the basic concepts of automated systems, automated control systems, programmable systems, signal conversion and processing, and real-time application operating systems.

COURSE CONTENTS: Course: Introduction to Industrial Informatics; Automatic adjustment systems; Representation of information; Conversion and signal processing; System Transfer Functions; Operating systems for real-time applications; The MPLAB programming environment; Applications using MPLAB and MICROCHIP PICKIT2; Applications using MPLAB and Microchip PIC18F4550 Microchip. Laboratory: Representing numbers in your computer; Quantification of signals; Continuous system transfer functions; Transfer functions of discrete systems; Introductory applications using MPLAB; Applications for managing I/ O ports using the Robo Gamel platform with PIC18F4550 and MPLAB - writing messages, reading photoelectric sensors inputs, displaying button statuses and potentiometer value; Applications for managing I/ O ports using the Robo Gamel platform with PIC18F4550 and MPLAB - CAN working and PWM command for DC drive control.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: FINITE ELEMENT METHOD IN ELECTROTECHNICS

COURSE OBJECTIVE(S): It is a specialized discipline for the field of Electrical Engineering study. It is about deepening and understanding the mathematical and numerical principles of the Finite Element Method (MEF) and exemplifying this method to solve specific problems in the electrotechnical field. Theoretical notions are complemented and supported by laboratory work. The laboratory work aims to develop the ability to build numeric codes for the use of the method in solving type problems.

COURSE CONTENTS: Course: Introduction to the finite element method. Overview, examples, steps to solve a problem through this method, integral formulations, error estimation; Variational approximation methods; Finite element method applied for linear environments in electrotechnics; The finite element method applied for nonlinear environments in electrical engineering; Analysis of the efficiency of the finite element method; Software based on MEF software used in electrical engineering. Laboratory: Work safety training. Presentation of laboratory work; Using the Matlab programming environment to approximate the exact solution using MEF. Error analysis; Application of MEF to solve electrostatic problems; Application of MEF to solve nonlinear problems; Application of MEF to solve some of the problems of magnetic field stationary pararel plan; Application of MEF to solve variable regime problems; *Recovering laboratories and evaluating knowledge and skills acquired during laboratory hours*

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS WITH MICROPROCESSORS

COURSE OBJECTIVE(S): Applying knowledge to acquire microprocessor technique in automatic process management.

COURSE CONTENTS: Course: Introduction. Microprocessor - general landmarks; Getting Started. Arithmetic of whole numbers; Numerical Logic Elements; Microprocessor - functional presentation; Microprocessor - hardware presentation; Internal memory of the microcomputer system; Microprocessor system software - general issues; Input/ output elements of microprocessor systems; INTEL 80x86 microprocessor; Organize memory. Interrupt system; Applications of microprocessor systems; Designing the hardware of the system; Designing the system's software structure. Laboratory: Conversions and operations in different counting bases; Internal data representation; 80x86 microprocessor instruction set; Testing, setting, and resetting a bit from a number; Arithmetic, logic, displacement and rotation instructions of the 80x86 (I) microprocessor; Arithmetic, logic, displacement and rotation instructions of the 80x86 (II) microprocessor; Assembly language. Evaluation of Arithmetic and Logical Expressions (I); Assembly language. Evaluation of Arithmetic and Logical Expressions (II); Specialized ports: Programmable clocks. Serial interfaces; Laboratory testing

LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ANALYSIS OF NONLINEAR SYSTEMS IN ELECTRICAL ENGINEERING

COURSE OBJECTIVE(S): Teaching the fundamentals on nonlinear systems specific to electrical engineering applications, as well as skills in using specific methods and software tools for numerical analysis of nonlinear systems.

COURSE CONTENTS: Course: Introduction: linear/ nonlinear systems, parametric systems, inertial systems, properties, analysis/ synthesis problems; Modeling of nonlinear elements: global/ local approximation, piecewise/ local linearization, equivalent linear diagrams, examples; Modeling of time-variable elements: ideal switching, real switching, examples; Modeling of inertial elements: analytical/ numerical/ mixed models, examples; Mathematical models of nonlinear systems in steady state working mode, mathematical tools, numerical algorithms and software tools specific for analysis of steady states of nonlinear systems, examples; Mathematical models of nonlinear systems in dynamic working mode, mathematical

tools, numerical algorithms and software tools specific for analysis of nonlinear dynamic systems, examples; Software tools for analysis of nonlinear, parametric and inertial systems. Laboratory: Spline interpolation of nonlinear characteristics specified by points; Implementation of iterative algorithms for solving one-variable nonlinear algebraic equations; Implementation of iterative algorithms for solving multivariable algebraic nonlinear equations; Numerical integration of one-variable nonlinear state equations by Euler explicit/ implicit formulae; comparative study; Numerical integration of multivariable nonlinear state equations by first and second order methods; Numerical integration of nonlinear and time-variable state equations.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROMAGNETIC COMPATIBILITY

COURSE OBJECTIVE(S): Introducing, understanding and thoroughgoing study of notions related to: conducted and radiated emissions; immunity to conducted and radiated emissions; electromagnetic interferences. Acquiring by students of the main phenomena considered when reducing the degree of electromagnetic pollution as a consequence of the electromagnetic interference and radiation (both in the environment and respectively for all power and telecommunication networks).
COURSE CONTENTS: Course: Introduction on Electromagnetic compatibility (EMC); Electromagnetic disturbances; Transmission of electromagnetic disturbances. Disturbances electromagnetic coupling; Common mode currents. Differential mode currents; The shielding. Electromagnetic screens; Conducting emissions. Electric filters; Instrumentation in the electromagnetic compatibility domain; Antennas; Standards used in EMC. Standards concerning emissions and susceptibility tests; Seminar: Diagrame of frequency spectrum for the rated lightning voltage wave 1.2/50 μs; Propagation of magnetic field in pieces of steel (Aluminium, Copper) at different frequencies; Penetration depth for an electromagnetic wave for a directional coupler; Coaxial ahunta with a certain response time; Electric filters. Network electric filters. Active filters; Electromagnetic induction inside a magnetostatic shield. Electromagnetic induction inside a magnetic cylindrical shield. Shielding efficiency for spherical shields; Measuring Eddy voltages and currents. Measuring the disturbing fields strength. Emission antennas. Measuring the perturbative powers. Laboratory: Introducing the laboratory works ; Experimental study of the opto-coupler; Experimental study of the coaxial cable used to transmit electric signals; Study of lossless low-pass and high-pass passive filters; Study of lossless low-pass , high-pass active and band-pass filters; Study of electromagnetic shields ; Final evaluation of laboratory activities.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): The discipline has the role to offer to the students theoretical and practical knowledge necessary to develop their activitie inside industrial plants which use electro-thermal processes and plants. At the end of the semester, the students will be able to design an electro-thermal system, to calculate the electrical energy supply circuits of electro-thermal plants, to analize the yield, costs and the thermal efficiency of a proposed technical solution for a electro-thermal system.
COURSE CONTENTS: Course: Basic notions of heat technique; Heat transfer; Materials used in electric heating equipments; Electric heating with resistors; Electric heating through direct conduction; Electric heating through induction; Heating using electric arc; Heating using infrared radiations and heating with plasma installations; Heating due to dialectical losses and microwaves heating; Heating in installations with electron beam and laser heating; Notions regarding the temperature measurement inside electro-thermal processes. Seminar: Notions of heat technique and the problems of the calculation of the thermal flow; The principle of calculation for an oven with resistors The principle of calculation for an induction oven; The principle of calculation for an oven with electrical arc; Modern electro-thermal plants and thechniques. Laboratory: The design activitie is developed in 3-6 working sub-groups depending on the number of students. Each sub-group will receive a project theme. During the weekly meetings it will be presented the stages of the design and calculations, common and specific for each theme. It will be analyzed the stage in which each project is, and each blocking point in the design, will be solved. The last meeting is dedicated to the presentation of the final projects.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MICROCONTROLLERS AND PLC'S

COURSE OBJECTIVE(S): Students acquire knowledge of: using the instruction set of a microcontroller; interpretation of microcontroller-based systems features, performances and architectures in the context of a given theme; choosing a programmable machine according to certain imposed requirements; installing a programmable machine in a particular installation; programming a microcontroller; design, implementation and testing of written applications in assembly language, C and C ++; realizing the interface of a programmable machine with industrial equipment.

COURSE CONTENTS: Course: Microcontrollers. Introduction. Structure of a microcontroller; Microcontrollers. Architectural features of the CPU. I/ O system. Deploying memory; Microcontrollers. Representative families. Programming languages. Developing and testing applications; Driving systems. Introduction; Automated programmable. Definitions. Types; PLC programming languages; Operating modes of programmable automatic machines; Instruction kits for programmable automatic machines; Special functions of programmable machines; Communications with programmable machines; Interfacing programmable machines with industrial equipment; Choice and installation of programmable automatic machines. Laboratory: • Introductory applications using MPLab software; Managing I/ O ports using the PICKIT2 and MPLab platforms; Making a program in MPLab to ignite the PICKIT2 platform lights with a binary counter; Introductory applications using the TWidosuite software; Making a Twidosuite program to control a smart lighting system; Final assessment of laboratory activity. Project: Urban traffic management; Overview of the Telemecanique Programmable PLC (PLC) and the Twido Suite programming environment; Overview Ladder Diagram, Electrical Chart and Components of Traffic Control System; PLC programming for intelligent urban traffic control.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: NUMERICAL MODELING OF ELECTROMAGNETIC FIELD

COURSE OBJECTIVE(S): Become familiar with the main aspects related to the numerical modeling of the electromagnetic field, as well as with the different methods and techniques used for it.
COURSE CONTENTS: Course: Introduction. The quantities of the electromagnetic field. Equations of the electromagnetic field; The electromagnetic field regimes: equations, particularities, conditions of uniqueness; Formulations of electromagnetic field problems; Finite difference method. Formulation of the method. Aspects regarding the discretization (meshing) of the equations for one-dimensional and two-dimensional problems; Finite volume method. Formulation of the method. Aspects regarding the discretization of the equations for electric field and magnetic field problems; Finite element method. Formulation of the method. Aspects regarding the discretization of field equations; Finite integral methods. Formulation of the method. Aspects regarding the discretization of the equations. Laboratory: Presentation of safety rules. Presentation of laboratory works; Finite element method. QuickField software. Applications for electrostatic field; Finite element method. QuickField software. Applications for stationary and quasi-stationary magnetic field (dc and ac); Finite element method. FEMM software. Applications for electrostatic field; Finite element method. FEMM software. Applications for stationary and quasi-stationary magnetic field (dc and ac); Finite difference method. One-dimensional and two-dimensional problems. Electrostatic field problems; Finite difference method. One-dimensional and two-dimensional problems. Stationary magnetic field problems; Numerical modeling of electromagnetic field in coaxial cable in stationary regime: electric field; magnetic field; Formulating and solving a new engineering problem using the accumulated knowledge; Finalizing the lab activity. Final test.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER-BASED DESIGN OF ELETRICAL INSTALLATION

COURSE OBJECTIVE(S): It contributes to the formation of future electrical engineers, familiarizing them with the main aspects of the operation and optimization of industrial electrical installations in accordance with the international standards and assuring the development of their design skills assisted by the Paladin DesignBase and ELCAD software packages.
COURSE CONTENTS: Course: Installed power - generalities; Power distribution networks of MV and LV 3. Determination of the calculus power and the average power factor; Power installation; Calculation of short-circuit currents; Sizing of distribution facilities; Improving the power factor; Capabilities of software programs for the design of electrical networks and installations. Project: Computer-based design of the power supplying installation for a production workshop according to project data – software packages Paladin DesignBase/ ELCAD.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): Teaching the theoretical support for computer-aided analysis of linear analog circuits specific to electrical engineering applications as well as skills to use commercial software for circuit simulation.
COURSE CONTENTS: Course: Fundamentals on modeling and simulation of analog circuits, both reciprocal and nonreciprocal; Fundamentals on topology of electric circuits; Topological mathematical models and numerical simulation methods of linear analog circuits in DC mode; Topological mathematical models and numerical simulation methods of sinusoidal steady states; Topological mathematical models and numerical simulation methods of linear analog circuits in transient behavior; time-domain methods and complex frequency methods; Validation of the results obtained through numerical simulation. Laboratory: Topology analysis of an analog

lumped; SPICE family circuit simulators. Modeling principles, algorithms and options of numerical computation, input data, output data; Simulation of linear circuits in DC mode: computation of operating points; Simulation of linear circuits in DC mode: building of static characteristics by stepping sources; Simulation of circuits in sinusoidal steady states; Simulation of circuits with magnetically coupled inductors in sinusoidal steady states; Building of frequency characteristics of electrical filters. Families of frequency characteristics; Simulation of transients of lumped circuits. Managing the initial conditions; Simulation of transients of lumped circuits. Choosing the options of numerical computation for accurate results; Families of characteristics obtained by sweeping some circuit parameters; Optimization simulations: choosing objective functions and interpretation of results; Numerical simulation of three-phase circuits.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TRANSDUCERS, INTERFACES AND DATA ACQUISITION

COURSE OBJECTIVE(S): Familiarize students with the main types of transducers used in industrial applications. Making GUI interfaces from Matlab. Presentation of structural elements of data acquisition systems.

COURSE CONTENTS: Course: Sensors and transducers. General notions. Definitions; Transducers for distances and positions; Temperature transducers; Current and voltage transducers; Mechanical force and deformation sensors; Speed and acceleration sensors; Motion and presence sensors; Creating and programming graphical interfaces using Matlab GUI; Data acquisition systems. Definitions. General. Structure. Laboratory: Introduction to the use of Matlab GUI; Programming Matlab GUI components; Matlab interface using GUI to monitor the state of a circuit breaker: appreciation of electro-erosion of circuit breaker contacts; Matlab interface using GUI to monitor the state of a circuit breaker: Estimate the wear of the insulating oil; Matlab interface using GUI to monitor the status of a circuit breaker: Diagnosis of the weakened contact; Matlab interface using GUI for short circuit current analysis; Laboratory testing. Project: For a three-phase system, the current values and the voltage values on the three phases were experimentally determined over a 20ms time interval; To create a graphical interface in Matlab that meets the following requirements: allow to graphically view instantaneous current values acquired on the three phases, individually on each phase and on all three phases, allow visualization of the instantaneous voltage values acquired on the three phases individually in each phase and all three phases, allow graphic display of instantaneous current and voltage values purchased on each of the three phases and all three phases, allow to calculate and display the following sizes: effective current value per phase, effective voltage across each phase, the phase-to-phase phase-to-phase value for each phase, the effective power value for each phase, the effective value of reactive power at each phase.

LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 2ND SEMESTER

COURSE TITLE: VIRTUAL INSTRUMENTATION (LABVIEW)

COURSE OBJECTIVE(S): Understanding and deepening the fundamental concepts of virtual instrumentation used in data acquisition. Students acquire knowledge of: choosing a data acquisition system for a specific application; realizing graphical interfaces for purchasing electrical signals using the LabVIEW graphics programming environment; solving specific data acquisition applications in the field of electrical engineering.

COURSE CONTENTS: Course: Introduction to virtual instrumentation; Virtual Instrumentation with LabVIEW; Functions used in LabVIEW; Strings, lists, tables. Boolean indicators and controls. Pictures. Groups; Structures in LabVIEW; Elements for graphical representations in LabVIEW; Nodes, terminals and threads in LabVIEW; SubVIs in LabVIEW; Data acquisition with LabVIEW. Laboratory: Initialization in LabVIEW; Numeric functions in LabVIEW; Functions for working with strings and arrays in LabVIEW; Structures. For, while in LabVIEW; Structures. Houses, the node formula in LabVIEW; LabVIEW graphical controls and indicators; Signal operations in LabVIEW; Voltage measurement application using the NI PCI 6221 and LabVIEW acquisition system; Power intensity measurement application using the NI PCI 6221 and LabVIEW acquisition system; Temperature measurement application using NI PCI 6221 acquisition system and thermocouple and LabVIEW; Temperature measurement application using the NI PCI 6221 acquisition system and heat resistance and LabVIEW; Temperature measurement application using the DLP IO8 and LabVIEW acquisition system; Electrical voltage measurement application using DLP IO8 and LabVIEW acquisition system; Final assessment of laboratory activity

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MONITORING AND DIAGNOSIS OF ELECTROTECHNICAL EQUIPMENT

COURSE OBJECTIVE(S): Theoretical and practical foundation of the techniques for monitoring and diagnostics of electrical equipment.

COURSE CONTENTS: Course: Monitoring systems. Importance. Current stage. Getting Started with Control and Monitoring of Electrical Systems; Surveillance and control systems. SCADA -

Supervisor Control and Data Acquisitions; Applications of SCADA systems in our country. SCADA in energy; Monitor High Voltage Switches. Parameters supervised by a high-voltage circuit breaker; Methods and techniques of diagnosis; Expert systems; Applications of expert systems. Seminar: Processing algorithms for two sampled process sizes; Study of the status of electrical contacts; Study of dielectric rigidity variation of oil; Calculation of the synthetic values of the sampled electrical quantities; Calculation of the phase shifting of the sampled electrical quantities; Processing algorithms for two sampled process sizes. Laboratory: The CLIPS language. Expert systems to simplify the truth table of a complex logic circuit; Implementing rules in CLIPS (I); Design and analysis of fault trees for the analysis of the reliability of electrical systems. Primary and secondary fault tree; Construction and analysis of fault trees for the analysis of the reliability of the electrical networks.; Expert systems for the diagnosis of electrical machinery The graph of system states. Implement rules in CLIPS language; Expert systems for the diagnosis of electrical transformers. The graph of system states. Implement rules in CLIPS language; Expert systems for diagnosis of power rectifiers. The graph of system states. Implement rules in CLIPS language; Laboratory testing.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: REGULATIONS IN ELECTRICAL ENGINEERING

COURSE OBJECTIVE(S): It contributes to the formation of future electrical engineers, familiarizing them with the main theoretical, legislative and practical aspects related to the composition, characteristics, functioning of the electric, power, national power system, etc.

COURSE CONTENTS: Organizing the energy system; Organizing the power system; Electricity Law, Law 13/ 2007Complemented and Amended by GEO 33/2007 and GEO 172/2008; Considerations on the national energy system and the evolution of the electricity market; Law 199/2000 on the efficient use of energy (republished); Law no. 372/2005 on the energy performance of buildings; Government Emergency Ordinance no. 18/2009 on increasing the energy performance of housing blocks published in the Official Gazette, no. 155/12 March 2009; The manufacturer's guide to renewable energy; Policies and directives of the European Union on the use of renewable energy resources; The production and consumption of electricity in the world

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: LIGHTING TECHNIQUE

COURSE OBJECTIVE(S): Acquisition by students of the knowledge and skills necessary to acquire professional skills in order to understand and manage the theoretical and computational bases of electrical lighting installations (construction, operation, exploitation and design of these installations (light sources and luminaires) specific to electrical engineering.

COURSE CONTENTS: Course: Electrical lighting (Overview. Light - visible radiation); Photometric sizes and units; Light electrical sources (Characteristic sizes. Classification); Luminaires (Photometric characteristics. Classification. Lighting quality conditions); Design of indoor lighting installations (Classification of electrical lighting installations. Quantitative and qualitative parameters of lighting installations. Setting of illuminance level. Layout of general luminaires); Methods of technical lighting calculating of the lighting installations (Specific power method. Method of usage factor. Point by point method for point sources and linear sources. The use of automated calculation for the design of lighting installations); Dimensioning of the interior networks for light receivers/ circuits and light columns (Dimensioning of the section at heating in permanent regime. Checking of the section at the voltage drop and at the framing within minimum admissible limits. Choice of protection, switching and measuring afferent equipment). Seminar: Predimensioning in terms of technical lighting of an interior lighting installation by the use of usage factor method. Presentation and demonstration with the program for the design and analysis of indoor lighting systems and for open surfaces - ELBALux4.4; Checking of the illuminance at a point of the useful plan by point by point method for linear sources; Dimensioning of the interior power supply network for light receivers. Dimensioning of the section at heating in permanent regime. Checking of the section at the voltage drop. Framing within minimum admissible limits from a constructive point of view. Choice of protection, switching and measuring equipment; Numerical applications for the variation of the electric and photometric sizes of the lamps according to the temperature of the filament and the supply voltage; Numerical applications for the calculation of the photometrical sizes. Laboratory: Study of the tubular fluorescent lamp; Practical circuits fitted with tubular fluorescent lamps; Study of the high-pressure mercury vapour discharge lamp; The study of the high-pressure sodium vapour discharge lamp; Study of the possibilities of changing of the luminous flux emitted by light electrical sources; Monoblock high power LED lighting systems. Determination of the light distribution emitted by LED street luminaires; Final evaluation of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: ELECTRICAL ENGINEERING AND COMPUTER SCIENCE
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY

COURSE OBJECTIVE(S): Acquire by students of knowledge of theoretical background of linear algebra and analytical geometry, as well as skills training in the use of dedicated computing techniques.
COURSE CONTENTS: Vector spaces; Linear applications; Bilinear forms; Euclidean spaces; Euclidean spaces: Cases E2 and E3; Analytical geometry of space E3; Quadric surfaces. Quadric curves (recapitulation from high school).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MATHEMATICAL ANALYSIS I

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.
COURSE CONTENTS: Course: Elements of multimillion theory (multitudes, functions). Space Rn; Strings and vector vectors in Rn; Continuous functions of several real variables; Different functions and applications at the extremes of functions; Default functions and applications; Applications on curves and surfaces; Power series; Fourier series. Seminar: Exercises for mathematical analysis - recapitulation of the notion of string limit and properties fixed in high school; Exercises with strings and vector vectors in Rn; Exercises with continuous functions of several real variables; Exercises with differentiable functions and applications at extremes of functions; Exercises with default functions and applications; Applications on curves and surfaces; Exercises with series of powers; Exercises with Fourier series.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: CHEMISTRY

COURSE OBJECTIVE(S): Acquisition of fundamental notions and dimensions of chemistry, explanation and understanding of the principles that control the reactivity of chemical elements and combinations. Structure and substance properties, notions of thermochemistry, chemical kinetics, notions of electrochemistry and electrochemical conversion of energy; corrosion and corrosion protection methods, materials used in the electrotechnical industry.
COURSE CONTENTS: Course: Periodic system and structure of electronic envelopes. Structure of molecules. Properties of substances; Chemical bonds: ionic bonding; the covalent bond; metal bond (electron gas theory, energy band theory, valence bond theory); Characteristic properties of metals (optical, physico-mechanical and chemical). The ability of metals to form alloys; Representative types of alloys. Amalgams; Electrochemistry and electrochemical conversion of energy (potential of electrode, electrical cells, electrolysis, electrochemical conversion of energy); Corrosion and corrosion protection (chemical corrosion, electrochemical corrosion, methods of metal protection against corrosion); Macromolecular compounds (structure, classification, properties, types of polymers used in electrotechnics). Laboratory: Labor protection rules in the chemistry laboratory and presentation of laboratory work; Protection of metallic surfaces against corrosion by copper; Determination of Diesel fuel index; Determining the viscosity of a lubricant with the Engler viscometer; Determination of metal corrosion rate; Analysis of alloys by electrographic method.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMMUNICATION

COURSE OBJECTIVE(S): The accomplishing of a key stage within the training process that rounds specialised training in the technical field and contributes to shape the personality of future pecialists to meet the requirements of the European Union.
COURSE CONTENTS: Course: INTRODUCTION; Definitions of communication. The process of communication. Communication objectives; VERBAL COMMUNICATION; Verbal communication principles. Verbal messages receiving – listening; NONVERBAL COMMUNICATION; Nonverbal communication principles. Transmission and perception of nonverbal messages. Visual communication; PROFESSIONAL COMMUNICATION; Speech management. Meeting moderation. Multimedia presentation exposure. Scientific poster. Curriculum vitae. Language passport. Participation in interview. Telephone conversation; MANAGEMENT AND COMMUNICATION; Communication in management processes. The art of listening – the asset of a manager. Organizational culture; People recruiting and selecting. Laboratory: Job finding modalities; Letter of intent writing; Curriculum Vitae drafting - Drafting rules in compliance with European Union rules (CV online filling); Language passport - Drafting rules in compliance with European Union recommendations rules; (Language Passport online filling); Verbal and nonverbal communication techniques; Interview simulation (Students will take part to a verbal and

nonverbal communication-based drill. An interview simulation); Rules to draft and display a scientific poster (Scientific poster drawing up focused on the central topic key approached in the team report); Activity completion. Poster presentation/ ppt. (team work). Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNICAL DRAWING

COURSE OBJECTIVE(S): The technical drawing is the discipline of the general technical culture that deals with the plane graphic transposition of a conceptual or technical idea according to certain established rules and rules for the purpose of representing and determining objects. The complexity of the information provided ensures that the technical design plays a decisive role in the life of a product and in that it represents the most concise and synthetic form of communication in the technical field. This fact ensures the importance of knowing the norms, of the conventional elements used in the plane representation of spatial geometric bodies and the high degree of universality of these norms and rules.
COURSE CONTENTS: Course: Overview; Standards. Formats. Lines; General rules of representation in the technical drawing. Views. Sections; Quotation in the technical drawing; Representing, quoting and marking the threads; Classification of materials; Statement of surface conditions; Overall drawing; Representation and quantification of gears and gears; Schematic drawing. Laboratory: Standardized writing. Types of lines used in the technical drawing. Layout of projections; Rules for drafting the sketch. The simple piece; Hexagonal prism construction. Screw head and nut; Simply rated piece. TEST 1; Quoted complex piece; Threaded piece 1; Threaded piece 2. TEST 2; Two-piece assembly. Drawings of parts; Assembly drawing; Explosive drawing. TEST 3; Overall drawing 2; Assembly drawing. TEST 4; Repeat a test and final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION I

COURSE OBJECTIVE(S): Acquiring the theoretical, practical and methodological skills of practicing physical exercise in an organized or independent manner in order to acquire a healthy lifestyle.
COURSE CONTENTS: Gymnastics: basic exercises, aerobic gymnastics; Application paths combined with running, jumps, equilibrium exercises, escalation, climbing skills, etc; Main sports skills of football game (boys), basketball (girls); Bilateral games under similar competition conditions; Evaluation tests.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH I

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.
COURSE CONTENTS: Reading the text" E-commerce", oral debate on questions like: Why/ what do people buy online?/Does online shopping help businesses? Solving grammar and vocabulary exercises. Listening to an interview about an electronics company that decided to open an online store; Reading the text "Cell Phones", oral debate on the importance of communication at work. Solving grammar and vocabulary exercises – modal verbs. Listening to a conversation between an engineer and his manager; Reading the text "Alternative Energy", oral debate on ways of protecting the environment. Solving grammar and vocabulary exercises – phrasal verbs. Listening to a conversation between a supervisor and an engineer; Reading the text "Tablets and laptops", oral debate on questions like: Are electronic devices useful at work? .Solving grammar and vocabulary exercises. Listening to a conversation related to civil engineering and filling in the blanks according to the record; Reading the text "Peripherals", oral debate on questions like: Why do people need peripherals?/What types of peripherals are used in the electromechanical domain? Solving grammar and vocabulary exercises. Filling in the Curriculum Vitae and personalizing an Application Letter; Reading the text "Mechanical Engineering", oral debate on questions like: What type of problems do mechanical engineers fix? What kind of computer methods do mechanical engineers use? Solving grammar and vocabulary exercises; Reading the text "Materials and properties", oral debate on questions like: What kind of materials do people use to build structures?/ Why are some materials better for projects than others? Grammar focus: English Pronoun. Solving grammar and vocabulary exercises. Listening to a conversation between an engineer and his client.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: METHODS AND TECHNOLOGICAL PROCESSES

COURSE OBJECTIVE(S): Acquiring knowledge on manufacturing technologies, components of technological systems, processing operations; Students acquire the theoretical knowledge for calculating and analyzing the parameters necessary for the optimization of the processing processes; Obtaining practical and analytical skills.
COURSE CONTENTS: Course: Introduction. Objectives and discipline issues, structure of

technological processes and types of processing operations; Technical and technological properties of materials and their importance in the establishment and development of processing technologies; Technology of metallic materials. Definitions, classifications, structures, phases encountered in metal alloys, binary equilibrium diagrams; Machining processes: turning, milling, drilling, grinding, mortising, planing, broaching; Kinematic chains of machine tools: classification, structure, characteristics, kinematic representation, transmissions and mechanisms; Forming processing processes: plastic deformation processes (rolling, forging, drawing, extruding, molding, stamping), welding, cutting and gluing processes; Methods and processes for the manufacture of powdered metal products: the formation of powders and powders. Powder metallurgy products. Laboratory: Presentation of laboratory work and protective measures to perform this work; Determination of forces and turning speed at turning. Construct the mechanical parts of the lathe. Construction and release of the EMCO UNIMAT PCs. Simulation of the turning process by using the UNIMAT program; Determination of the functionalities of the milling process. Analysis of the inequality of the inundations; Measurement of the parameters to show the external characteristics and to the arc fault in the c.a. Characteristics of the transformer for welding with magnetic magnification; Measuring the parameters to show the external welding characteristics. the use of a welding breaker; Final evaluation of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER PROGRAMMING

COURSE OBJECTIVE(S): Familiarizing students with notions of algorithms, their description in pseudocod and with fundamentals languages C and C ++.
COURSE CONTENTS: Course: Algorithms. General notions. Enunciation of a problem, input and output data, the steps of solving a problem. Objects with which algorithms and allowed operations work. Made operations by an algorithm; Principles of Structured Programming. Generalities. Basic structures and their description in the pseudocode; Basic Elements of Language C. Generalities. Structure of programs. Interface with input/ output devices. Output functions. Input functions. Input/ output functions provided by the stdio.h and iostream.h library. The vocabulary of the language. Data types. Constants. Expressions; Language C instructions. Expression instruction. The if instruction; The composite instruction. Switch instruction. The while instruction. The do while instruction. Instruction for. Jump instructions; Functions. Overview. Definition or description of functions. Declaring functions. Local variables. Global variables. Calling a function. Memory class specifiers. Recursive functions; Arrays and strings. Declaring and initializing arrays. Array elements referring. Functions that use arrays as arguments. Strings of characters; The usual mathematical functions. Trigonometric functions. Functions for dividing integers. Functions for working with logarithms, and exponential function. Functions for power of a number and extracting square roots. Functions for determining the integer part and the fractional part. Functions for working with random numbers. Laboratory: Presentation of C ++ programming environment. Structure general of a program; Editing a program, compiling, debugging, executing; Types of basic data and modifiers. Simple programs with input/ output functions from the stdio.h library; Use the if instruction ; Use while and do instructions; Use the for and switch instructions; Use the break, continue instructions; Working with functions; Work with arrays; Work with strings; Working with mathematical functions.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS II

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.
COURSE CONTENTS: Course: Riemann Integrity and its Extensions (Incorrect Integral with Parameters) and Applications (Functions G and b); Integrated curvilinear of the first type and applications; Double Integral and Applications; Triple Integral and Applications; Surface integrity and applications; Field theory elements; operators of field theory; particular fields; Field integration and integral formulas; The reverse of field theory. Seminar: Exercises with integral Riemann and its extensions (incomplete integral with parameters) and applications (functions G and b); Exercises with integral curves of the first type and applications; Exercises with double integers and applications; Exercises with triple integers and applications; Exercises with surface integrals and applications; Exercises with field theory elements, field theory operators and particular fields; Exercises with integral formulas; The reverse of field theory.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INFORMATICS APPLICATIONS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications

in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.
COURSE CONTENTS: Course: Riemann Integrity and its Extensions (Incorrect Integral with Parameters) and Applications (Functions G and b); Integrated curvilinear of the first type and applications; Double Integral and Applications; Triple Integral and Applications; Surface integrity and applications; Field theory elements; operators of field theory; particular fields; Field integration and integral formulas; The reverse of field theory. Seminar: Exercises with integral Riemann and its extensions (incomplete integral with parameters) and applications (functions G and b); Exercises with integral curves of the first type and applications; Exercises with double integers and applications; Exercises with triple integers and applications; Exercises with surface integrals and applications; Exercises with field theory elements, field theory operators and particular fields; Exercises with integral formulas; The reverse of field theory.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERAL ECONOMY

COURSE OBJECTIVE(S): Students acquire the basic knowledge of economic theory and modern methods specific to the field in order to identify, define, explain, interpret and apply economic concepts at micro and macroeconomic level to formulate hypotheses and propose solutions to economic problems.
COURSE CONTENTS: Course: Economics - Social Science and Form of Human Action; Market economy; Economic goods. Their utility and value; Factors of production and their use; Demand; Offer; The money market; Capital market; Labor market; Occupation and unemployment; Inflation. Laboratory: Economy - science of economic action and form of human action; Economic goods. Their utility and value – applications; Factors of production and efficiency of their use – applications; Demand and supply – applications; The system of markets: the money market, the capital market and the labor market; Unemployment and Inflation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION II

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Aerobics/ Fitness Gymnastics; Application trails combined with treadmills, jumps; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports: Football; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICS

COURSE OBJECTIVE(S): It has as main objectives the formation of future electronics engineers by providing them with knowledge in the fundamental physical field and creating computational skills in case of concrete problems in which knowledge of fundamental and applicative physics intervenes.
COURSE CONTENTS: Course: Elements of mathematical physics: Vector and tensor calculus; Differential calculation. Elements of analytical mechanics: Lagrange Equations; Hamilton equations; Poisson brackets. Applications; Moving charged particles into electric and magnetic fields. Thermodynamic elements: Thermodynamic status, status parameters, status equations; Principle I of thermodynamics; Politrope processes; Principle II of thermodynamics. The Carnot theorem; Clausius' inequality. Entropia; Distributions in statistical physics. Optical elements: Reflection, refraction, Fresnel's formulas; interference; a diffraction; a dispersion. Quantum Physics Elements: The Compton effect. Bohr's hydrogen atom model; His Broglie Hypothesis. Heisenberg's non-determination principle; Schrödinger equation. The general form of the principle of uncertainty. Seminar: Superposition of sound waves; Interference of sounds; Temperature and heat; Specific heat; Ideal gas laws; Polarization; Difference of light.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH II

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.
COURSE CONTENTS: Reading the text" E-commerce", oral debate on questions like: Why/ what do people buy online?/ Does online shopping

help businesses? Solving grammar and vocabulary exercises. Listening to an interview about an electronics company that decided to open an online store; Reading the text "Cell Phones", oral debate on the importance of communication at work. Solving grammar and vocabulary exercises – modal verbs. Listening to a conversation between an engineer and his manager; Reading the text "Alternative Energy", oral debate on ways of protecting the environment. Solving grammar and vocabulary exercises – phrasal verbs. Listening to a conversation between a supervisor and an engineer; Reading the text "Tablets and laptops", oral debate on questions like: Are electronic devices useful at work? .Solving grammar and vocabulary exercises. Listening to a conversation related to civil engineering and filling in the blanks according to the record; Reading the text "Peripherals", oral debate on questions like: Why do people need peripherals?/ What types of peripherals are used in the electromechanical domain? Solving grammar and vocabulary exercises. Filling in the Curriculum Vitae and personalizing an Application Letter; Reading the text "Mechanical Engineering", oral debate on questions like: What type of problems do mechanical engineers fix? What kind of computer methods do mechanical engineers use? Solving grammar and vocabulary exercises; Reading the text "Materials and properties", oral debate on questions like: What kind of materials do people use to build structures?/ Why are some materials better for projects than others? Grammar focus: English Pronoun. Solving grammar and vocabulary exercises. Listening to a conversation between an engineer and his client.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: PROGRAMMING LANGUAGES

COURSE OBJECTIVE(S): Students acquire knowledge of pointer variables, user-defined data types, C language-specific files, and examples of C language usage in solving numerical analysis problems.

COURSE CONTENTS: Course: Pointer variables in C. Declaring pointer variables. Operations with pointers. Dynamic variables; Using user-defined data types. Using Structures; the representation of the lists; Input/ Output Devices in Computer Use. Input/ output functions for console and general purpose. File operations; Using C ++ features. Input/ output operations. Reference variables. Parameters with default values. Overriding functions. Dynamic memory allocation; Using C language to solve numerical analysis problems. Algebraic equations. Differential equations. Equations systems. Own factors and values. Numerical integration and derivation. Interpolation. Laboratory: L1 General language elements C; L2 Pointers in the C language; L3 Paintings and pointers in C language; L4 Functions in C language; L5 Structures in the C language; L6 Lists in C language; L7 Files in C language; L8 Solving equations; L9 Interpolation of functions; L10 Integration of ordinary differential equations; L11 Solving linear systems equations; L12 Vectors and their own values; L13 End of activity. Test final laboratory.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SPECIAL MATHEMATICS

COURSE OBJECTIVE(S): Assimilation of the main theoretical notions and methods of solving problems related to differential equations, complex analysis and Fourier analysis. Using the knowledge and computer skills acquired during the course to solve concrete problems (solving some differential equations attached to electrical circuits, analysis of concrete signals) and interpreting the results.

COURSE CONTENTS: Course: *I Differential equations:* Basic notions; First order differential equations; Higher order linear differential equations (the variation of constants and the characteristic equation methods); Laplace transform. Applications in solving Cauchy problems; Systems of linear equations; Applications of differential equations in the study of electric circuits. *II Complex analysis:* The set of complex numbers (algebric and trigonometric forms, operations with complex numbers, geometrical representations; Elementary complex functions (polynomials, rationals, exponential, trigonometric, logarithm, power function); Calculus (derivability - Cauchy-Riemann theorem-, holomorphic functions, computation of derivatives); Integrals (complex integral, definite integral, Cauchy integrals, residues theorem). *III Fourier analysis:* Development in Fourier series (Classical form, complex form, spectral form, geometrical representations and physical interpretations); Fourier integral and Fourier transform; Discrete Fourier transform and fast Fourier transform; Applications of Fourier transform in the study of signals. Seminar: Differential equations: general solution, particular and singular solutions. Cauchy problems; First order differential equations; Higher order linear differential equations; Solving differential equation using the Laplace transform; Systems of differential equations; Verification test; Complex numbers (algebric and trigonometric form, geometrical representation, operations); Elementary omplex functions (exponential, trigonometric, power); Calculus; Integrals; Developments in Fourier series; Fourier transform; Fast Fourier transform; Applications of Fourier transform in signals' study.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MECHANICS AND STRENGTH OF MATERIALS

COURSE OBJECTIVE(S): Knowledge, understanding and deepening of the basic notions of mechanics with applications in electromechanical engineering. Apply basic principles and methods for solving well-defined issues/ situations, typical of the field under qualified assistance.

COURSE CONTENTS: Course: Elements of vector analysis and force reduction. Elements of mass geometry; Static elements of the material point; Material kinematic elements; Static solids; The rigid solid kinematics; Elements of rigid solids dynamics; Supports and reactions. Representation of effort diagrams; Geometric features of flat figures. Static moments, moments of inertia, resistance modules. Steiner's formulas; Geometric features of simple flat figures and composite plane figures; Simple axial requests; tensions and deformations. Conventional Shear Shear Calculation: Tensions and Deformations; Circular section bar tensioning request: Voltages and deformations; Bending request: Normal and tangential stresses; Bending request: Deformations to bending request. Seminar: Applications concerning the composition of forces, determination of resultant force and resultant moment.; Problems related to the torsion of a given force system. Determining the equilibrium conditions of a material point and a rigid solid; Traving of materials; Compression test of materials; Shear testing of materials; Static bending test of materials; Bending test with singular shock.

LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: PHYSICAL EDUCATION III

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.

COURSE CONTENTS: Athletics: The long jump technique in place; Utility-application paths; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALOGUE ELECTRONICS

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of analog electronics; acquiring basic notions about the construction and operation of the main analog devices and circuits; creating and developing the ability to design and build an electronic circuit to process analogue signals used in electrical equipment (generation, transmission, reception).

COURSE CONTENTS: Course: Introduction to analog electronics: analog signals: classification, analysis, notation convention; passive circuit elements; Semiconductor electrical conduction: intrinsic semiconductors; extrinsic semiconductors; PN junction; Semiconductor diode: symbol, structure, operation; simple diode circuit (load right, static PFS); approximate models; diode recovery. Voltage stabilizer: Symbol, structure, operation; Bipolar Transistor (TB): structure and operation; types of connections and static features; simple circuit with TB (load right, PFS static operating point, operating modes); polarization circuits in cc; Unipolar Transistor (TU) type TEC-J and TEC-MOS: structure and operation; static features; typical applications; Other electronic devices with junctions: thyristor (structure, operation, applications); triac (structure, operation, applications); diac; Optoelectronic devices: photodetectors (photoresistor, photovoltaic cell, photodiode, phototransistor) and photoelectric (LED, LCD, PDP); optocouplers; Operational Amplifier: Symbol, Function, Specific Parameters, Ideal AO, Real AO; linear applications (repeater, inversor, noninvert, sumer, integrator, derivative, comparator). Project: Labor protection training; presentation of the laboratory/ works, organization of working groups; Study of the rectifier diode and stabilizers; Study of bipolar transistor (TB); Study of the unipolar transistor (TU); Virtual AO study; Real AO study; Final assessment of laboratory activity. Laboratory: Statement of the theme, presentation of theoretical notions, organization, way of working; Electronic chart analysis and operation; Calculation of electrical quantities (currents, voltages, powers) and non-electric inputs in the diagram; Sizing and choosing from the catalog the electronic components that make up the schematic; Simulate schema operation using software assistant tools; Analysis by comparison with other schemes fulfilling the same function: advantages and disadvantages; Teaching, project support.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED GRAPHICS

COURSE OBJECTIVE(S): Acquiring basic knowledge about the facilities and how to use AutoCAD for computer-aided design and design.

COURSE CONTENTS: Course: Basic concepts and concepts; Familiarize with the basics of the program. Coordinate and coordinate system

notions of a point. How to initiate drawing and command dialing in AutoCAD; AutoCAD graphics facilities. Working modes, mechanisms, filters, visualization; Modes and tools provided by AutoCAD to facilitate work. Techniques for quick realization of some elements in the drawing; Graphics without thickness and thickness. Drawing layers; Drawing of non-thick graphic objects (finite lines, endless lines of construction, circles, circular arcs, etc.). Drawing of thick graphic objects (polylines and circular rings full). Effective use of drawing layers. Querying certain properties or values in the drawing; Quotation of drawings. Hatching; How to add dimensions to a scale drawing. Creating and customizing quote styles; how to individually change the characteristics of a quota or group of allowances. Basics related to border hatching; Editing techniques; Creating a multiple selection of editing objects; the specific ways to get this crowd. The main commands for editing existing objects in the drawing; Editing options with grip points equivalent to discreet controls; Using blocks; The basics of working with blocks, respectively defining and inserting them into the drawing. Creating and using attribute blocks; edit attributes; 3D modeling; The main commands for creating and editing Solid 3D objects; 3D viewing facilities. Laboratory: Getting Started in AutoCAD; Use simple editing commands; Editing with gripping points; Making drawings on a scale; Quotation of drawings; Creating and using blocks; Create and use attribute blocks; Solids modeling; Final evaluation
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH II

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.
COURSE CONTENTS Reading the text" *Computer engineering*", oral debate on questions like: Why is computer engineering a rapidly expanding field?/ What kind of work do computer engineers do?. Grammar focus: English Present Tenses. Solving grammar and vocabulary exercises. Listening activities; Reading the text "*Materials Engineering-part I*", oral debate on questions like: Why do some materials engineers have to be knowledgeable about geology? Grammar focus: *Present Perfect Simple and Past Tense Simple*. Solving grammar and vocabulary exercises. Listening to a dialogue and completing the missing words in the blank spaces; Reading the text "*Materials Engineering-part II*", oral debate on questions like: How do you think materials will change in the future?. Solving grammar and vocabulary exercises. Listening activities; Reading the text "History of Engineering – part I", oral debates on questions like: How was engineering expertise in the 1970's? Present Perfect Continuous. Solving grammar and vocabulary exercises. Listening activity: choose the correct answer for each of the given questions based on the recording that you will hear; Reading the text "History of Engineering- Part II", oral debate on questions like: How can we learn from previous machineries? Solving grammar and vocabulary exercises. Listening activities; Reading the text "Engineering design method", oral debate on questions like: What are some steps in the engineering design method? Why is using a design method important? Grammar focus: Third Conditional- Mixed Conditionals. Solving grammar and vocabulary exercises. Listen to a conversation between a supervisor and an engineer. Complete the missing words/ phrases; Reading the text "Traits of an engineer", oral debates on questions like: Good qualities for engineers/ how can these qualities be developed? Grammar focus: Means of Expressing Future. Solving grammar and vocabulary exercises. Listening to a conversation between an interviewer and an engineer.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: HYDRAULIC MACHINES AND INSTALLATIONS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire the basic knowledge on the notions of fluid flow in technological systems and processes, as well as skills training in the design, construction and operation of hydraulic and pneumatic machines.
COURSE CONTENTS: Course: Physical and chemical properties of fluids; Fluid hydrostatic. Fundamental hydrostatic equations. Methods and apparatus for measuring pressure; Dynamics of fluids. General equations of perfect fluids. Bernoulli's relationship. Speed and flow rate meters; Permanent movements in pressure systems. Calculation of pressure pipes; Pumping installations. Basic elements regarding the operation of pumps in hydraulic installations. Materials, apparatus, equipment and aggregates for pumping installations; Fans and ventilation systems. Characteristic dimensions. Classification. Construction. Fan equation. Ventilation installations; Compressed air installations. Construction solutions and schemes for the construction of compressed air installations. Materials, equipment and machinery specific to compressed air installations. Laboratory: Methods and apparatus for measuring pressure. Calibration and check of manometers; Methods and apparatus for flow measurement. Calibrating and checking the diaphragm; Experimental determination of energy line and piezometric line; Determining the

energy characteristics of a centrifugal fan. Attenuation of vibrations; Joint operation of two centrifugal fans of different types; Testing an axial fan; Determining the energy characteristics of a submersible hydrodynamic pump; Hydrophore plant study; Study of centrifugal pumps. Construction, operation, energy features; Network operation of centrifugal pumps. Coupling centrifugal pumps in series and parallel; Testing an axial pump; Study of the compressed air system; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNICAL MATERIALS

COURSE OBJECTIVE(S): Presentation in a synthetic manner of the structure and microstructure of the materials, their properties and their functional characteristics; Students' acquisition of basic phenomena and principles through illustrative examples or numerical calculations and the acquisition of practical skills and analysis and diagnostics.
COURSE CONTENTS: Course: Introduction. Presentation of "Materials Science" as a multidisciplinary science. Material cycle, resources and prospects for development; General problems regarding the structure of materials: structure of atoms and groups of atoms, bonds, internal cohesion forces, physical states of materials, molecular solids; Reticular crystalline structure: types of networks, plane identification and crosslinking directions, defects, electron states in crystals; Conductive, semiconductor and insulating materials: general characteristics, classification, types of conduction, properties and their dependence on various factors. Illustrative examples and applications; Dielectric properties of materials: electrical polarization and dielectric losses; Magnetic properties of materials: general magnetic properties, types of magnetism (dia-, para-, ferro-, ferri- and antiferromagnetism), magnetizing mechanism. Soft and hard magnetic materials; Composite materials: concept, types, structures, classification, phenomena, properties, calculations and applications. Laboratory: Presentation of laboratory work and protection measures to perform this work; Measurement of insulating resistance and determination of the viscosities of solid insulating materials; Determination of metallicity; The study of the import of the material at traction does not; Microscopic analysis of probelormetalographic; Determination of the electrical conductivity of liquids; Determination of Charpy shock resistance and impact resistance; Indo-alternate test of plates and bands; Determination of electrical properties of solid-insulating materials; Determination of the electrical properties of the electro-isoleucyl-alkali materials; Study of material feeds on flexion; Determination of the resistance and leakage resistance indicators in the humidity conditions; Determination of capacity, relative permissivity and insulation loss factor; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of mechanical transmission as well as the stimulation and development of students' creativity skills by carring out projects using established principles and methods, in compliance the standards.
COURSE CONTENTS: Course: MECHANISMS; Analysis and structural synthesis of mechanisms; Kinematic analysis of mechanisms; Cinetostatic analysis of mechanisms; MACHINE PARTS; Non-demountable assemblies; Demountable assemblies; Gear transmission; Friction transmissions; Axles and shafts; Spindles and pivots; Bearings. Laboratory: Analysis and learning basis of the design theme. (teamwork) Establishing the kinematic scheme. Determination of kinematic and dynamic parameters; Belts transmission design; Gear design; Shafts design; Gearbox bearings selecting; Couplings selecting. Sealing systems selecting; Project Presentation/ Support (Power Point).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL CIRCUITS THEORY

COURSE OBJECTIVE(S): It is a discipline in the field of Electrical Engineering. It aims to deepen the theory of electrical circuits of cc and so on, the theoretical foundation for all specialty disciplines with electrical profile in the curriculum. Theoretical notions are complemented and supported by applications (seminar and laboratory works). Laboratory works aim at the experimental study of electrical circuits of d.c. and a.c. regimes.
COURSE CONTENTS: Course: Getting Started; DC circuits; Circuits in permanent sinusoidal mode; Three-phase electric circuits; Two-ports four-poles electric circuit and electric filters; Circuits in non-sinusoidal periodic regimes; Transient regime of electric circuits. Seminar: DC circuits: analysis by Kirchhoff theorems, equivalent circuits; DC circuits: operative analysis methods, theorems of equivalent generators; Permanent sinusoidal circuits: symbolic representation of sinusoidal magnitudes, phasorical representation, analysis by Kirchhoff's theorems; Operating methods, powers, electrical resonance mode, magnetic coupling treatment; Three-phase circuits: single-phase circuit design for balanced circuit study, neutral point potential method, power balance calculation for balanced/ unbalanced receivers; Transient regimes: the meaning of the initial conditions, the direct integration method, the meaning of the free/forced components; Transient regimes: the operational method. Laboratory: Specific PM and PSI rules. Team work sharing.

Presentation of the works cycle; Experimental study of RLC circuit in a.c; Experimental study of transient regimes in simple circuits; Experimental study of three-phase circuits powered by a symmetrical voltage system; Experimental verification of some theorems in d.c. circuits; Experimental study of passive linear two-ports four-poles electric circuit; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 2ND SEMESTER

COURSE TITLE: DATABASE
COURSE OBJECTIVE(S): Students training in the field of database design: familiarizing with the possibilities of using databases regardless of their type and acquiring the ability to design relational databases.
COURSE CONTENTS: Course: DATABASES - FUNDAMENTAL KNOWLEDGE; Concepts; Fundamental objectives of a database; The architecture of a database system; Database management systems; MODELING DATABASES; Concepts; classifications; The relational model. Relational system operators; Examples; RELATIONAL DATABASES DESIGN; Achieving the conceptual scheme of database (entity-link model); Achieving the logical schema (design, diagram) of a database; Physical design of the database; Database Implementation; DATABASES NORMALIZATION; Getting Started. Types of canonical forms; Constraints of integrity; SQL LANGUAGE; Introduction to SQL; Commands to define data; Commands for querying data; SQL functions; COMPETITIVE ACCESS TO DATA AND CONSERVATION OF THEIR CONSISTENCY; THE SECURITY OF ORACLE DATABASE. Laboratory: ORACLE database management system; SQL - structured, universal language for querying databases; Populate the database with tables. CREATE, ALTER TABLE, DROP, RENAME commands; Insert data into tables. INSERT command; Modify the data in the tables. UPDATE, DELETE, TRUNCATE commands; Insert data into tables. MERGE command; Data query. SELECT command; Sorting data. ORDER BY clause; Filtering the table lines. WHERE clause. Use of logical operators; SQL functions. Functions for a single record; SQL functions. Functions for multiple records; Grouping Records. GROUP BY and HAVING clauses; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION IV
COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Fitness - optimizing your physical condition; Utility-applicative skills; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL ELECTRONICS
COURSE OBJECTIVE(S): Principles of operation for digital circuits, starting from binary logic and arithmetic; methods for analysis and synthesis of digital circuits; typical combinational and sequential circuits; programmable logic arrays; constructive and functional features for the main families of digital integrated circuits; digital circuit applications.
COURSE CONTENTS: Course: Logical operations and functions; Representation of information in digital circuits; Synthesis and processing of combinational logic functions; Representative combinational circuits; Sequential logic circuits (CLS); Main sequential circuits; Programmable logic arrays; Physical logic circuits. Families of integrated circuits. Laboratory: Computer Aided Analysis of digital circuits by Digital Works program; Study of TTL and CMOS logic gates. Study of astable and monostable typical circuits; Study of the bistable typical circuits; Study of decoders, code converters, counters and registries; Experimental analysis of digital circuits by logic analyzer and computer; Study of some complex digital equipment: positioning system based on optical slide transducer, digital controller with industrial input/ output devices. Project: The project theme. Steps, personalized elements, theoretical support and tools necessay, way of completion, practical achievements. Project model; Calculation of personal data. The custom functional cycle; Sequencer design; Choosing components for the sequencer; Computer simulation of the sequencer circuit; Designing the clock circuit with adjustable frequency; Choosing components for the clock generator. Verifying the virtual operation; Configuration and calculation of the control block (Start/ Stop, Reset, Init); Choosing components for the control block. Operation check by simulation; Configuring, choosing components and calculating the displaying block; Integration the designed

modules into a single assembly and check the operation; Elements of sizing and selection of the power supply unit; Methods of physical realization of the assembly; Presentation and scoring.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH IV

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.

COURSE CONTENTS: Reading the text"*Robotics*", oral debate on questions like: IN which fields of activity are robots important? /Robotics and electromechanics – connections. Grammar focus: Active and Passive Voice. Solving grammar and vocabulary exercises. Listening activities; Reading the text "*E-Commerce*", oral debate on questions like: How are computers used in electromechanics? Does online advertising help businesses? Grammar focus: *Modals in English*. Solving grammar and vocabulary exercises. Listening to a dialogue and completing the missing words in the blank spaces; Reading the text "*New technologies*", oral debate on questions like: Mention some ways to keep the workplace safe? How can we ensure safety at work?. Solving grammar and vocabulary exercises. Listening to a conversation between a supervisor and an engineer; Reading the text "*Resistors, LEDs and cell phones*", oral debates on questions like: What is a resistor? Can you explain the LED technology? Can the smartphone replace the laptop in business trips- explain your answer?. Grammar focus: *Should,Ought to, Had better*. Solving grammar and vocabulary exercises. Listening activity: choose the correct answer for each of the given questions based on the recording that you will hear; Reading the text "Peripherals", oral debate on questions like: Why do people need peripherals?/ What types of peripherals are used in the electromechanical domain? Solving grammar and vocabulary exercises. Filling in the Curriculum Vitae and personalizing an Application Letter; Reading the text "Engineering design method", oral debate on questions like: What are some steps in the engineering design method? Why is using a design method important? Grammar focus: Third Conditional- Mixed Conditionals. Solving grammar and vocabulary exercises. Listen to a conversation between a supervisor and an engineer. Complete the missing words/ phrases; Reading the text "Tables and Graphs", oral debate on questions like: what are graphs used for? How do graphs help engineers and those who work in the electromechanical domain? Grammar focus: *Phrasal Verbs*. Solving grammar and vocabulary exercises. Listening to a conversation between two engineers; after hearing the conversation mark the given statements as true (T) or false (F).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER-AIDED DESIGN

COURSE OBJECTIVE(S): Knowing the principles of computer-aided design and manufacturing. Modules of the integrated CATIA design and manufacturing system are presented. The knowledge of concepts and methods of assisted design and manufacturing, the ability to create virtual models of bodies or assemblies and the use of assisted manufacturing modules in CATIA are evaluated.

COURSE CONTENTS: Course: Design of CAD/ CAM/ CAE. Principles and peculiarities; Overview CATIA; The Sketcher modulePart Design Module; Assembly module; Drafting Module; Generative Shape Design module; The DMU module; NC Manufacturing Module; CATIA assisted analysis and manufacturing modules. Laboratory: L1 Module CATIA Sketcher - General Elements; L2 Drawing in Sketcher; L3 Operations and constraints in Sketcher; L4 Part Design Module - General Elements; L5 Sketch-based features toolbar; L6 Dress-up features toolbar; L7 Transformation features toolbar; L8 Rib Options, Slot and Stiffener; L9 Module CATIA Drafting; L10 Assembly Design Module; L11 Module NC Manufacturing.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROMAGNETIC FIELD'S THEORY

COURSE OBJECTIVE(S): It is a fundamental discipline for the field of Electrical Engineering study. It aims at deepening the macroscopic theory of electromagnetic phenomena, the theoretical foundation for all specialty disciplines with electrical profile in the curriculum. Theoretical notions are complemented and supported by applications (seminar and laboratory works). The laboratory work aims at the experimental verification of the laws and the theorems of the electromagnetic field.

COURSE CONTENTS: Course: Getting Started. Theoretical aspects of the electrostatic field. Electrical capacitor. Capacitor networks; The stationary electro-kinetics regime; Stationary magnetic field; Magnetic circuits. Inductances; Variable regime. Evolution laws of the electromagnetic field. Seminar: Calculation of electrostatic fields: elementary method, electric flux law method; Calculation of electrical capacities, capacitor networks; Energy and forces in the electrostatic field; Applications of the electrical charge conservation law. Applications of electrical conduction law; Calculation of stationary magnetic fields with the Biot-Savart-Laplce method and Ampère's theorem; Magnetic circuits. Calculation of own and mutual inductances; Applications of

electromagnetic induction law. Laboratory: Specific PM and PSI rules. Team work sharing. Presentation of the works cycle. Knowledge and use of laboratory devices and devices; Capacitors. Capacities. Capacitor networks; Experimental verification of the electromagnetic induction law; Experimental verification of magnetic circuit law; Experimental study of forces that manifest in the magnetic field; Calculation of mutual inductance; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEM THEORY AND CONTROL

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of system theory and process control.
Developing skills in: modeling and simulation of dynamic systems; analysis of general properties of dynamic systems; definition of performance and quality indicators for control systems; analysis and design of automatic control systems.
COURSE CONTENTS: Course: Fundamental concepts of automatic control systems (Oriented Systems, Examples, State Concept); Properties of linear time invariant systems (Transfer function; Graphical representation of systems; Systems connection; Equivalent reductions; State equations; System controllability and observability; Frequency characteristics; Systems stability); The general structure of an automatic control system (Conventional Control System; Classification of Regulators and Control Systems); Typical Control Algorithms (P, I, PI, PD, PID); Quality and performance indicators imposed on control systems (Quality indicators that measure the precision of control systems; Quality and performance indicators defined in the harmonic regime; Quality and performance indicators defined in the transient regime); Control Structures (Combined Control Systems; Cascade Control Systems; Discrete Time Systems; Process Computer Architecture; Digital Control Algorithms). Seminar: Laplace transformation; examples of application; Solving differential equations using Laplace transformation; Examples of setting mathematical models; Systems reduction using block diagrams; Study of system controllability and observability; Frequency characteristics drawing; Systems response computing to type signals; Systems stability analysis. Laboratory: Matlab/ Simulink work environment - Overview. Symbolic calculation in Matlab; Description of linear, time invariant systems. System response to type signals; Structural properties of linear systems. Observability. Controllability. Stability; Quanser SRV02 engine angular positioning system; Quanser flexible beam control methods using the Wincon real time; Typical control laws implemented on Quanser's Analog Plant Simulator; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 1ST SEMESTER

COURSE TITLE: ELECTROMECHANICAL CONVERTERS I

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of electromechanical converters, very much used in systems engineering applications. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: General concepts of electric cars; Electric transformer. Constructive elements, operating principle and transformer equations, phasorical diagrams and equivalent schemes. Transformer operating queens: naked, short circuit and load. Parallel coupling and operation of transformers. Operation in non-symmetrical load of transformers; Asynchronous machine. Elements constructive principle and operating regimes. Equations of the asynchronous machine, phasor diagrams and equivalent schemes. Mechanical characteristics, start, speed control and braking of asynchronous motors; Synchronous machine. Constructive elements, principle of operation, equations and phasorical diagrams of synchronous generators. Electromagnetic torque and static angular characteristic. Coupling and parallel operation of synchronous generators. Synchronous motors: equations, operating characteristics and starting methods; DC machine.Constructive components, Generator c.c. derivation. Cc motors: mechanical characteristics, starting, adjusting speed and braking. Laboratory: Work safety training. Presentation of the laboratory; Study of three-phase electric transformers: schemes and groups of connections; The efficiency of the transformer determined by the direct method; Coupling and parallel operation of three-phase transformers; The three-phase asynchronous motor operating characteristics (direct method); Determination of the asynchronous motor efficiency by the indirect method; Adjusting the speed of asynchronous motors by the rheostatic method; Self Synchronous Generator Study; Start-up and V-sync features of the synchronous engine; Coupling and parallel operation of synchronous generators; Study of the c.c. with separate excitation; Study of the c.c. with excitation bypass; Study of the c.c. with series excitation; Final assessment of laboratory activity
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER STATIC CONVERTERS I

COURSE OBJECTIVE(S): Acquiring basic knowledge on the principles, operation, performances and design of the static power converters, as well as acquiring skills in their use in the electrical engineering applications.
COURSE CONTENTS: Course: The place of the static converters in the energy flow. Classification of

the static converters. Applications of power static converters; Power semiconductor devices: characteristics and control; losses; choice and verification; protection; (Alternating Current) AC/ (Direct Current) DC static converters (rectifiers): general theory, practical schemes of single-phase and three-phase rectifiers; bidirectional rectifiers; AC voltage controllers: principle, basic power circuit; control; operation; characteristic quantities; performances; practical schemes; Direct AC/AC frequency converters with natural commutation (cycloconverters): principle; control; operation; performances; practical schemes; DC/DC static converters (DC voltage controllers/ choppers): principle; control; operation; characteristic quantities; performances; practical schemes; Indirect AC/AC frequency converters: classification; particularities; DC/AC static converters (inverters): single-phase voltage source inverters with square wave output; three-phase voltage source inverter with square wave output; three-phase current source inverter with square wave output; Pulse Width Modulation (PWM) inverters. Laboratory: Study of the control circuit and switching characteristics of the Gate Turn-Off thyristor (GTO); Study of the control circuit and switching characteristics of the Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET); Study of the phase angle *control of the rectifiers;* Study of the three-phase bridge controlled rectifier; Study of the buck DC voltage controller; Study of an indirect frequency converter with voltage source inverter and pulse width modulation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL EQUIPMENT I

COURSE OBJECTIVE(S): The discipline purpose is presenting the theoretical basics of electrical equipments functioning, regarding the transient regimes, thermal regimes, electrodynamics and insulation of electrical equipment.

COURSE CONTENTS: Course: Electrical equipment: Classification. Definitions. Rated parameters. Operating regimes; Thermal, dielectric and electrodynamic stresses; Environmental streses. Electrical circuits commutation. Transient regimes: Electrical circuits (RC,RL, RLC) connecting at dc and ac power supply sources; Electrical circuits disconnecting. Transient recovery voltage. Parameters; Three phase shortcircuits disconnecting; Small inductive and capacitive currents disconnecting; Long power transmission lines disconnecting; Disconnecting of phase opposition. Electrodynamic forces: Electrodynamic forces between threadlike and coplanar conductors; Electrodynamic forces in mono phase and three phase a.c. circuits; Steady state and transient regime; 3. Electrodynamic stability of electrical circuits; 4. Forces shielded bars. Thermal regime of electrical equipment: Heat sources. Ways of heat transmitting; Laws of heat transmitting. General equation of heat transmitting; Spatial distribution of temperature in flat walls with losses and no losses; Thermal resistance of a planar wall; thermal resistance of a cylindrical wall; Uniform heating and cooling of current paths. Thermal time constant; Heating in intermittent regime; heating in short-circuit regime. Electrical contacts: Contact resistance. Dependence of contact resistance, the contact pressing force, the temperature of contact point and the voltage drop across the contact; Thermal regimes of the electricl contacts; The electrical contacts vibration; Migration of electrical contact material . Materials and constructive principles. Electrical equipment insulation: Overvoltages. Basic insulating level. Behavior ai short and long-term overvoltages; Liquid , gaseous and solid insulation. Vacuum insulation; Overvoltages protection; Surge arreters with metal oxides; Coordination of insulation; Composite insulation. Seminar: Shortcircuit simulation. Circuit breakers selection; The simulation of the recovery overvoltages; Shortcircuit disconnecting. Circuits with two oscillation frequencies; The computation of electrodynamic forces between filiform and threadlike circuits; busbars. Electrodynamic stability; Transmitting of heating through the planar and cylindrical walls- numerical applications. Thermal stability computation; The computation temperature in electrical contacts. Force rejection in electrical contacts. Laboratory: Study of electromagnetic relays and triggers construction; Study of contactors and low voltage circuit breakers construction; Study of medium and high voltage circuit breakers construction; Study of fuses, disconnectors and surge arreters construction; Study of thermal regimes of iron core coils and current paths of electrical equipment; The simulation of transient regimes; Experimental study of electrical contacts; Experimental study of electrodynamic forces; Final students evaluation

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: OBJECT ORIENTED PROGRAMMING

COURSE OBJECTIVE(S): Students acquire knowledge of the concept of object-oriented programming.

COURSE CONTENTS: Course: Introduction to Java. Lexical structure. Variables. Execution control; Objects and classes. Creating classes. Methods; Exceptions. Treating exceptions; Input-output flows; Interfaces. Defining. Implementation; Class organization; Serializing objects; AWT components. Treating events. Using windows; Drawing; Execution threads. Pipe type flows; Android Application Architecture; Using the Android SDK to compile mobile apps. Laboratory: Getting Started in the Eclipse Development Environment; Operations with strings. Defining classes;

Inheritance and overload. File operations; Interfaces and collections of objects; Introduction to AWT; Graphical interfaces; Develop an Android app. Project: Designing an application in Java for an Android device; The organization chart of the application. Structuring classes. Introduction to XML; Developing the required objects and classes; Implement the main program; Compiling and testing the application on the emulator; Compiling and testing the application on a real device; Source code optimization.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TRANSLATORS, INTERFACES AND DATA ACQUISITIONS

COURSE OBJECTIVE(S): Study of electrical transducers, interfaces and data acquisition systems on: architectures, signal conditioning circuits, analog-to-digital and analogue-to-analog converters, and software for data acquisition. The lab has the role of fixing theoretical knowledge and creating practical skills for application development using virtual instruments.
COURSE CONTENTS: Course: Electrical transducers; Communication interfaces; Data acquisition systems; Modules for data acquisition; Data acquisition with LabVIEW 8.5 and with LabVIEW SignalExpress. Laboratory: Labor protection training; Presentation of laboratory work; Study of resistive transducers; Study of numerical transducers; Introduction to LabVIEW; Elements of the front panel of a virtual instrument. Controls window; Block diagram elements of a virtual tool. Function Window (Functions); Creating, editing, and correcting a Virtual Instrument; Creating and using SubVIs; Analog switches - Applications: Numerically programmed voltage divider; Automatic switching of amplifier factor; Numerical-analogue data conversion circuits - DAC 08; Analog-numeric data conversion circuits - CAN with successive approximations; Analog-digital data conversion circuits: three-digit integrated voltmeter; LabVIEW applications for data acquisition and generation; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 2ND SEMESTER

COURSE TITLE: ELECTROMECHANICAL CONVERTERS II

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the basic concepts of electromechanical converters II. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: Synchronous machine: constructive elements, operating range and industry response. Operation equations and phasorical diagrams of synchronous generators. Power, electromagnetic torque and static angular characteristic. Parallel coupling and operation of synchronous generators. Operation in non-symmetrical load of synchronous generators. Synchronous motors: phasorical equations and diagrams, operating characteristics, starting methods. Synchro compensator. The geometric location of the synchronous machine current; DC machine: construction elements, DC coils, t.e.m. induced and electromagnetic torque. Direct current generators: with separate excitation, intermittent and mixed: operating characteristics. DC motors: with separate excitation, derivation, series and mixed: functional and mechanical characteristics. Starting, speeding and braking of DC motors. Laboratory: Work safety training. Presentation of the laboratory; Self Synchronous Generator Study; Starting and operating characteristics of the synchronous motor; Starting and curves in V on the synchronous motor; Parallel coupling and operation of synchronous generators; Determining the parameters of the synchronous machine in symmetrical stationary mode; Determining the parameters of the synchronous machine in unstable stationary mode; Study of the c.c. with separate excitation; Priming and studying the c.c. with dithering excitation; Study of the c.c. with mixed excitement; Study of the c.c. with dithering excitation; Study of the c.c. with excitement series; Study of the c.c. with mixed excitement; Final assessment of laboratory activity. Project: Assignment of project themes (low-voltage three-phase asynchronous motor with short-circuit rotor); Calculation of the main dimensions; Dimension of stator windings and rotor; Magnetic circuit dimensioning, magnetization current determination; Calculation of machine parameters (resistors and reactants); Calculation of losses and operating characteristics; Supporting and evaluating projects.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER STATIC CONVERTERS II

COURSE OBJECTIVE(S): Knowledge of the construction, operation and design of static converters c.a.-c.a., c.c.cc.c. and c.c.-c.a.
COURSE CONTENTS: Course: STATIC CONVERTERS C.A.-C.A. WITH NATURAL COMUTATION: Single-phase alternating voltage variator; Principle, scheme (triac and thyristor), operation; Waveforms and specificities depending on the type of task; VTA three-phase; applications; Problems solved. Cicloconvertoare; Principle, scheme, operation, waveforms; STATIC CONVERTERS C.C.-C.C: DC low voltage (Buck); Principle, schema of principle, operation, modalities of command; External and command features. Problems solved; High Voltage Continuous Voltage (Boost) Voltage Transducer; Principle, schema of principle, operation, command; External and command features; Problems solved; Voltage switch continues in four dials; Scheme; Control variants;

Applications; STATIC SWITCH-OFF CONVERTERS C.C.-C.A. AND C.A.-C.A .; Static voltage and frequency converters; Inverters principle; One-phase voltage inverter; Characteristic dimensions; Static three phase voltage converter and indirect voltage frequency with amplitude modulation; Problems solved; Static voltage and frequency converters with time modulation; The principle of modulation in duration; Types of sinusoidal modulation for single-phase inverters; Static three phase voltage converter and indirect voltage frequency with time modulation; Other modulation strategies over time (in frequency, vector, bang-bang, pre-calculated). Laboratory 1: One-phase VTA study; The voltage variation study continues downward; Continuous elevation voltage variance study; Frequency modulation voltage inverter study; Continuous modulation voltage inverter study; Study and parameterization of an industrial inverter; Testing. Laboratory 2: A forced static (VTC or inverter) static converter will be designed; The force scheme and the calculation of the characteristic quantities; Choosing and checking the transistors; Design of overcurrent protection; Synthesis and digital design of the control circuit; Support and evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTING ENVIRONMENTS IN ELECTROENERGETICS

COURSE OBJECTIVE(S): Knowledge of methods, techniques and strategies for conception and implementation of information systems; Driving processes in the energy industry by integrating process computers into centralized and hierarchical computerized SCADA systems.

COURSE CONTENTS: Course: General aspects of computer systems; SCADA systems in power engineering; Integrated systems for protection, automation, measurement and control of electrical stations; DMS/ SCADA systems for operational management at the energy dispatcher level. Laboratory: Labor protection training; Presentation of laboratory work; Use and programming in LabVIEW in power engineering; Programming structures in LabVIEW; Making graphic representations. Local and global variables; Communicating in LabVIEW using the TCP/ IP protocol; Data acquisition with the NI cDAQ-9172 system using NI LabVIEW Signal Express: Configuring the cDAQ-9172 hardware; Data acquisition with NI cDAQ-9172 using NI LabVIEW Signal Express: Software Configuration; Recording of data acquired with NI cDAQ-9172 using NI LabVIEW SignalExpress; Analysis of data acquired with NI cDAQ-9172 using NI LabVIEW SignalExpress; LabVIEW applications for data acquisition and generation; Final evaluation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER-AIDED DESIGN

COURSE OBJECTIVE(S): Knowing the principles of computer-aided design and manufacturing. Modules of the integrated CATIA design and manufacturing system are presented. The knowledge of concepts and methods of assisted design and manufacturing, the ability to create virtual models of bodies or assemblies and the use of assisted manufacturing modules in CATIA are evaluated.

COURSE CONTENTS: Course: Design of CAD/ CAM/ CAE. Principles and peculiarities; Overview CATIA; The Sketcher modulePart Design Module; Assembly module; Drafting Module; Generative Shape Design module; The DMU module; NC Manufacturing Module; CATIA assisted analysis and manufacturing modules. Laboratory: L1 Module CATIA Sketcher - General Elements; L2 Drawing in Sketcher; L3 Operations and constraints in Sketcher; L4 Part Design Module - General Elements; L5 Sketch-based features toolbar; L6 Dress-up features toolbar; L7 Transformation features toolbar; L8 Rib Options, Slot and Stiffener; L9 Module CATIA Drafting; L10 Assembly Design Module; L11 Module NC Manufacturing.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ROBOTICS

COURSE OBJECTIVE(S): Students acquire knowledge of building, modeling and robot management in applications from various industrial and non-industrial fields, as well as skills training in the use, modeling, programming and management of robots.

COURSE CONTENTS: Course: Introduction. Domains of use of robots; Structure of the robot system; Analysis of the robot operating space; Kinematic modeling of robots; Dynamic robot modeling; Robot actuation systems; Sensor system of robots; Mobile robots; Robot management systems; Integration of robots into Flexible Manufacturing Systems. Laboratory: Analysis of mechanical structure components for typical robotic arm cases. SO analysis; Study of industrial and special (unconventional) • Study of locomotive systems for mobile robots; Study of actuation systems, sensing systems and motion of robots; Kinematic modeling of robots (Denavit-Hartemberg method); Dynamic robot modeling (Lagrange method); Manipulating manipulators with rigid systems in wired technology; Driving robots with flexible systems based on microprogrammable automata; Driving robots with programmable automation systems; Driving robots using training sessions; Managing mobile robots in (non) restricted operating fields; Integration of robots into flexible machining lines (by chipping); Integration of robots into flexible multi-post assembly lines; Final evaluation. Laboratory test.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): Acquiring basic notions about the construction/ operation of the main sensors and sensing systems used in the complex automation of industrial processes (industrial robots).

COURSE CONTENTS: Course: General aspects of sensors and sensing systems: block diagram, types, static and dynamic features; the place of the sensory block within the industrial robot's driving system; Classification of sensors and functions of robotic sensory systems; principles and methods of measurement; metrological characteristics of sensory systems; Sensors for measuring internal parameters (proprioception): general notions; sensors for position/ displacement measurement; linear/ angular displacement fluid sensors; electrical motion sensors - general notions; Electric generating displacement sensors; Electronic adaptive circuits - signal processing; Linear and circular inductosin: construction and operation; processing of inductosin signals with electronic adapters; other types of electric motion sensors: non-coded and encoded rulers/ discs; Optical motion sensors: construction, operating principles, readings, reading method in V; Sensors for speed measurement: operating principles, construction, sensors with interruption/ reflection of light flux; Sensors for measurement of external (extrinsceptive) parameters: general notions, classification, isolated tactile sensors; Types of sensor matrices: electro-optical and resistive; with carbon fibers and magnetoresistive fibers; magnetostrictive and piezoelectric; with phototransistors; Proximity sensors: inductive; capacitive; photoelectric, pneumatic; with optical fibers. Laboratory: Labor protection training; presentation of the laboratory/ works, organization of working groups; Positioning system with two-phase asynchronous motor; Positioning system with M.P.P; Positioning system with AC servomotor; Study of linear inductosin transducer: construction and operation in a positioning system; Charlyrobot robot grill positioning study; Final assessment of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ELECTRIC DRIVES I

COURSE OBJECTIVE(S): Determination of the functional interdependence between the electric motor and the working machine in order to choose the electric drive motor, the starting method, the speed control method, the braking method and the determination of the corresponding parameters.

COURSE CONTENTS: Course: Introduction; Static characteristics of working machinesDefinition of static characteristics of working machines: Signing and movement of energy convention; Static static couples; Angular speed-dependent static couples Static couples dependent on linear displacement; Static torque-dependent static couples. Static torque diagram: Classification of working machines according to static torque diagram; Determining the Static Torque Diagram from Experimental Data; Basic equations of motion in electromechanical drive systems: Fundamental equation of motion; Reporting static torques and static forces; Reporting moments of inertia and masses; Motion diagrams of electromechanical drive elements; Choosing and checking the power of electric drive motors: Heating and cooling of electric motors; The principle of choosing the power of electric motors; Typical services of electric motors; The general algorithm for selecting and checking the power of electric drive motors; Selection and verification of engine power for S1, S2, S3, S4, S5, S6, S7, S8 engines; Mechanical electromechanical drives with separate excitation motors: Mechanical and electromechanical static characteristics Analyzing methods and determining parameters for starting electromechanical drives with DC motors with separate excitation; Analysis of methods and determination of parameters for adjusting the velocity of electromechanical actuations with DC motors with separate excitation; Determination of parameters for electric braking of electromechanical drives with separate excitation DC motors; Analysis of the dynamic regime of electromechanical actuations with separate excitation DC motors; Electromechanical drives with three-phase asynchronous motors: Static characteristics of asynchronous motor electromechanical drive; Determination of parameters of the natural mechanical characteristic; Determination of parameters for starting of electromechanical actuations with asynchronous motors; Determination of parameters for adjusting the speed of electromechanical actuations with asynchronous motors; Determining parameters for braking electromechanical actuations with three-phase asynchronous motors; Analysis of the dynamic regime. Laboratory: Laboratory methodology; Experimental determination of static parameters and characteristics at start of electromechanical actuations with m.c. with separate excitation; Experimental determination of static parameters and characteristics at start of electromechanical actuations with m.c. with excitement series; Experimental determination of parameters and static characteristics at start of electromechanical actuations with m.a; Experimental determination of static parameters and characteristics in controlling the speed of electromechanical actuations with m.c. with separate excitation; Experimental determination of static parameters and characteristics in controlling the speed of

electromechanical actuations with m.c. with excitement series; Experimental determination of static parameters and characteristics in regulating the velocity of electromechanical actuations with m.a; Experimental determination of parameters and static characteristics at braking of electromechanical actuations with m.c. with separate excitation; Experimental determination of parameters and static characteristics at braking of electromechanical actuations with m.c. with excitement series; Experimental determination of parameters and static characteristics at braking of electromechanical actuators with m.a; Numerical simulation of the transient regime at starting and braking electromechanical actuators with m.c.c with separate excitation; Numerical simulation of the transient regime at starting and braking electromechanical actuators with m.c.c with series excitation; Numerical simulation of the transient regime when starting and braking electromechanical actuators with asynchronous motor.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT

COURSE OBJECTIVE(S): To familiarize students with the main concepts and practices in the field of management. To develop organizational and decision-making skills.
COURSE CONTENTS: Course: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Management information system: concept, components, functions, principles, deficiencies. Seminar: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Management information system: concept, components, functions, principles, deficiencies.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MODELLING AND SIMULATION

COURSE OBJECTIVE(S): Learning to use MATLAB-SIMULINK simulation environment, knowledge of modeling and simulation techniques of articulated mechanical systems, electrical systems and electromechanical systems.
COURSE CONTENTS: Course: MATLAB-SIMULINK SIMULATION ENVIRONMENT: General Matlab-Simulink. Getting Started About Creating a Model. Simulink Libraries. The SimPowerSystem Library; DYNAMIC SYSTEMS AND STATE MODELS: Definitions and examples. Terminology and notations. Modeling and analysis; MODELING MECHANICAL MECHANICAL SYSTEMS: Dynamics of rigid bodies in a plane; example - modeling the dynamics of a missile. Dynamics of articulated mechanical systems: definition of coordinates, expression of geometric restrictions, motion equations, elimination of redundant coordinates, example: the dynamic model of a manipulator arm. Elastic joints. Friction; MODELING THE ELECTRICAL SYSTEMS: Electrical networks: the equation of the state model of an electrical network; ELECTROMECHANICAL SYSTEMS MODELING: General algorithm for obtaining the dynamic model of an electromechanical system; example electromagnet. Dynamic models of electric machines: chopper, asynchronous machine, synchronous machine with permanent magnets. Laboratory: SIMULINK simulation environment; standard SIMULINK libraries. Making simple models; The SimPowerSystem Library: features, facilities, use; Simulating a manipulator arm; Simulating a rectifier circuit and LC filter; SIMULINK models for sources used in c. C. the m.c; Simulation of S.A. with m.c. and VTC in closed circuit; SIMULINK models for sources used in asynchronous motor drive systems; the asynchronous motor model with the short-circuited rotor; SA simulation with asynchronous motor and inverter with prescribed currents ordered with rotor flow orientation; SA simulation with asynchronous motor and voltage controlled inverter with rotor flow orientation; SA simulation with synchronous synchronous motor with permanent magnets and vector-controlled inverter; SA simulation with synchronous synchronous motor with permanent magnets and voltage vector inverter with vector control; Testing
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ROBOTS PROGRAMMING

COURSE OBJECTIVE(S): Students acquire knowledge of methods of implementation of robot controllers as well as programming and operating methods.
COURSE CONTENTS: Course: Structure of a robot system; Robot - driving object; Reference systems; Kinematic elements; Programming the movement; Robot trajectory control; Hardware implementation

of a robot controller • Methods of programming robots; Programming languages for robots; RAPID Language. Laboratory: Simulation and programming environment of industrial robots; Hardware and software study of a mobile robot; Study of approach and obstacle avoidance movements; Study of Robotino mobile robot orientation in the operating area using image processing functions; ABB RobotStudio programming and simulation environment; ABB RobotStudio Programming and Simulation - part II; Schedule a handling operation; Programming a painting operation; Schedule an assembly operation; Introduction to Python; RoboDK off-line programming environment; Programming manipulation in RoboDK.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS WITH MICROPROCESSORS

COURSE OBJECTIVE(S): Acquisition of concepts related to fundamental architectural features of microprocessors, data structures, addressing modes, instruction set, registers, interrupt systems, mathematical processors. Understanding the internal structure of a 80X86 family of microprocessors. Development and implementation of hardware and software applications for microprocessor systems. The lab has the role of fixing theoretical knowledge and creating practical skills for application development using microprocessor applications using virtual instruments.
COURSE CONTENTS: Course: Microprocessor - General concepts; Families of microprocessors; The INTEL 80X86 family; Programming the microprocessor; Applications of microprocessor systems. Laboratory: Labor protection training; Presentation of laboratory work; Scheduling in assembly language using the SMS32 simulator: use of internal registers; Scheduling in assembly language using the SMS32 simulator: access to memory; Scheduling in assembly language using the SMS32 simulator: stack usage and subroutines; Scheduling in assembly language using the SMS32 simulator: programming real simulated systems; Scheduling in assembly language using the SMS32 simulator: scheduling using interruptions; Introduction to Microprocessor Systems: hardware description and operation - Z3EV mode; Introduction to microprocessor systems: description and software operation - Z3EV mode; 32-bit microprocessor - Z3EV mode: microsystem programming using console; 32-bit microprocessor system - Z3EV mode: microsystem programming using PC; 32-bit microprocessor - Z3EV mode: Advanced programming. Managing interruptions; 32-bit microprocessor - Z3EV mode: Parallel communication interface; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DISCRETE EVENT DYNAMIC SYSTEMS

COURSE OBJECTIVE(S): The goal of this course is identification of structural features and behavioral particularities of an discrete event dynamic system, as well as acquiring of abilities in representation, analysis and management of discrete event dynamic processes, using particular modeling techniques.
COURSE CONTENTS: Course: The structure and the dynamic behavior of an discrete event dynamic process; General principles of analysis dues to the Petri Nets models formalism; Techniques of behavioral properties analysis of the models used in command/control structures of discrete event dynamic systems; Using non-autonomous Petri Nets models for synthesis of the models; Design of command/control structures for discrete event dynamic systems; Modeling techniques for hybrid systems representation and analysis. Laboratory: Presentation of the laboratory, of the equipment and programs used to carry out the works and the related themes; Visual Object Net – a software tool used for achieving the discrete Petri Nets models of the discrete event dynamic systems; Using Petri Maker software tool in behavioral analysis of Petri Nets models; Hybrid synthesis technique of an flexible manufacturing cell Petri Nets model; Control/command structure based to the Petri Nets model for an discrete event dynamic system, using the Matlab-Petri2 software toolbox; Various command/control techniques for robotized structures based its Petri Nets models; Combined synthesis techniques of the Petri Nets models for various discrete event dynamic processes; Control/ command structure based to the GRAFCET model on an manipulator robot.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER SOURCES

COURSE OBJECTIVE(S): Acquiring fundamental notions about energy resources and systems that use these resources.
COURSE CONTENTS: Course: Energy resources; Hydraulic energy conversion; Converting highmotor energy; Wave energy conversion. Conversion of marine current energy; Geothermal energy conversion; Biomass conversion. Laboratory: Labor protection and laboratory presentation; Turbidity of the attraction flow of a fish pass; Drinking water between two tanks; Hydroelectric power plant on medium water drop; Hydraulic low drop systems; onnect the CHE synchronous generators to the grid. The study of the synchronous generator operating in high-power hydraulic systems; Self-synchronous synchronous generator in low power hydraulic systems; Asynchronous generator study; Pelton Turbine (I); Pelton turbine test (II); Testing of the Francis turbine; Study of a mini hydropower plant

(I); Study of a mini hydropower plant (II); Recovering outstanding work.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 2ND SEMESTER

COURSE TITLE: ELECTRIC DRIVES II

COURSE OBJECTIVE(S): Formation of skills for reading and compiling a sequential automated control scheme and a structural scheme for a DC drive system and controlled rectifiers or continuous voltage changers and a structural scheme for an asynchronous motor drive system Static converters in the stator or rotor circuit.
COURSE CONTENTS: Course: Introduction . Fundamental elements of automated electromechanical drive systems; Choice of automatic electromechanical drive systems; Electromechanical drive systems with DC motors and continuous voltage variators: Equation of mechanical characteristic; Structure of milling systems and continuous voltage variators; Adaptive command of electromechanical drive systems with m.c. and continuous voltage variators; Electromechanical drives with direct current motors and controlled rectifiers: Analysis of electromechanical drive systems with m.c. and rectifiers ordered according to the number of dials; Energy analysis of the drive system with m.c. and rectifier ordered; Structure and operation of electromechanical drive systems with m.c. and rectifiers ordered; Structure and operation of reversible electromechanical actuation systems; Structure of optimal positioning systems; Electromechanical drives with asynchronous motors and alternating voltage variators: The principle of the drive system; Structure of the drive system; Numerical control of drive systems with asynchronous motors and alternating voltage variators; Heating system equipped with single-phase asynchronous motors and alternating voltage variator; Asynchronous motors with rotor winding to adjust speed by changing the sliding energy: Speed-dissipating systems by dissipating the sliding energy; Speed control systems for the recovery of sliding energy; Electromechanical drive systems with asynchronous motors and static converters: The principle of speed regulation; Equation of mechanical characteristic; Structure of the power part of drive systems with asynchronous motors and static converters; Asynchronous motor drive systems and static converter with variable voltage DC intermediate circuit; Asynchronous motor drive system and static DC converter; Structure of drive systems ordered on the field orientation principle; Structure of drive systems for direct torque control; Electromechanical drive systems with linear motors. Seminar: Methodology of the implementation of classical (with contacts and control relays) control schemes used for sequential control of electric drives; Reversing start sequence control by direct coupling of electric drive with m.c. and with asynchronous motors; Sequential control of the rheostatic start-up of electric actuators with m.c. and with asynchronous motors; Sequential control of rheostatic start-up of electric actuators with m.c. and with asynchronous motors; Sequential control of rheostatic start-up depending on the speed of electric drives with m.c. and with asynchronous motors; Sequential command of star-delta starting of electric drives with asynchronous motors; Identification of abnormal operating modes in sequential control schemes. Laboratory: Laboratory methodology; Automatic sequential coinage of electromechanical shareholders; Drive system with m.a. and alternating voltage variator; Electromechanical drive with asynchronous motor and static converter; Asynchronous motor drives with winding rotor for speed adjustment by sliding energy recovery (cascade); Electromechanical drive with linear three-phase asynchronous motor; Star-delta automatic start command (simulation); Experimental analysis of the transient mode for asynchronous motor operation; Study of the programming cycles for the operation of electromechanical actuators with asynchronous motor and static converters; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MONITORING AND DIAGNOSIS OF ELECTROTECHNICAL EQUIPMENT

COURSE OBJECTIVE(S): Theoretical and practical foundation of the techniques for monitoring and diagnostics of electrical equipment.
COURSE CONTENTS: Course: Monitoring systems. Importance. Current stage. Getting Started with Control and Monitoring of Electrical Systems; Surveillance and control systems. SCADA - Supervisor Control and Data Acquisitions; Applications of SCADA systems in our country. SCADA in energy; Monitor High Voltage Switches. Parameters supervised by a high-voltage circuit breaker; Methods and techniques of diagnosis; Expert systems; Applications of expert systems. Seminar: Processing algorithms for two sampled process sizes; Study of the status of electrical contacts; Study of dielectric rigidity variation of oil; Calculation of the synthetic values of the sampled electrical quantities; Calculation of the phase shifting of the sampled electrical quantities; Processing algorithms for two sampled process sizes. Laboratory: The CLIPS language. Expert systems to simplify the truth table of a complex logic circuit; Implementing rules in CLIPS (I); Design and analysis of fault trees for the analysis of the reliability of electrical systems. Primary and secondary fault tree; Construction and analysis of fault trees for the analysis of the reliability of the electrical networks.; Expert systems for the diagnosis of electrical machinery The graph of system states.

Implement rules in CLIPS language; Expert systems for the diagnosis of electrical transformers. The graph of system states. Implement rules in CLIPS language; Expert systems for diagnosis of power rectifiers. The graph of system states. Implement rules in CLIPS language; Laboratory testing.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL EQUIPMENT

COURSE OBJECTIVE(S): Learning the principles of construction and operation for typical numerical equipment; knowing the hardware/ software features for microcontrollers and developing applications; knowledge of structure, operation and programming of the main industrial numerical equipments: digital controllers, programmable logic controllers and computerized numerical controls for machine tools.
COURSE CONTENTS: Course: Microcontrollers. Hardware and software features. Specific functional modules, languages and programming tools; Applications with microcontrollers for controlling servosystems and temperature control; Digital control equipment. The structure of a digital controller. Z-Transform, sampling, extrapolation. Discrete models, choice of the sampling period; Processing of signals and information in digital controllers; Digital control algorithms. Auxiliary software modules; Programmable logic controllers. Structure, modules description, operational cycle. Related input/ output devices: transducers, actuators; Programming in LADDER and using state graphs. Applications; Numerical controls for machine tools. CNC. Structure and operation. Typical blocks; Programming CNC: ISO, APT - RCV, conversational programming. Seminar: Developing programs for a CISC microcontroller (80C552); Developing programs for PIC and AVR microcontrollers. I/ O operations, timing, acquisition of analog signals, arithmetic calculation, LCD display; Discretization of continuous models (first and second order systems); Designing a digital control loop for temperature; LADDER programs for TSX (Telemecanique) and Simatic (Siemens) PLCs. I/ O operations, logical operations, timing and other function blocks; Programs in GAFCET language for PLC. From the functional Grafcet steps to associating the physical elements and programming the LADDER networks for sequential and posterior areas; Development of milling and turning programs for CNC NUM 760. Analysis of trajectories, characteristic points and technological processing data. Writing programs in ISO code. Laboratory: Presentation of laboratory, equipment and hardware/ software tools; Digital controller with multiplexer PAL22V10 - PIC16F877; Programming and operation on temperature control equipment with MCU 80C552; Programming a MIDICOM equipment by LNTOOLS software; Design of control applications with an ARDUINO platform; Programming applications in the FLOWCODE IDE for the Ebloks modular platform; Programming the TSX 17-20 in the LADDER language; Programming and operating with an equipment based on SIMATIC S7-200 PLC; Programming the TSX 17-20 in GRAFCET language; Programming and operating of a mobile microrobot (contour and labyrinth); Temperature control equipment with an industrial digital controller (TECO) and Eblocks system; Computer aided learning for turning and milling programs with NUM Keller 760 equipment; Programming the numerically controled lathe EMCO; Final examination and scoring. Project: Every student has to design his/ her own digital equipment from the a list: PLC for environment parameters (light, humidity, temperature) and for motion control; PIC, AVR, ARM, ARDUINO based platforms for control applications in motion, temperature, humidity etc; The project theme. Steps, personalized elements, theoretical support and tools necessay, way of completion, practical achievements. Project model; Block diagram and basic principle for the designed equipment; Hardware structure design; Software design: IDE, language, simulation; Program data computing; Modules for displaying, control, power supply, actuators; Presentation and scoring.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SERVO SYSTEMS

COURSE OBJECTIVE(S): Assimilation of principles of operation and construction of servosystems;
Acquiring the knowledge needed to design, design and maintain components of servosystems.
COURSE CONTENTS: Course: Servosystems - Requirements, Block Structure, Classifications; Mathematical Model, Response - Closed-circuit servosystems, analog, digital servosystems. Examples of servosystems; DC current servo motors: with brushes, brushless construction, features; AC servomotors: two-phase asynchronous, synchronous - construction, features; Universal collector actuators, step-by-step servomotors, features; Actuator control; Examples of servo system applications in electromechanical equipment. Laboratory: Labor protection training and PSI rules. Presentation of laboratory work; Servosystem study of servomotor of c.c.; Study of the asynchronous servomotor servosystem; Studio system with brushless c.c servomotor; Study of the electronic switch of a brushless cc servomotor; The pulse control study of the c.c; Final Evaluation. Project: Designing the servosystems needed to drive the joints of a four-axis robot designed to serve a technological line; Communication theme project and initial data, discussion on how to approach the theme; Robot description; Sequences of movement; Selection of servomotors and transmission mechanisms for axis θ; Selection of servomotors and transmission mechanisms for axis r; Selection

of servomotors and transmission mechanisms for axis ϕ; Choice of position transducers; Supporting the project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTEGRATED MANUFACTURING SYSTEMS

COURSE OBJECTIVE(S): Students acquire basic knowledge in the field of integrated manufacturing structures and the importance and advantages of using robots and integrated manufacturing systems in the mechanization and automation of production. Analysis, knowledge and use of the main components of the integrated manufacturing system structure used in the processing, dosing and packaging processes. Creating the basis for the design, programming, operation and maintenance of equipment in the integrated manufacturing structure (processing, handling, bottling, sorting and packaging).

COURSE CONTENTS: Course: The place of integrated manufacturing systems in industrial structures; Assembly and assembly systems as an integrated manufacturing system; Conditions for mechanization and automation of assembly; Modeling work cycles for integrated manufacturing systems; Specific features of integrated manufacturing structures; Teleoperation in robotic integrated systems; Processing in integrated manufacturing systems and real-time driving algorithms; Industrial communications equipment. Seminar: Analysis of working cycles in integrated manufacturing systems; Calculation of parameters specific to the assembly technology: calculation of robotic assembly schemes; Choice of component parts of the manufacturing line (manipulators, transfer system, machine tools, control elements); Implementation of real-time management algorithms of integrated manufacturing structures. Laboratory: Hardware configuration of Siemens S7-300 automats from integrated manufacturing structures; S7-300 siemens automation programming from the manufacturing line structure; Analysis and simulation of pneumatic circuits in integrated manufacturing structures; Design and simulation of pneumatic circuits in integrated manufacturing structures; Hardware and Software Analysis of Factory Stations; Hardware and Software Analysis of Handling Stations; Hardware and software analysis of sorting stations; Hardware and software analysis of dosing facilities; Analysis of packing facilities in integrated manufacturing structures; Hardware and software study of mobile robots; Integration of operator tach screen panels into integrated manufacturing management systems; Control and monitoring of integrated manufacturing systems using SIMACTIC WinCC Flexible.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: ELECTRO-MECHANICS (FULL-TIME AND PART-TIME PROGRAMMES)
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY

COURSE OBJECTIVE(S): Acquire by students of knowledge of theoretical background of linear algebra and analytical geometry, as well as skills training in the use of dedicated computing techniques.
COURSE CONTENTS: Vector spaces; Linear applications; Bilinear forms; Euclidean spaces; Euclidean spaces: Cases E2 and E3; Analytical geometry of space E3; Quadric surfaces. Quadric curves (recapitulation from high school).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MATHEMATICAL ANALYSIS I

COURSE OBJECTIVE(S): Assimilation of mathematical methods with application in engineering, physics mechanics, resistance of materials, informatics, numerical methods, technology of materials.
COURSE CONTENTS: Course: Elements of Set Theory; Real Sequences and Series; Continuity of real –valued functions; The Derivative; Graphs of Functions; The Definite Integral; The Improper Integral; Power Series. Laboratory: Set Theory; Real Sequences and Series; Continuity of real –valued functions; The Derivative; Graphs of Functions; The Definite Integral; Improper Integral; Power series.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: CHEMISTRY

COURSE OBJECTIVE(S): Students acquire knowledge of the theoretical support for the notions of atomic structure, chemical bonds, solutions, semiconductors, and the ability to work with utensils and laboratory equipment.
COURSE CONTENTS: Course: Considerations of the structure of the atom; Chemical bonds; Chemical kinetics. Chemical balance; Solutions; Electrochemical notions; Semiconductors. Laboratory: Presentation of laboratory work and labor protection in the Chemistry laboratory; Determining the Diesel Index; Determination of corrosion speed; Determination of viscosity in lubricants; Protection of metal surfaces against corrosion; Conductometric analysis; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMMUNICATION

COURSE OBJECTIVE(S): The accomplishing of a key stage within the training process that rounds specialised training in the technical field and contributes to shape the personality of future pecialists to meet the requirements of the European Union.
COURSE CONTENTS: Course: INTRODUCTION; Definitions of communication. The process of communication. Communication objectives; VERBAL COMMUNICATION; Verbal communication principles. Verbal messages receiving – listening; NONVERBAL COMMUNICATION; Nonverbal communication principles. Transmission and perception of nonverbal messages. Visual communication; PROFESSIONAL COMMUNICATION; Speech management. Meeting moderation. Multimedia presentation exposure. Scientific poster. Curriculum vitae. Language passport. Participation in interview. Telephone conversation; MANAGEMENT AND COMMUNICATION; Communication in management processes. The art of listening – the asset of a manager. Organizational culture; People recruiting and selecting. Laboratory: Job finding modalities; Letter of intent writing; Curriculum Vitae drafting - Drafting rules in compliance with European Union rules (CV online filling); Language passport - Drafting rules in compliance with European Union recommendations rules; (Language Passport online filling); Verbal and nonverbal communication techniques; Interview simulation (Students will take part to a verbal and nonverbal communication-based drill. An interview simulation); Rules to draft and display a scientific poster (Scientific poster drawing up focused on the central topic key approached in the team report); Activity completion. Poster presentation/ ppt. (team work). Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNICAL DRAWING

COURSE OBJECTIVE(S): The technical drawing is the discipline of the general technical culture that deals with the plane graphic transposition of a conceptual or technical idea according to certain established rules and rules for the purpose of representing and determining objects. The complexity of the information provided ensures that the technical design plays a decisive role in the life of a product and in that it represents the most concise and synthetic form of communication in the technical field. This fact ensures the importance of knowing the norms, of the conventional elements used in the plane representation of spatial geometric bodies and the high degree of universality of these norms and rules.
COURSE CONTENTS: Course: Overview; Standards. Formats. Lines; General rules of representation in the technical drawing. Views. Sections; Quotation in the technical drawing; Representing, quoting and marking the threads; Classification of materials; Statement of surface

conditions; Overall drawing; Representation and quantification of gears and gears; Schematic drawing. Laboratory: Standardized writing. Types of lines used in the technical drawing. Layout of projections; Rules for drafting the sketch. The simple piece; Hexagonal prism construction. Screw head and nut; Simply rated piece. TEST 1; Quoted complex piece; Threaded piece 1; Threaded piece 2. TEST 2; Two-piece assembly. Drawings of parts; Assembly drawing; Explosive drawing. TEST 3; Overall drawing 2; Assembly drawing. TEST 4; Repeat a test and final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION I

COURSE OBJECTIVE(S): Acquiring the theoretical, practical and methodological skills of practicing physical exercise in an organized or independent manner in order to acquire a healthy lifestyle.

COURSE CONTENTS: Gymnastics: basic exercises, aerobic gymnastics; Application paths combined with running, jumps, equilibrium exercises, escalation, climbing skills, etc; Main sports skills of football game (boys), basketball (girls); Bilateral games under similar competition conditions; Evaluation tests.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH I

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.

COURSE CONTENTS: Reading the text" E-commerce", oral debate on questions like: Why/ what do people buy online?/Does online shopping help businesses? Solving grammar and vocabulary exercises. Listening to an interview about an electronics company that decided to open an online store; Reading the text "Cell Phones", oral debate on the importance of communication at work. Solving grammar and vocabulary exercises – modal verbs. Listening to a conversation between an engineer and his manager; Reading the text "Alternative Energy", oral debate on ways of protecting the environment. Solving grammar and vocabulary exercises – phrasal verbs. Listening to a conversation between a supervisor and an engineer; Reading the text "Tablets and laptops", oral debate on questions like: Are electronic devices useful at work? .Solving grammar and vocabulary exercises. Listening to a conversation related to civil engineering and filling in the blanks according to the record; Reading the text "Peripherals", oral debate on questions like: Why do people need peripherals?/What types of peripherals are used in the electromechanical domain? Solving grammar and vocabulary exercises. Filling in the Curriculum Vitae and personalizing an Application Letter; Reading the text "Mechanical Engineering", oral debate on questions like: What type of problems do mechanical engineers fix? What kind of computer methods do mechanical engineers use? Solving grammar and vocabulary exercises; Reading the text "Materials and properties", oral debate on questions like: What kind of materials do people use to build structures?/ Why are some materials better for projects than others? Grammar focus: English Pronoun. Solving grammar and vocabulary exercises. Listening to a conversation between an engineer and his client.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: METHODS AND TECHNOLOGICAL PROCESSES

COURSE OBJECTIVE(S): Acquiring knowledge on manufacturing technologies, components of technological systems, processing operations; Students acquire the theoretical knowledge for calculating and analyzing the parameters necessary for the optimization of the processing processes; Obtaining practical and analytical skills.

COURSE CONTENTS: Course: Introduction. Objectives and discipline issues, structure of technological processes and types of processing operations; Technical and technological properties of materials and their importance in the establishment and development of processing technologies; Technology of metallic materials. Definitions, classifications, structures, phases encountered in metal alloys, binary equilibrium diagrams; Machining processes: turning, milling, drilling, grinding, mortising, planing, broaching; Kinematic chains of machine tools: classification, structure, characteristics, kinematic representation, transmissions and mechanisms; Forming processing processes: plastic deformation processes (rolling, forging, drawing, extruding, molding, stamping), welding, cutting and gluing processes; Methods and processes for the manufacture of powdered metal products: the formation of powders and powders. Powder metallurgy products. Laboratory: Presentation of laboratory work and protective measures to perform this work; Determination of forces and turning speed at turning. Construct the mechanical parts of the lathe. Construction and release of the EMCO UNIMAT PCs. Simulation of the turning process by using the UNIMAT program; Determination of the functionalities of the milling process. Analysis of the inequality of the inundations; Measurement of the parameters to show the external characteristics and to the arc fault in the c.a. Characteristics of the transformer for welding with magnetic magnification; Measuring the parameters to show

the external welding characteristics. the use of a welding breaker; Final evaluation of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER PROGRAMMING

COURSE OBJECTIVE(S): Familiarizing students with notions of algorithms, their description in pseudocod and with fundamentals languages C and C ++.
COURSE CONTENTS: Course: Algorithms. General notions. Enunciation of a problem, input and output data, the steps of solving a problem. Objects with which algorithms and allowed operations work. Made operations by an algorithm; Principles of Structured Programming. Generalities. Basic structures and their description in the pseudocode; Basic Elements of Language C. Generalities. Structure of programs. Interface with input/ output devices. Output functions. Input functions. Input/ output functions provided by the stdio.h and iostream.h library. The vocabulary of the language. Data types. Constants. Expressions; Language C instructions. Expression instruction. The if instruction; The composite instruction. Switch instruction. The while instruction. The do while instruction. Instruction for. Jump instructions; Functions. Overview. Definition or description of functions. Declaring functions. Local variables. Global variables. Calling a function. Memory class specifiers. Recursive functions; Arrays and strings. Declaring and initializing arrays. Array elements referring. Functions that use arrays as arguments. Strings of characters; The usual mathematical functions. Trigonometric functions. Functions for dividing integers. Functions for working with logarithms, and exponential function. Functions for power of a number and extracting square roots. Functions for determining the integer part and the fractional part. Functions for working with random numbers. Laboratory: Presentation of C ++ programming environment. Structure general of a program; Editing a program, compiling, debugging, executing; Types of basic data and modifiers. Simple programs with input/ output functions from the stdio.h library; Use the if instruction; Use while and do instructions; Use the for and switch instructions; Use the break, continue instructions; Working with functions; Work with arrays; Work with strings; Working with mathematical functions.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS II

COURSE OBJECTIVE(S): Assimilation of mathematical methods with applications in engineering, physics, mechanics, machine organs, resistance of materials, informatics, numerical methods, study and technology of materials
COURSE CONTENTS: The n – Space R^n. Vectors; Fuctions of Several Variables: Limits and Continuity, Partial Derivatives, Extrema, Constrained Extrema; Curve Integrals. Applications; Double Integrals. Applications; Triple Integrals. Applications; Surface Integrals. Applications; Vector Fields, Curl and Divergence of a Vector Field, Green's Theorem, Gauss – Ostrogradski's Theorem, Stokes' Theorem.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERAL ECONOMY

COURSE OBJECTIVE(S): Students acquire the basic knowledge of economic theory and modern methods specific to the field in order to identify, define, explain, interpret and apply economic concepts at micro and macroeconomic level to formulate hypotheses and propose solutions to economic problems.
COURSE CONTENTS: Course: Economics - Social Science and Form of Human Action; Market economy; Economic goods. Their utility and value; Factors of production and their use; Demand; Offer; The money market; Capital market; Labor market; Occupation and unemployment; Inflation. Laboratory: Economy - science of economic action and form of human action; Economic goods. Their utility and value – applications; Factors of production and efficiency of their use – applications; Demand and supply – applications; The system of markets: the money market, the capital market and the labor market; Unemployment and Inflation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION II

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Aerobics/ Fitness Gymnastics; Application trails combined with treadmills, jumps; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball;

Sports: Football; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICS

COURSE OBJECTIVE(S): Acquiring necessary knowledge and familiarization of students with the theoretical methods which describes, at the fundamental level, physical phenomena involving in applications of electrical, energy, aerospace engineering. Formation of skills and abilities necessary to manipulate calculus techniques used in theoretical models which describe physical systems with applicability in electrical, energy, aerospace engineering.
COURSE CONTENTS: Course: Classical (Newtonian) mechanics. Mechanics of a point-particle. Dynamics of a system of particles. Non-inertial frame. Inertial forces; Notions of the mechanics of fluid. Dynamics of ideal fluids. Dynamics of real fluids; Elements of analytical mechanics. The Lagrangian formalism. The Hamiltonian formalism; Elements of classical electrodynamics. The Maxwell equations in vacuum. Electrostatics and magnetostatic of vacuum. Electromagnetic wave in vacuum; Thermodynamics. Principles. Thermodynamics potentials. Equilibrium and phase transition. Elementary notions of classical statistical physics; Elements of relativistic mechanics. Relativistic kinematics and relativistic dynamics. Relativistic energy and Einstein's formula; Introduction to quantum mechanics. Pre-quantum physics. Wave quantum mechanics. Schrödinger equation; Elementary notions of nuclear physics. Nuclear fission and nuclear fusion. Seminar: Elements of vector algebra; Elements of vector calculus; Applications of Newtonian classical mechanics; Usually applications of fluid mechanics in different engineering fields; Applications of Lagrangian mechanics. Applications of Hamiltonian method; The fundamental problem of electrostatics and magnetostatic of vacuum. Applications; Simple thermodynamic systems. Perfect gas and real van der Waals gas. Applications; Applications of relativistic dynamics; Applications of quantum mechanics. Potential barrier. Tunnelling effect.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.
COURSE CONTENTS: Reading the text" Transport", oral debate on questions like: Identify the different forms of transport based on the given pictures/Work in small groups. List and name other types of land, sea and air transport. Solving grammar and vocabulary exercises. Listening to a conversation about different types of transport; Reading the text "Living in a digital age", oral debate on questions like: How are computers used in electromechanics? Why is the computer important in our job? Solving grammar and vocabulary exercises. Listening to a conversation between an engineer and his manager; Reading the text "New technologies", oral debate on questions like: Mention some ways to keep the workplace safe? How can we ensure safety at work?. Solving grammar and vocabulary exercises. Listening to a conversation between a supervisor and an engineer; Reading the text "Storage devices", oral debate on questions like: What kind of storage devices do people use? Why do people store data/ information on different devices? .Solving grammar and vocabulary exercises. Listening to a conversation related to civil engineering and filling in the blanks according to the record; Reading the text "Peripherals", oral debate on questions like: Why do people need peripherals?/What types of peripherals are used in the electromechanical domain? Solving grammar and vocabulary exercises. Filling in the Curriculum Vitae and personalizing an Application Letter; Reading the text "Mechanical Engineering", oral debate on questions like: What type of problems do mechanical engineers fix? What kind of computer methods do mechanical engineers use? Solving grammar and vocabulary exercises; Reading the text "Electrical Engineering" oral debate on questions like: What is electrical engineering? /What products do electrical engineers make? Listening to a dialogue about electrical engineering.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: PROGRAMMING LANGUAGES

COURSE OBJECTIVE(S): Students acquire knowledge of pointer variables, user-defined data types, C language-specific files, and examples of C language usage in solving numerical analysis problems.
COURSE CONTENTS: Course: Pointer variables in C. Declaring pointer variables. Operations with pointers. Dynamic variables; Using user-defined data types. Using Structures; the representation of the lists; Input/ Output Devices in Computer Use. Input/ output functions for console and general purpose. File operations; Using C ++ features. Input/ output operations. Reference variables. Parameters with default values. Overriding functions. Dynamic memory allocation; Using C language to solve numerical analysis problems. Algebraic equations. Differential equations. Equations systems. Own factors and values. Numerical integration and derivation. Interpolation. Laboratory: L1 General language elements C; L2

Pointers in the C language; L3 Paintings and pointers in C language; L4 Functions in C language; L5 Structures in the C language; L6 Lists in C language; L7 Files in C language; L8 Solving equations; L9 Interpolation of functions; L10 Integration of ordinary differential equations; L11 Solving linear systems equations; L12 Vectors and their own values; L13 End of activity. Test final laboratory.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SPECIAL MATHEMATICS

COURSE OBJECTIVE(S): Assimilation of the main theoretical notions and methods of solving problems related to differential equations, complex analysis and Fourier analysis. Using the knowledge and computer skills acquired during the course to solve concrete problems (solving some differential equations attached to electrical circuits, analysis of concrete signals) and interpreting the results.
COURSE CONTENTS: Course: *I Differential equations:* Basic notions; First order differential equations; Higher order linear differential equations (the variation of constants and the characteristic equation methods); Laplace transform. Applications in solving Cauchy problems; Systems of linear equations; Applications of differential equations in the study of electric circuits. *II Complex analysis:* The set of complex numbers (algebric and trigonometric forms, operations with complex numbers, geometrical representations; Elementary complex functions (polynomials, rationals, exponential, trigonometric, logarithm, power function); Calculus (derivability - Cauchy-Riemann theorem-, holomorphic functions, computation of derivatives); Integrals (complex integral, definite integral, Cauchy integrals, residues theorem). *III Fourier analysis:* Development in Fourier series (Classical form, complex form, spectral form, geometrical representations and physical interpretations); Fourier integral and Fourier transform; Discrete Fourier transform and fast Fourier transform; Applications of Fourier transform in the study of signals. Seminar: Differential equations: general solution, particular and singular solutions. Cauchy problems; First order differential equations; Higher order linear differential equations; Solving differential equation using the Laplace transform; Systems of differential equations; Verification test; Complex numbers (algebric and trigonometric form, geometrical representation, operations); Elementary omplex functions (exponential, trigonometric, power); Calculus; Integrals; Developments in Fourier series; Fourier transform; Fast Fourier transform; Applications of Fourier transform in signals' study.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MECHANICS AND STRENGTH OF MATERIALS

COURSE OBJECTIVE(S): Knowledge, understanding and deepening of the basic notions of mechanics with applications in electromechanical engineering. Apply basic principles and methods for solving well-defined issues/ situations, typical of the field under qualified assistance.
COURSE CONTENTS: Course: Elements of vector analysis and force reduction. Elements of mass geometry; Static elements of the material point; Material kinematic elements; Static solids; The rigid solid kinematics; Elements of rigid solids dynamics; Supports and reactions. Representation of effort diagrams; Geometric features of flat figures. Static moments, moments of inertia, resistance modules. Steiner's formulas; Geometric features of simple flat figures and composite plane figures; Simple axial requests; tensions and deformations. Conventional Shear Shear Calculation: Tensions and Deformations; Circular section bar tensioning request: Voltages and deformations; Bending request: Normal and tangential stresses; Bending request: Deformations to bending request. Seminar: Applications concerning the composition of forces, determination of resultant force and resultant moment.; Problems related to the torsion of a given force system. Determining the equilibrium conditions of a material point and a rigid solid; Traving of materials; Compression test of materials; Shear testing of materials; Static bending test of materials; Bending test with singular shock.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: PHYSICAL EDUCATION III

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Athletics: The long jump technique in place; Utility-application paths; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports

games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALOGUE ELECTRONICS

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of analog electronics; acquiring basic notions about the construction and operation of the main analog devices and circuits; creating and developing the ability to design and build an electronic circuit to process analogue signals used in electrical equipment (generation, transmission, reception).
COURSE CONTENTS: Course: Introduction to analog electronics: analog signals: classification, analysis, notation convention; passive circuit elements; Semiconductor electrical conduction: intrinsic semiconductors; extrinsic semiconductors; PN junction; Semiconductor diode: symbol, structure, operation; simple diode circuit (load right, static PFS); approximate models; diode recovery. Voltage stabilizer: Symbol, structure, operation; Bipolar Transistor (TB): structure and operation; types of connections and static features; simple circuit with TB (load right, PFS static operating point, operating modes); polarization circuits in cc; Unipolar Transistor (TU) type TEC-J and TEC-MOS: structure and operation; static features; typical applications; Other electronic devices with junctions: thyristor (structure, operation, applications); triac (structure, operation, applications); diac; Optoelectronic devices: photodetectors (photoresistor, photovoltaic cell, photodiode, phototransistor) and photoelectric (LED, LCD, PDP); optocouplers; Operational Amplifier: Symbol, Function, Specific Parameters, Ideal AO, Real AO; linear applications (repeater, inversor, noninvert, sumer, integrator, derivative, comparator). Project: Labor protection training; presentation of the laboratory/ works, organization of working groups; Study of the rectifier diode and stabilizers; Study of bipolar transistor (TB); Study of the unipolar transistor (TU); Virtual AO study; Real AO study; Final assessment of laboratory activity. Laboratory: Statement of the theme, presentation of theoretical notions, organization, way of working; Electronic chart analysis and operation; Calculation of electrical quantities (currents, voltages, powers) and non-electric inputs in the diagram; Sizing and choosing from the catalog the electronic components that make up the schematic; Simulate schema operation using software assistant tools; Analysis by comparison with other schemes fulfilling the same function: advantages and disadvantages; Teaching, project support.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED GRAPHICS

COURSE OBJECTIVE(S): Acquiring basic knowledge about the facilities and how to use AutoCAD for computer-aided design and design.
COURSE CONTENTS: Course: Basic concepts and concepts; Familiarize with the basics of the program. Coordinate and coordinate system notions of a point. How to initiate drawing and command dialing in AutoCAD; AutoCAD graphics facilities. Working modes, mechanisms, filters, visualization; Modes and tools provided by AutoCAD to facilitate work. Techniques for quick realization of some elements in the drawing; Graphics without thickness and thickness. Drawing layers; Drawing of non-thick graphic objects (finite lines, endless lines of construction, circles, circular arcs, etc.). Drawing of thick graphic objects (polylines and circular rings full). Effective use of drawing layers. Querying certain properties or values in the drawing; Quotation of drawings. Hatching; How to add dimensions to a scale drawing. Creating and customizing quote styles; how to individually change the characteristics of a quota or group of allowances. Basics related to border hatching; Editing techniques; Creating a multiple selection of editing objects; the specific ways to get this crowd. The main commands for editing existing objects in the drawing; Editing options with grip points equivalent to discreet controls; Using blocks; The basics of working with blocks, respectively defining and inserting them into the drawing. Creating and using attribute blocks; edit attributes; 3D modeling; The main commands for creating and editing Solid 3D objects; 3D viewing facilities. Laboratory: Getting Started in AutoCAD; Use simple editing commands; Editing with gripping points; Making drawings on a scale; Quotation of drawings; Creating and using blocks; Create and use attribute blocks; Solids modeling; Final evaluation
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH II

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.
COURSE CONTENTS Reading the text" *Computer engineering*", oral debate on questions like: Why is computer engineering a rapidly expanding field?/What kind of work do computer engineers do?. Grammar focus: English Present Tenses. Solving grammar and vocabulary exercises. Listening activities; Reading the text "*Materials Engineering- part I*", oral debate on questions like: Why do some materials engineers have to be

knowledgeable about geology? Grammar focus: *Present Perfect Simple and Past Tense Simple*. Solving grammar and vocabulary exercises. Listening to a dialogue and completing the missing words in the blank spaces; Reading the text "*Materials Engineering- part II*", oral debate on questions like: How do you think materials will change in the future?. Solving grammar and vocabulary exercises. Listening activities; Reading the text "History of Engineering – part I", oral debates on questions like: How was engineering expertise in the 1970's? Present Perfect Continuous. Solving grammar and vocabulary exercises. Listening activity: choose the correct answer for each of the given questions based on the recording that you will hear; Reading the text "History of Engineering- Part II", oral debate on questions like: How can we learn from previous machineries? Solving grammar and vocabulary exercises. Listening activities; Reading the text "Engineering design method", oral debate on questions like: What are some steps in the engineering design method? Why is using a design method important? Grammar focus: Third Conditional- Mixed Conditionals. Solving grammar and vocabulary exercises. Listen to a conversation between a supervisor and an engineer. Complete the missing words/ phrases; Reading the text "Traits of an engineer", oral debates on questions like: Good qualities for engineers/ how can these qualities be developed? Grammar focus: Means of Expressing Future. Solving grammar and vocabulary exercises. Listening to a conversation between an interviewer and an engineer.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: HYDRAULIC MACHINES AND INSTALLATIONS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire the basic knowledge on the notions of fluid flow in technological systems and processes, as well as skills training in the design, construction and operation of hydraulic and pneumatic machines.
COURSE CONTENTS: Course: Physical and chemical properties of fluids; Fluid hydrostatic. Fundamental hydrostatic equations. Methods and apparatus for measuring pressure; Dynamics of fluids. General equations of perfect fluids. Bernoulli's relationship. Speed and flow rate meters; Permanent movements in pressure systems. Calculation of pressure pipes; Pumping installations. Basic elements regarding the operation of pumps in hydraulic installations. Materials, apparatus, equipment and aggregates for pumping installations; Fans and ventilation systems. Characteristic dimensions. Classification. Construction. Fan equation. Ventilation installations; Compressed air installations. Construction solutions and schemes for the construction of compressed air installations. Materials, equipment and machinery specific to compressed air installations. Laboratory: Methods and apparatus for measuring pressure. Calibration and check of manometers; Methods and apparatus for flow measurement. Calibrating and checking the diaphragm; Experimental determination of energy line and piezometric line; Determining the energy characteristics of a centrifugal fan. Attenuation of vibrations; Joint operation of two centrifugal fans of different types; Testing an axial fan; Determining the energy characteristics of a submersible hydrodynamic pump; Hydrophore plant study; Study of centrifugal pumps. Construction, operation, energy features; Network operation of centrifugal pumps. Coupling centrifugal pumps in series and parallel; Testing an axial pump; Study of the compressed air system; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNICAL MATERIALS

COURSE OBJECTIVE(S): Presentation in a synthetic manner of the structure and microstructure of the materials, their properties and their functional characteristics; Students' acquisition of basic phenomena and principles through illustrative examples or numerical calculations and the acquisition of practical skills and analysis and diagnostics.
COURSE CONTENTS: Course: Introduction. Presentation of "Materials Science" as a multidisciplinary science. Material cycle, resources and prospects for development; General problems regarding the structure of materials: structure of atoms and groups of atoms, bonds, internal cohesion forces, physical states of materials, molecular solids; Reticular crystalline structure: types of networks, plane identification and crosslinking directions, defects, electron states in crystals; Conductive, semiconductor and insulating materials: general characteristics, classification, types of conduction, properties and their dependence on various factors. Illustrative examples and applications; Dielectric properties of materials: electrical polarization and dielectric losses; Magnetic properties of materials: general magnetic properties, types of magnetism (dia-, para-, ferro-, ferri- and antiferromagnetism), magnetizing mechanism. Soft and hard magnetic materials; Composite materials: concept, types, structures, classification, phenomena, properties, calculations and applications. Laboratory: Presentation of laboratory work and protection measures to perform this work; Measurement of insulating resistance and determination of the viscosities of solid insulating materials; Determination of metallicity; The study of the import of the material at traction does not; Microscopic analysis of probelormetalographic; Determination

of the electrical conductivity of liquids; Determination of Charpy shock resistance and impact resistance; Indo-alternate test of plates and bands; Determination of electrical properties of solid-insulating materials; Determination of the electrical properties of the electro-isoleucyl-alkali materials; Study of material feeds on flexion; Determination of the resistance and leakage resistance indicators in the humidity conditions; Determination of capacity, relative permissivity and insulation loss factor; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MACHINE ELEMENTS AND MECHANISMS

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of mechanical transmission as well as the stimulation and development of students' creativity skills by carring out projects using established principles and methods, in compliance the standards.
COURSE CONTENTS: Course: Mechanisms; Analysis and structural synthesis of mechanisms; Kinematic analysis of mechanisms; Cinetostatic analysis of mechanisms; Machine elements; Non-demountable assemblies; Demountable assemblies; Gear transmission; Friction transmissions; Axles and shafts; Spindles and pivots; Bearings. Laboratory: Analysis and learning basis of the design theme. (teamwork) Establishing the kinematic scheme. Determination of kinematic and dynamic parameters; Belts transmission design; Gear design; Shafts design; Gearbox bearings selecting; Couplings selecting. Sealing systems selecting; Project Presentation/Support (Power Point).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL CIRCUITS THEORY

COURSE OBJECTIVE(S): It is a discipline in the field of Electrical Engineering. It aims to deepen the theory of electrical circuits of cc and so on, the theoretical foundation for all specialty disciplines with electrical profile in the curriculum. Theoretical notions are complemented and supported by applications (seminar and laboratory works). Laboratory works aim at the experimental study of electrical circuits of d.c. and a.c. regimes.
COURSE CONTENTS: Course: Getting Started; DC circuits; Circuits in permanent sinusoidal mode; Three-phase electric circuits; Two-ports four-poles electric circuit and electric filters; Circuits in non-sinusoidal periodic regimes; Transient regime of electric circuits. Seminar: DC circuits: analysis by Kirchhoff theorems, equivalent circuits; DC circuits: operative analysis methods, theorems of equivalent generators; Permanent sinusoidal circuits: symbolic representation of sinusoidal magnitudes, phasorical representation, analysis by Kirchhoff's theorems; Operating methods, powers, electrical resonance mode, magnetic coupling treatment; Three-phase circuits: single-phase circuit design for balanced circuit study, neutral point potential method, power balance calculation for balanced/ unbalanced receivers; Transient regimes: the meaning of the initial conditions, the direct integration method, the meaning of the free/ forced components; Transient regimes: the operational method. Laboratory: Specific PM and PSI rules. Team work sharing. Presentation of the works cycle; Experimental study of RLC circuit in a.c; Experimental study of transient regimes in simple circuits; Experimental study of three-phase circuits powered by a symmetrical voltage system; Experimental verification of some theorems in d.c. circuits; Experimental study of passive linear two-ports four-poles electric circuit; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 2ND SEMESTER

COURSE TITLE: DATABASE

COURSE OBJECTIVE(S): Students training in the field of database design: familiarizing with the possibilities of using databases regardless of their type and acquiring the ability to design relational databases.
COURSE CONTENTS: Course: DATABASES - FUNDAMENTAL KNOWLEDGE; Concepts; Fundamental objectives of a database; The architecture of a database system; Database management systems; MODELING DATABASES; Concepts; classifications; The relational model. Relational system operators; Examples; RELATIONAL DATABASES DESIGN; Achieving the conceptual scheme of database (entity-link model); Achieving the logical schema (design, diagram) of a database; Physical design of the database; Database Implementation; DATABASES NORMALIZATION; Getting Started. Types of canonical forms; Constraints of integrity; SQL LANGUAGE; Introduction to SQL; Commands to define data; Commands for querying data; SQL functions; COMPETITIVE ACCESS TO DATA AND CONSERVATION OF THEIR CONSISTENCY; THE SECURITY OF ORACLE DATABASE. Laboratory: ORACLE database management system; SQL - structured, universal language for querying databases; Populate the database with tables. CREATE, ALTER TABLE, DROP, RENAME commands; Insert data into tables. INSERT command; Modify the data in the tables. UPDATE, DELETE, TRUNCATE commands; Insert data into tables. MERGE command; Data query. SELECT command; Sorting data. ORDER BY clause; Filtering the table lines. WHERE clause. Use of logical operators; SQL functions. Functions for a single record; SQL functions. Functions for multiple records; Grouping Records. GROUP BY and HAVING clauses; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION III

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.

COURSE CONTENTS: Athletics: The long jump technique in place; Utility-application paths; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL ELECTRONICS

COURSE OBJECTIVE(S): Principles of operation for digital circuits, starting from binary logic and arithmetic; methods for analysis and synthesis of digital circuits; typical combinational and sequential circuits; programmable logic arrays; constructive and functional features for the main families of digital integrated circuits; digital circuit applications.

COURSE CONTENTS: Course: Logical operations and functions; Representation of information in digital circuits; Synthesis and processing of combinational logic functions; Representative combinational circuits; Sequential logic circuits (CLS); Main sequential circuits; Programmable logic arrays; Physical logic circuits. Families of integrated circuits. Laboratory: Computer Aided Analysis of digital circuits by Digital Works program; Study of TTL and CMOS logic gates. Study of astable and monostable typical circuits; Study of the bistable typical circuits; Study of decoders, code converters, counters and registries; Experimental analysis of digital circuits by logic analyzer and computer; Study of some complex digital equipment: positioning system based on optical slide transducer, digital controller with industrial input/ output devices. Project: The project theme. Steps, personalized elements, theoretical support and tools necessay, way of completion, practical achievements. Project model; Calculation of personal data. The custom functional cycle; Sequencer design; Choosing components for the sequencer; Computer simulation of the sequencer circuit; Designing the clock circuit with adjustable frequency; Choosing components for the clock generator. Verifying the virtual operation; Configuration and calculation of the control block (Start/ Stop, Reset, Init); Choosing components for the control block. Operation check by simulation; Configuring, choosing components and calculating the displaying block; Integration the designed modules into a single assembly and check the operation; Elements of sizing and selection of the power supply unit; Methods of physical realization of the assembly; Presentation and scoring.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED DESIGN II

COURSE OBJECTIVE(S): Knowledge and deepening of graphical facilities offered by the MATLAB programming environment. Forming 2D and 3D graphics representation of data contained in vectors and arrays, predefined functions, interpolation and data adjustment, creation and use of user graphical user interfaces.

COURSE CONTENTS: Course: General notions about the MATLAB programming environment; MATLAB object-oriented graphical system. Access to the properties of graphics objects. Graphic object Figure; Elementary 2D representations; Graphical representation in linear, logarithmic and semilogarithmic coordinates. Using the plotyy function. Graphic representation of polygons. The properties of Line and Patch graphics; Display mode control. Graphics objects of the Axes type; Control of how to display the display space of the graphical representation. Limits, grading, appearance and labeling of axles; Displaying Text objects in coordinate axis space; Creation, properties, particular types. Display and control of how the legend is displayed; Graphic representation of predefined functions between imposed limits. Interactive reading of data; Interpolation and adjustment of unidimensional data; 3D graphics representations; Types of 3D graphical representations and associated functions. Surface graphic object. Graphical representation of functions of two variables. Representing predefined 3D objects. Appearance control; Creating and using user graphical user interfaces. Laboratory: Getting started using the MATLAB programming environment; Elementary functions for graphical representations of data in linear, logarithmic and semilogarithmic coordinates; Multiple 2D graphic representations of data. Using script files; 2D graphic representations with double coordinate axes; Control of presentation of display space for graphical representations. Grading and axle boundaries; Show text and annotations in the display area; Graphic representation of predefined functions. The appearance of the axle system; Graphic representation with bars. Fast Fourier Transform of a Periodic Function; Interpolation and

adjustment of unidimensional data; 3D graphics representations; Creating and using user graphical user interfaces; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INSTALLATIONS FOR LIFTING AND TRANSPORTING

COURSE OBJECTIVE(S): Student acquirement of knowledge in the field of lifting and transporting equipment. The student understands the importance and advantages of using lifting and transport facilities in the mechanization and automation of transport and handling. Analysis and knowledge of the main components of lifting and transport facilities used in transport, storage and handling infrastructure; Creating and developing the skills and the basis for designing and programming the complex electromechanical equipment that includes lifting and transport facilities; Creating and developing skills required to operate and maintain lifting and transport facilities in accordance with ISCIR prescriptions and norms.
COURSE CONTENTS: Course: Classification of lifting and transport facilities; the transport process; abstract models in the analysis of transport systems; manipulation automation; parameters, criteria and operating groups for lifting and transport facilities; Organs specific to lifting and transporting installations: flexible organs; winding and guiding organs; cable and chain drums; guide rollers for cables and chains; hoists; the load suspending and clamping device; ancillary gripping devices; handling bulk loads; Braking and stopping devices; radial brakes; axial brakes; locking device. Safety devices and safety switches for lifting equipment; end stroke limiters; load limiters; safety devices for cranes; safety devices for lifts; Stationary analysis of the lifting, translation, swinging and tilting mechanisms, etc., and the load diagram; Drive and automation elements specific to lifting and transport facilities; constructive and functional particularities; Continuous transport installations; continuous conveyor systems with flexible traction (belt conveyors, plate conveyors, bucket, scraper, suspension); continuous transport installations without flexible traction (gravity, helical, oscillating, pneumatic); Land and suspended transport systems: constructive and functional features; Automated Guided Vehicle (AVG); Systematic analysis of manipulation in industrial processes. Storage and transport of materials and products. Control of logistics processes planning. Distribution logistics. IT systems in industrial logistics. Logistics and information communications technologies in industrial logistics; Development of handling technologies - storage - internal transport. Formation of cargo units for handling and transport; IRT exploitation: trials; modern trends, modular structures. Laboratory: Determining the functional parameters for the lifting and; Translation mechanism; Command of lifts, using the TSX17-20; Command of lifts, using contact and relay schemes; Remote control of monogr; Determination of the characteristic dimensions of the braking devices: electrohydraulic lift brake and swingarm brake; Hardware configuration of Siemens S7-300 automated industrial logistics; Analysis and simulation of pneumatic circuits in logistic structures; Hardware and Software Analysis of Handling Stations; Hardware and software analysis of sorting stations; Hardware and Software Study of AVG Structures; Integration of operator tach screen panels into handling systems; Control and monitoring of handling systems
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH IV

COURSE OBJECTIVE(S): Optimizing the ability to perceive and express, orally and in writing, taking particular account of the specialty of the students. This capacity development is designed to enable students to receive literature, participate in scientific conferences in their subject areas, draft academic texts in specialized language, and discuss problems in the language of their specialty.
COURSE CONTENTS: Reading the text"*Robotics*", oral debate on questions like: IN which fields of activity are robots important? /Robotics and electromechanics – connections. Grammar focus: Active and Passive Voice. Solving grammar and vocabulary exercises. Listening activities; Reading the text "*E-Commerce*", oral debate on questions like: How are computers used in electromechanics? Does online advertising help businesses? Grammar focus: *Modals in English*. Solving grammar and vocabulary exercises. Listening to a dialogue and completing the missing words in the blank spaces; Reading the text "*New technologies*", oral debate on questions like: Mention some ways to keep the workplace safe? How can we ensure safety at work?. Solving grammar and vocabulary exercises. Listening to a conversation between a supervisor and an engineer; Reading the text "*Resistors, LEDs and cell phones*", oral debates on questions like: What is a resistor? Can you explain the LED technology? Can the smartphone replace the laptop in business trips- explain your answer?. Grammar focus: *Should,Ought to, Had better*. Solving grammar and vocabulary exercises. Listening activity: choose the correct answer for each of the given questions based on the recording that you will hear; Reading the text "Peripherals", oral debate on questions like: Why do people need peripherals?/ What types of peripherals are used in the electromechanical domain? Solving grammar and vocabulary exercises. Filling in the Curriculum Vitae and personalizing an Application Letter; Reading the text "Engineering design method", oral debate on questions like: What are some steps in the engineering design method? Why is using a

design method important? Grammar focus: Third Conditional- Mixed Conditionals. Solving grammar and vocabulary exercises. Listen to a conversation between a supervisor and an engineer. Complete the missing words/ phrases; Reading the text "Tables and Graphs", oral debate on questions like: what are graphs used for? How do graphs help engineers and those who work in the electromechanical domain? Grammar focus: *Phrasal Verbs*. Solving grammar and vocabulary exercises. Listening to a conversation between two engineers; after hearing the conversation mark the given statements as true (T) or false (F).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROMAGNETIC FIELD'S THEORY

COURSE OBJECTIVE(S): It is a fundamental discipline for the field of Electrical Engineering study. It aims at deepening the macroscopic theory of electromagnetic phenomena, the theoretical foundation for all specialty disciplines with electrical profile in the curriculum. Theoretical notions are complemented and supported by applications (seminar and laboratory works). The laboratory work aims at the experimental verification of the laws and the theorems of the electromagnetic field.
COURSE CONTENTS: Course: Getting Started. Theoretical aspects of the electrostatic field. Electrical capacitor. Capacitor networks; The stationary electro-kinetics regime; Stationary magnetic field; Magnetic circuits. Inductances; Variable regime. Evolution laws of the electromagnetic field. Seminar: Calculation of electrostatic fields: elementary method, electric flux law method; Calculation of electrical capacities, capacitor networks; Energy and forces in the electrostatic field; Applications of the electrical charge conservation law. Applications of electrical conduction law; Calculation of stationary magnetic fields with the Biot-Savart-Laplce method and Ampère's theorem; Magnetic circuits. Calculation of own and mutual inductances; Applications of electromagnetic induction law. Laboratory: Specific PM and PSI rules. Team work sharing. Presentation of the works cycle. Knowledge and use of laboratory devices and devices; Capacitors. Capacities. Capacitor networks; Experimental verification of the electromagnetic induction law; Experimental verification of magnetic circuit law; Experimental study of forces that manifest in the magnetic field; Calculation of mutual inductance; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEM THEORY AND CONTROL

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of system theory and process control. Developing skills in: modeling and simulation of dynamic systems; analysis of general properties of dynamic systems; definition of performance and quality indicators for control systems; analysis and design of automatic control systems.
COURSE CONTENTS: Course: Fundamental concepts of automatic control systems (Oriented Systems, Examples, State Concept); Properties of linear time invariant systems (Transfer function; Graphical representation of systems; Systems connection; Equivalent reductions; State equations; System controllability and observability; Frequency characteristics; Systems stability); The general structure of an automatic control system (Conventional Control System; Classification of Regulators and Control Systems); Typical Control Algorithms (P, I, PI, PD, PID); Quality and performance indicators imposed on control systems (Quality indicators that measure the precision of control systems; Quality and performance indicators defined in the harmonic regime; Quality and performance indicators defined in the transient regime); Control Structures (Combined Control Systems; Cascade Control Systems; Discrete Time Systems; Process Computer Architecture; Digital Control Algorithms). Seminar: Laplace transformation; examples of application; Solving differential equations using Laplace transformation; Examples of setting mathematical models; Systems reduction using block diagrams; Study of system controllability and observability; Frequency characteristics drawing; Systems response computing to type signals; Systems stability analysis. Laboratory: Matlab/ Simulink work environment - Overview. Symbolic calculation in Matlab; Description of linear, time invariant systems. System response to type signals; Structural properties of linear systems. Observability. Controllability. Stability; Quanser SRV02 engine angular positioning system; Quanser flexible beam control methods using the Wincon real time; Typical control laws implemented on Quanser's Analog Plant Simulator; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 1ST SEMESTER

COURSE TITLE: ELECTROMECHANICAL CONVERTERS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of electromechanical converters, very much used in systems engineering applications. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: General concepts of electric cars; Electric transformer. Constructive elements, operating principle and transformer equations, phasorical diagrams and equivalent schemes. Transformer operating queens: naked, short circuit and load. Parallel coupling and operation of transformers. Operation in non-

symmetrical load of transformers; Asynchronous machine. Elements constructive principle and operating regimes. Equations of the asynchronous machine, phasor diagrams and equivalent schemes. Mechanical characteristics, start, speed control and braking of asynchronous motors; Synchronous machine. Constructive elements, principle of operation, equations and phasorical diagrams of synchronous generators. Electromagnetic torque and static angular characteristic. Coupling and parallel operation of synchronous generators. Synchronous motors: equations, operating characteristics and starting methods; DC machine.Constructive components, Generator c.c. derivation. Cc motors: mechanical characteristics, starting, adjusting speed and braking. Laboratory: Work safety training. Presentation of the laboratory; Study of three-phase electric transformers: schemes and groups of connections; The efficiency of the transformer determined by the direct method; Coupling and parallel operation of three-phase transformers; The three-phase asynchronous motor operating characteristics (direct method); Determination of the asynchronous motor efficiency by the indirect method; Adjusting the speed of asynchronous motors by the rheostatic method; Self Synchronous Generator Study; Start-up and V-sync features of the synchronous engine; Coupling and parallel operation of synchronous generators; Study of the c.c. with separate excitation; Study of the c.c. with excitation bypass; Study of the c.c. with series excitation; Final assessment of laboratory activity
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER STATIC CONVERTERS I

COURSE OBJECTIVE(S): Acquiring basic knowledge on the principles, operation, performances and design of the static power converters, as well as acquiring skills in their use in the electrical engineering applications.

COURSE CONTENTS: Course: The place of the static converters in the energy flow. Classification of the static converters. Applications of power static converters; Power semiconductor devices: characteristics and control; losses; choice and verification; protection; (Alternating Current) AC/ (Direct Current) DC static converters (rectifiers): general theory, practical schemes of single-phase and three-phase rectifiers; bidirectional rectifiers; AC voltage controllers: principle, basic power circuit; control; operation; characteristic quantities; performances; practical schemes; Direct AC/AC frequency converters with natural commutation (cycloconverters): principle; control; operation; performances; practical schemes; DC/DC static converters (DC voltage controllers/ choppers): principle; control; operation; characteristic quantities; performances; practical schemes; Indirect AC/AC frequency converters: classification; particularities; DC/AC static converters (inverters): single-phase voltage source inverters with square wave output; three-phase voltage source inverter with square wave output; three-phase current source inverter with square wave output; Pulse Width Modulation (PWM) inverters. Laboratory: Study of the control circuit and switching characteristics of the Gate Turn-Off thyristor (GTO); Study of the control circuit and switching characteristics of the Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET); Study of the phase angle *control of the rectifiers;* Study of the three-phase bridge controlled rectifier; Study of the buck DC voltage controller; Study of an indirect frequency converter with voltage source inverter and pulse width modulation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL EQUIPMENT I

COURSE OBJECTIVE(S): The discipline purpose is presenting the theoretical basics of electrical equipments functioning, regarding the transient regimes, thermal regimes, electrodynamics and insulation of electrical equipment.

COURSE CONTENTS: Course: Electrical equipment: Classification. Definitions. Rated parameters. Operating regimes; Thermal, dielectric and electrodynamic stresses; Environmental streses. Electrical circuits commutation. Transient regimes: Electrical circuits (RC,RL, RLC) connecting at dc and ac power supply sources; Electrical circuits disconnecting. Transient recovery voltage. Parameters; Three phase shortcircuits disconnecting; Small inductive and capacitive currents disconnecting; Long power transmission lines disconnecting; Disconnecting of phase opposition. Electrodynamic forces: Electrodynamic forces between threadlike and coplanar conductors; Electrodynamic forces in mono phase and three phase a.c. circuits; Steady state and transient regime; 3. Electrodynamic stability of electrical circuits; 4. Forces shielded bars. Thermal regime of electrical equipment: Heat sources. Ways of heat transmitting; Laws of heat transmitting. General equation of heat transmitting; Spatial distribution of temperature in flat walls with losses and no losses; Thermal resistance of a planar wall; thermal resistance of a cylindrical wall; Uniform heating and cooling of current paths. Thermal time constant; Heating in intermittent regime; heating in short-circuit regime. Electrical contacts: Contact resistance. Dependence of contact resistance, the contact pressing force, the temperature of contact point and the voltage drop across the contact; Thermal regimes of the electricl contacts; The electrical contacts vibration; Migration of electrical contact material . Materials and constructive principles. Electrical equipment insulation: Overvoltages. Basic insulating level. Behavior ai short and long-term overvoltages; Liquid , gaseous

and solid insulation. Vacuum insulation; Overvoltages protection; Surge arreters with metal oxides; Coordination of insulation; Composite insulation. Seminar: Shortcircuit simulation. Circuit breakers selection; The simulation of the recovery overvoltages; Shortcircuit disconnecting. Circuits with two oscillation frequencies; The computation of electrodynamic forces between filiform and threadlike circuits; busbars. Electrodynamic stability; Transmitting of heating through the planar and cylindrical walls- numerical applications. Thermal stability computation; The computation temperature in electrical contacts. Force rejection in electrical contacts. Laboratory: Study of electromagnetic relays and triggers construction; Study of contactors and low voltage circuit breakers construction; Study of medium and high voltage circuit breakers construction; Study of fuses, disconnectors and surge arreters construction; Study of thermal regimes of iron core coils and current paths of electrical equipment; The simulation of transient regimes; Experimental study of electrical contacts; Experimental study of electrodynamic forces; Final students evaluation
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL AND ELECTRONIC EQUIPMENT FOR CARS

COURSE OBJECTIVE(S): It is one of the specialty disciplines in the curriculum, designed to present to the students the theoretical aspects regarding the construction, functioning, mathematical modeling and the characteristics of the component elements, as well as practical aspects related to the selection, operation, maintenance, verification and regulation of electrical equipment and electronics of motor vehicles.
COURSE CONTENTS: Course: General; Battery accumulator; Alternator; Automatic Voltage Regulator; Parallel operation. Adapting the power supply system; Conventional ignition system ; Gas discharge. Induction coil. Spark; Electronic ignition; Control structures for spark ignition engines; Startup system; Assistance systems used in diesel engines; Security system; The measurement and control system; Transducers for motor vehicles. Laboratory: Work safety training. Presentation of the laboratory and the works; Study of the electrical and electronic equipment schemes of motor vehicles; Acid accumulator study; Alternator study; Study of electronic voltage regulators; Study of excitation and battery charging schemes; Study of the classic ignition system; Study of induction coil and spark plug; Study of electronic ignition devices; Starter study; Study of security systems; Study of transducers on a motor vehicle; Location and interconnection of EEEA on a functional vehicle; Verification and recovery session.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TRANSLATORS, INTERFACES AND DATA ACQUISITIONS

COURSE OBJECTIVE(S): Study of electrical transducers, interfaces and data acquisition systems on: architectures, signal conditioning circuits, analog-to-digital and analogue-to-analog converters, and software for data acquisition. The lab has the role of fixing theoretical knowledge and creating practical skills for application development using virtual instruments.
COURSE CONTENTS: Course: Electrical transducers; Communication interfaces; Data acquisition systems; Modules for data acquisition; Data acquisition with LabVIEW 8.5 and with LabVIEW SignalExpress. Laboratory: Labor protection training; Presentation of laboratory work; Study of resistive transducers; Study of numerical transducers; Introduction to LabVIEW; Elements of the front panel of a virtual instrument. Controls window; Block diagram elements of a virtual tool. Function Window (Functions); Creating, editing, and correcting a Virtual Instrument; Creating and using SubVIs; Analog switches - Applications: Numerically programmed voltage divider; Automatic switching of amplifier factor; Numerical-analogue data conversion circuits - DAC 08; Analog-numeric data conversion circuits - CAN with successive approximations; Analog-digital data conversion circuits: three-digit integrated voltmeter; LabVIEW applications for data acquisition and generation; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 2ND SEMESTER

COURSE TITLE: HYDRAULIC AND PNEUMATIC DRIVES

COURSE OBJECTIVE(S): Students acquire and apply the concepts of hydraulic and pneumatic drives by: knowledge of structure, operating principles and characteristics of hydropneumatic actuations; training of practical skills for hydro pneumatic circuits and their control solutions in concrete applications; the unitary approach of the hydraulic and pneumatic actuator elements from the perspective of the general theory of systems.
COURSE CONTENTS: Course: Introduction to hydraulic and pneumatic drives; Hydraulic generating elements (hydraulic volume pumps); Hydraulic execution elements; Hydraulic distribution and adjustment elements; Sequential control of hydraulic drives. Laboratory: Hydraulic drives; pressure regulation in drive circuits; Hydraulic drives; speed adjustment in drive circuits; Hydraulic drives; the use of the distribution apparatus in the realization of double action hydraulic cylinders. Pneumatic sequential drives; designing sequential control schemes with modular circuit elements; Modeling drives and automated hydraulic systems with the Matlab - Simulink environment; Pneumatic

operation of a manipulating robot; Command with programmable pneumatic actuators; Using the ASKSIM simulation program for sequential pneumatic actuation and automation analysis; Hydropneumatic actuation and automation modeling with Petri Networks; Sequential pneumatic automation of a production line and automatic sorting; Using the FLUID - SIM environment in the analysis of pneumatic actuations and automation; Achieving sequential automation circuits with logic sequence logic modules. Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROMECHANICAL CONVERTERS II

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the basic concepts of electromechanical converters II. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: Synchronous machine: constructive elements, operating range and industry response. Operation equations and phasorical diagrams of synchronous generators. Power, electromagnetic torque and static angular characteristic. Parallel coupling and operation of synchronous generators. Operation in non-symmetrical load of synchronous generators. Synchronous motors: phasorical equations and diagrams, operating characteristics, starting methods. Synchro compensator. The geometric location of the synchronous machine current; DC machine: construction elements, DC coils, t.e.m. induced and electromagnetic torque. Direct current generators: with separate excitation, intermittent and mixed: operating characteristics. DC motors: with separate excitation, derivation, series and mixed: functional and mechanical characteristics. Starting, speeding and braking of DC motors. Laboratory: Work safety training. Presentation of the laboratory; Self Synchronous Generator Study; Starting and operating characteristics of the synchronous motor; Starting and curves in V on the synchronous motor; Parallel coupling and operation of synchronous generators; Determining the parameters of the synchronous machine in symmetrical stationary mode; Determining the parameters of the synchronous machine in unstable stationary mode; Study of the c.c. with separate excitation; Priming and studying the c.c. with dithering excitation; Study of the c.c. with mixed excitement; Study of the c.c. with dithering excitation; Study of the c.c. with excitement series; Study of the c.c. with mixed excitement; Final assessment of laboratory activity. Project: Assignment of project themes (low-voltage three-phase asynchronous motor with short-circuit rotor); Calculation of the main dimensions; Dimension of stator windings and rotor; Magnetic circuit dimensioning, magnetization current determination; Calculation of machine parameters (resistors and reactants); Calculation of losses and operating characteristics; Supporting and evaluating projects.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STATIC CONVERTERS II

COURSE OBJECTIVE(S): Knowledge of the construction, operation and design of static converters c.a.-c.a., c.c.cc.c. and c.c.-c.a.
COURSE CONTENTS: Course: STATIC CONVERTERS C.A.-C.A. WITH NATURAL COMUTATION: Single-phase alternating voltage variator; Principle, scheme (triac and thyristor), operation; Waveforms and specificities depending on the type of task; VTA three-phase; applications; Problems solved. Cicloconvertoare; Principle, scheme, operation, waveforms; STATIC CONVERTERS C.C.-C.C: DC low voltage (Buck); Principle, schema of principle, operation, modalities of command; External and command features. Problems solved; High Voltage Continuous Voltage (Boost) Voltage Transducer; Principle, schema of principle, operation, command; External and command features; Problems solved; Voltage switch continues in four dials; Scheme; Control variants; Applications; STATIC SWITCH-OFF CONVERTERS C.C.-C.A. AND C.A.-C.A .; Static voltage and frequency converters; Inverters principle; One-phase voltage inverter; Characteristic dimensions; Static three phase voltage converter and indirect voltage frequency with amplitude modulation; Problems solved; Static voltage and frequency converters with time modulation; The principle of modulation in duration; Types of sinusoidal modulation for single-phase inverters; Static three phase voltage converter and indirect voltage frequency with time modulation; Other modulation strategies over time (in frequency, vector, bang-bang, pre-calculated). Laboratory 1: One-phase VTA study; The voltage variation study continues downward; Continuous elevation voltage variance study; Frequency modulation voltage inverter study; Continuous modulation voltage inverter study; Study and parameterization of an industrial inverter; Testing. Laboratory 2: A forced static (VTC or inverter) static converter will be designed; The force scheme and the calculation of the characteristic quantities; Choosing and checking the transistors; Design of overcurrent protection; Synthesis and digital design of the control circuit; Support and evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AIR CONDITIONING SYSTEMS

COURSE OBJECTIVE(S): Familiarizing students with aeraulic and thermal phenomena in refrigeration and air conditioning plants by: knowledge of techniques and equipment for obtaining artificial air and air conditioning; the formation of analytical, synthesis and comparison skills to ensure the ability to accurately assess the results of specific climate determinations performed on a numerical model, on an experimental or on-site basis.

COURSE CONTENTS: Course: Thermodynamic sizes and processes; Heat transmission elements and fluid flow. Wet air characteristics; Technics for obtaining low temperatures; Mechanical steam compressors; Evaporator feed schemes. Refrigerating compressors; Climate systems with absorption, ejection and thermoelectric; Automatically adjust physical size; Automatic air conditioning protection; General and Specialized Equipment for Air Conditioning; Ventilation and air conditioning structures. Laboratory: Refrigerator refrigerator study; Absorption refrigerant study; Air conditioning study; Study of the refrigeration plant and thermoelectric (Peltier); Determination of the main characteristics of a mechanical compressor system with vapor compression; Determining the parameters of the White-Westinghouse air conditioning equipment; Study of the air conditioning of a car; detecting defects and remedying them; Automatic temperature adjustment in a refrigeration and air conditioning system; Complex air treatment in an air conditioner; Experimental determination of the characteristics of electrical and textile filters; Experimental determination of pressure variation in air channels; Cooling the air with a refrigerant battery; Final assessment of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INSTALLATIONS FOR LIFTING AND TRANSPORTING

COURSE OBJECTIVE(S): Student acquirement of knowledge in the field of lifting and transporting equipment. The student understands the importance and advantages of using lifting and transport facilities in the mechanization and automation of transport and handling. Analysis and knowledge of the main components of lifting and transport facilities used in transport, storage and handling infrastructure; Creating and developing the skills and the basis for designing and programming the complex electromechanical equipment that includes lifting and transport facilities; Creating and developing skills required to operate and maintain lifting and transport facilities in accordance with ISCIR prescriptions and norms.

COURSE CONTENTS: Course: Classification of lifting and transport facilities; the transport process; abstract models in the analysis of transport systems; manipulation automation; parameters, criteria and operating groups for lifting and transport facilities; Organs specific to lifting and transporting installations: flexible organs; winding and guiding organs; cable and chain drums; guide rollers for cables and chains; hoists; the load suspending and clamping device; ancillary gripping devices; handling bulk loads; Braking and stopping devices; radial brakes; axial brakes; locking device. Safety devices and safety switches for lifting equipment; end stroke limiters; load limiters; safety devices for cranes; safety devices for lifts; Stationary analysis of the lifting, translation, swinging and tilting mechanisms, etc., and the load diagram; Drive and automation elements specific to lifting and transport facilities; constructive and functional particularities; Continuous transport installations; continuous conveyor systems with flexible traction (belt conveyors, plate conveyors, bucket, scraper, suspension); continuous transport installations without flexible traction (gravity, helical, oscillating, pneumatic); Land and suspended transport systems: constructive and functional features; Automated Guided Vehicle (AVG); Systematic analysis of manipulation in industrial processes. Storage and transport of materials and products. Control of logistics processes planning. Distribution logistics. IT systems in industrial logistics. Logistics and information communications technologies in industrial logistics; Development of handling technologies - storage - internal transport. Formation of cargo units for handling and transport; IRT exploitation: trials; modern trends, modular structures. Laboratory: Determining the functional parameters for the lifting and; Translation mechanism; Command of lifts, using the TSX17-20; Command of lifts, using contact and relay schemes; Remote control of monogr; Determination of the characteristic dimensions of the braking devices: electrohydraulic lift brake and swingarm brake; Hardware configuration of Siemens S7-300 automated industrial logistics; Analysis and simulation of pneumatic circuits in logistic structures; Hardware and Software Analysis of Handling Stations; Hardware and software analysis of sorting stations; Hardware and Software Study of AVG Structures; Integration of operator tach screen panels into handling systems; Control and monitoring of handling systems

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERATION, TRANSMISSION AND DISTRIBUTION OF ELECTRICITY

COURSE OBJECTIVE(S): The course aims at acquiring basic knowledge regarding the analysis and knowledge of the main components of the electricity generation, transmission and distribution systems, the principles of their operation, as well as issues related to: the calculation of the indicators and the realization of energy analyzes, the use of calculation algorithms for the analysis of thermal power plants and knowledge of the principles of power supply to consumers.

COURSE CONTENTS: Course: General aspects of electricity generation. Principles of Operation of Power Plants; Thermal yield and overall yield of TPF. Calculations and methods for improving the

thermoenergetic efficiency; Gas turbine power plants. Operation. Energy efficiency analysis. Cogeneration; Hydroelectric power stations. Structure, Characteristic Dimensions, Schemes; General notions regarding the electricity supply to consumers. Solutions and criteria for choosing the type of feed; Electrical and connection schemes of transmission and distribution stations and lines; Dimensioning the power of transformers in power stations and transformer stations; Choosing and checking the conductor section; Parameters of electrical networks. Calculation of Short Circuit Currents. Methods of calculation; Selection and testing of high voltage equipment; Selection and testing of switching and low-voltage protection equipment; The power factor. Installations for power factor improvement. Causes, Effects and Methods of Improvement; Protection devices against dangerous touching tensions. Types of defects, dangerous voltages. Methods of protection; Energy losses in electrical networks. Calculation of losses and methods of reducing them. Power balances. Laboratory: Work safety training. Presentation of laboratory work; Study of the energy efficiency of a 330 MW and 150 MW power group; Maneuvers and blockages in electrical stations. Application on numerical simulator; Study of electrical transformer protection equipment (classical and numerical systems); Study of automation installations in power systems (AAR and RAR); Power factor. Study of power factor improvement facilities; Laboratory test.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ELECTRIC DRIVES I
COURSE OBJECTIVE(S): Determination of the functional interdependence between the electric motor and the working machine in order to choose the electric drive motor, the starting method, the speed control method, the braking method and the determination of the corresponding parameters.
COURSE CONTENTS: Course: Introduction; Static characteristics of working machinesDefinition of static characteristics of working machines: Signing and movement of energy convention; Static static couples; Angular speed-dependent static couples Static couples dependent on linear displacement; Static torque-dependent static couples. Static torque diagram: Classification of working machines according to static torque diagram; Determining the Static Torque Diagram from Experimental Data; Basic equations of motion in electromechanical drive systems: Fundamental equation of motion; Reporting static torques and static forces; Reporting moments of inertia and masses; Motion diagrams of electromechanical drive elements; Choosing and checking the power of electric drive motors: Heating and cooling of electric motors; The principle of choosing the power of electric motors; Typical services of electric motors; The general algorithm for selecting and checking the power of electric drive motors; Selection and verification of engine power for S1, S2, S3, S4, S5, S6, S7, S8 engines; Mechanical electromechanical drives with separate excitation motors: Mechanical and electromechanical static characteristics Analyzing methods and determining parameters for starting electromechanical drives with DC motors with separate excitation; Analysis of methods and determination of parameters for adjusting the velocity of electromechanical actuations with DC motors with separate excitation; Determination of parameters for electric braking of electromechanical drives with separate excitation DC motors; Analysis of the dynamic regime of electromechanical actuations with separate excitation DC motors; Electromechanical drives with three-phase asynchronous motors: Static characteristics of asynchronous motor electromechanical drive; Determination of parameters of the natural mechanical characteristic; Determination of parameters for starting of electromechanical actuations with asynchronous motors; Determination of parameters for adjusting the speed of electromechanical actuations with asynchronous motors; Determining parameters for braking electromechanical actuations with three-phase asynchronous motors; Analysis of the dynamic regime. Laboratory: Laboratory methodology; Experimental determination of static parameters and characteristics at start of electromechanical actuations with m.c. with separate excitation; Experimental determination of static parameters and characteristics at start of electromechanical actuations with m.c. with excitement series; Experimental determination of parameters and static characteristics at start of electromechanical actuations with m.a; Experimental determination of static parameters and characteristics in controlling the speed of electromechanical actuations with m.c. with separate excitation; Experimental determination of static parameters and characteristics in controlling the speed of electromechanical actuations with m.c. with excitement series; Experimental determination of static parameters and characteristics in regulating the velocity of electromechanical actuations with m.a; Experimental determination of parameters and static characteristics at braking of electromechanical actuations with m.c. with separate excitation; Experimental determination of parameters and static characteristics at braking of electromechanical actuations with m.c. with excitement series; Experimental determination of parameters and static characteristics at braking of electromechanical actuators with m.a; Numerical simulation of the transient regime at starting and

braking electromechanical actuators with m.c.c with separate excitation; Numerical simulation of the transient regime at starting and braking electromechanical actuators with m.c.c with series excitation; Numerical simulation of the transient regime when starting and braking electromechanical actuators with asynchronous motor.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: LINES OF MANUFACTURE AND ROBOTS PRODUCTION LINES AND ROBOTS

COURSE OBJECTIVE(S): Students acquire basic knowledge in the field of robots and manufacturing lines. The student understands the importance and advantages of using robots and flexible manufacturing lines in the mechanization and automation of manufacturing. Analysis and knowledge of the main components of robots and manufacturing lines used in processing, bottling and packaging processes in the small and medium industry; Creating and developing the skills required for the design, programming, operation and maintenance of equipment in the automated manufacturing line.
COURSE CONTENTS: Course: Flexibility of manufacturing systems. Flexible processing systems. Industrial system and use of robots; Robot system, configuration, space and operating volume. Mechanical structure and drive system; Automated line items. Feeding parts, clamping devices, tool holders, changing tools. Modeling of production cycle cycles: unattended workstations, waiting jobs, cycle servicing, neighborhood service, and waiting in front of the workstation; Kinematic and geometric models for robots. Kinematic chains. Typical arm structures. Reference systems. Relative position; The Danavit Hartemberg algorithm. Determination of the generalized transfer operator using the DH algorithm. Direct and inverse kinematics for robots and manipulators in the structure of manufacturing lines; Use of programmable machines and WinCCFlexible in controlling and monitoring of manufacturing systems; Sensory systems, artificial vision systems and driving systems for robots and manipulators. Sensors and actuators. Intelligent decision support systems. Intelligent systems with high autonomy. Micro-electro-mechanical systems (MEMS); Technologies for integrated systems based on sensor networks; Assembly systems. Mounting as a system. Flexibility in technology. Functions of the mounting system. Mounting parameters. Design of mounting technology; Conditions for mechanization and automation of assembly. Conditions for the construction of parts. Conditions for installation schemes. Quality conditions for parts; Industrial communications equipment. Particularities of communication networks; industrial communications standards; HART, LIN, CAN, PROFIBUS protocol and industrial communication. Laboratory: Hardware configuration of Siemens S7-300 automats from integrated manufacturing structures; S7-300 siemens automation programming from the manufacturing line structure; Analysis and simulation of pneumatic circuits in integrated manufacturing structures; Design and simulation of pneumatic circuits in integrated manufacturing structures; Hardware and Software Analysis of Factory Stations; Hardware and Software Analysis of Handling Stations; Hardware and software analysis of sorting stations; Hardware and software analysis of dosing facilities; Analysis of packing facilities in integrated manufacturing structures; Hardware and software study of mobile robots; Integration of operator tach screen panels into integrated manufacturing management systems; Control and monitoring of integrated manufacturing systems using SIMACTIC WinCC Flexible.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT

COURSE OBJECTIVE(S): To familiarize students with the main concepts and practices in the field of management. To develop organizational and decision-making skills.
COURSE CONTENTS: Course: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Management information system: concept, components, functions, principles, deficiencies. Seminar: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Management information system: concept, components, functions, principles, deficiencies.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL MICRO-MACHINES

COURSE OBJECTIVE(S): Extremely extensive use of micromachines (automatic machine tools, industrial robots, peripheral equipment of computer systems, metering and recording equipment, aerial, naval and land transport, military equipment, medical equipment, printing and copying etc.) required their in-depth study in correlation with the supply and control systems.

COURSE CONTENTS: Course: General; Permanent magnets as elements of electric micromachines; Low-power electromechanical converters with collector; Low-power asynchronous electromechanical converters; Low power synchronous electromechanical converters; Micromachines as transducer elements. Laboratory: Work safety and equipment presentation; The c. Micromotor c. Excited with permanent magnets; Cylindrical servomotor with disc rotor; Universal Micromotor; Repellent Micromotor; Single-phase asynchronous motor; Three-phase asynchronous motor powered on single-phase network; Tahogeneratoare; Selsine I; Selsine II; Biphasic asynchronous actuator; Stepper motor; Constructive solutions of electric micromachines; Recovering overdue papers. Project: Distribution of project themes (AC generator with collector and series excitation); Calculation of the main dimensions; Window dimensioning and parameter calculation; Calculation of losses and operating characteristics; Supporting projects.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENVIRONMENT MODELLING AND SIMULATION

COURSE OBJECTIVE(S): Understanding physical phenomena and applying general groundwater modeling methods, calculating concentrations and speeds of pollutant displacement, pollutant displacement in the atmosphere, and risk situations (accidents).

COURSE CONTENTS: Course: Importance of environmental modeling and simulation. Examples of applications. Modeling and simulation of frequency water land: physical principles, general quantitative aspects, Darcy's law, interstitial speed equation, hydrographic maps, flow direction determination, and hydraulic gradient based on data from three wells; Modulation of air quality: physical principles, general quantitative aspects, single-dimensional and bi-dimensional diffusion, Gaussian model of the evacuation cloud; Management of dangerous materials: physical principles, risk characterization of flammable vapors, characterization of toxicity risk, structure and use of modeling programs. Laboratory: Presentation of laboratory contents, rules of conduct, presentation of laboratory work; Identification of local water sources; Identification of cases of groundwater pollution; Calculation of flow and concentrations of pollutants in aquifers; Calculation of interstitial velocity and time in aquifers using hydrographic maps; Use of hydrographic maps and determination of flow direction in aquifers; Analyze a situation of your choice using local maps; Calculation of concentration in case of gas diffusion; Exhaust cloud modeling; Simulation of the risks of an accident involving dangerous substances; Teaching assignments, examination, final evaluation and scoring.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS WITH MICROPROCESSORS

COURSE OBJECTIVE(S): Acquisition of concepts related to fundamental architectural features of microprocessors, data structures, addressing modes, instruction set, registers, interrupt systems, mathematical processors. Understanding the internal structure of a 80X86 family of microprocessors. Development and implementation of hardware and software applications for microprocessor systems. The lab has the role of fixing theoretical knowledge and creating practical skills for application development using microprocessor applications using virtual instruments.

COURSE CONTENTS: Course: Microprocessor - General concepts; Families of microprocessors; The INTEL 80X86 family; Programming the microprocessor; Applications of microprocessor systems. Laboratory: Labor protection training; Presentation of laboratory work; Scheduling in assembly language using the SMS32 simulator: use of internal registers; Scheduling in assembly language using the SMS32 simulator: access to memory; Scheduling in assembly language using the SMS32 simulator: stack usage and subroutines; Scheduling in assembly language using the SMS32 simulator: programming real simulated systems; Scheduling in assembly language using the SMS32 simulator: scheduling using interruptions; Introduction to Microprocessor Systems: hardware description and operation - Z3EV mode; Introduction to microprocessor systems: description and software operation - Z3EV mode; 32-bit microprocessor - Z3EV mode: microsystem programming using console; 32-bit microprocessor system - Z3EV mode: microsystem programming using PC; 32-bit microprocessor - Z3EV mode: Advanced programming. Managing interruptions; 32-bit microprocessor - Z3EV mode: Parallel communication interface; Final evaluation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: UNCONVENTIONAL TECHNOLOGIES AND EQUIPMENT

COURSE OBJECTIVE(S): Students acquire knowledge of the theoretical principles of unconventional technologies that underlie the processing and devices in the technical field

COURSE CONTENTS: Course: Ultrasonic based technologies; Waterjet Cutting Technology; Electron beam processing; Intelligent Fluid Technologies;

Technologies based on laser effect; Optical fiber technologies; Microwave based technologies; Technologies based on the Peltier effect; Internet of things; Radio frequency identification technology. Laboratory: Technology for printed circuit boards; Study of a magnetoreological damper; Study of radio frequency identification systems; Study of the mathematical model of a magnetoreological valve; The study of a semi-active suspension; Study of an IoT application. Project: Design of an ultrasonic plastics welding plant; General about ultrasonic processing in welding operations; The structure of the welding plant; Calculation of energy and ultrasound welding power; Dimensional calculation of the transducer; Electrical calculation of the transducer; Calculation of the concentrator; Raising the welding feature; Concentrator manufacturing technology; Logic scheme of a program for automation with PLC; Electrical system automation and power supply.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 2ND SEMESTER

COURSE TITLE: ELECTRIC DRIVES II

COURSE OBJECTIVE(S): Formation of skills for reading and compiling a sequential automated control scheme and a structural scheme for a DC drive system and controlled rectifiers or continuous voltage changers and a structural scheme for an asynchronous motor drive system Static converters in the stator or rotor circuit.
COURSE CONTENTS: Course: Introduction . Fundamental elements of automated electromechanical drive systems; Choice of automatic electromechanical drive systems; Electromechanical drive systems with DC motors and continuous voltage variators: Equation of mechanical characteristic; Structure of milling systems and continuous voltage variators; Adaptive command of electromechanical drive systems with m.c. and continuous voltage variators; Electromechanical drives with direct current motors and controlled rectifiers: Analysis of electromechanical drive systems with m.c. and rectifiers ordered according to the number of dials; Energy analysis of the drive system with m.c. and rectifier ordered; Structure and operation of electromechanical drive systems with m.c. and rectifiers ordered; Structure and operation of reversible electromechanical actuation systems; Structure of optimal positioning systems; Electromechanical drives with asynchronous motors and alternating voltage variators: The principle of the drive system; Structure of the drive system; Numerical control of drive systems with asynchronous motors and alternating voltage variators; Heating system equipped with single-phase asynchronous motors and alternating voltage variator; Asynchronous motors with rotor winding to adjust speed by changing the sliding energy: Speed-dissipating systems by dissipating the sliding energy; Speed control systems for the recovery of sliding energy; Electromechanical drive systems with asynchronous motors and static converters: The principle of speed regulation; Equation of mechanical characteristic; Structure of the power part of drive systems with asynchronous motors and static converters; Asynchronous motor drive systems and static converter with variable voltage DC intermediate circuit; Asynchronous motor drive system and static DC converter; Structure of drive systems ordered on the field orientation principle; Structure of drive systems for direct torque control; Electromechanical drive systems with linear motors. Seminar: Methodology of the implementation of classical (with contacts and control relays) control schemes used for sequential control of electric drives; Reversing start sequence control by direct coupling of electric drive with m.c. and with asynchronous motors; Sequential control of the rheostatic start-up of electric actuators with m.c. and with asynchronous motors; Sequential control of rheostatic start-up of electric actuators with m.c. and with asynchronous motors; Sequential control of rheostatic start-up depending on the speed of electric drives with m.c. and with asynchronous motors; Sequential command of star-delta starting of electric drives with asynchronous motors; Identification of abnormal operating modes in sequential control schemes. Laboratory: Laboratory methodology; Automatic sequential coinage of electromechanical shareholders; Drive system with m.a. and alternating voltage variator; Electromechanical drive with asynchronous motor and static converter; Asynchronous motor drives with winding rotor for speed adjustment by sliding energy recovery (cascade); Electromechanical drive with linear three-phase asynchronous motor; Star-delta automatic start command (simulation); Experimental analysis of the transient mode for asynchronous motor operation; Study of the programming cycles for the operation of electromechanical actuators with asynchronous motor and static converters; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL EQUIPMENT

COURSE OBJECTIVE(S): Learning the principles of construction and operation for typical numerical equipment; knowing the hardware/ software features for microcontrollers and developing applications; knowledge of structure, operation and programming of the main industrial numerical equipments: digital controllers, programmable logic controllers and computerized numerical controls for machine tools.
COURSE CONTENTS: Course: Microcontrollers. Hardware and software features. Specific functional modules, languages and programming tools;

Applications with microcontrollers for controlling servosystems and temperature control; Digital control equipment. The structure of a digital controller. Z-Transform, sampling, extrapolation. Discrete models, choice of the sampling period; Processing of signals and information in digital controllers; Digital control algorithms. Auxiliary software modules; Programmable logic controllers. Structure, modules description, operational cycle. Related input/ output devices: transducers, actuators; Programming in LADDER and using state graphs. Applications; Numerical controls for machine tools. CNC. Structure and operation. Typical blocks; Programming CNC: ISO, APT - RCV, conversational programming. Seminar: Developing programs for a CISC microcontroller (80C552); Developing programs for PIC and AVR microcontrollers. I/ O operations, timing, acquisition of analog signals, arithmetic calculation, LCD display; Discretization of continuous models (first and second order systems); Designing a digital control loop for temperature; LADDER programs for TSX (Telemecanique) and Simatic (Siemens) PLCs. I/ O operations, logical operations, timing and other function blocks; Programs in GAFCET language for PLC. From the functional Grafcet steps to associating the physical elements and programming the LADDER networks for sequential and posterior areas; Development of milling and turning programs for CNC NUM 760. Analysis of trajectories, characteristic points and technological processing data. Writing programs in ISO code. Laboratory: Presentation of laboratory, equipment and hardware/ software tools; Digital controller with multiplexer PAL22V10 - PIC16F877; Programming and operation on temperature control equipment with MCU 80C552; Programming a MIDICOM equipment by LNTOOLS software; Design of control applications with an ARDUINO platform; Programming applications in the FLOWCODE IDE for the Ebloks modular platform; Programming the TSX 17-20 in the LADDER language; Programming and operating with an equipment based on SIMATIC S7-200 PLC; Programming the TSX 17-20 in GRAFCET language; Programming and operating of a mobile microrobot (contour and labyrinth); Temperature control equipment with an industrial digital controller (TECO) and Eblocks system; Computer aided learning for turning and milling programs with NUM Keller 760 equipment; Programming the numerically controled lathe EMCO; Final examination and scoring. Project: Every student has to design his/ her own digital equipment from the a list: PLC for environment parameters (light, humidity, temperature) and for motion control; PIC, AVR, ARM, ARDUINO based platforms for control applications in motion, temperature, humidity etc; The project theme. Steps, personalized elements, theoretical support and tools necessay, way of completion, practical achievements. Project model; Block diagram and basic principle for the designed equipment; Hardware structure design; Software design: IDE, language, simulation; Program data computing; Modules for displaying, control, power supply, actuators; Presentation and scoring.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SERVO SYSTEMS

COURSE OBJECTIVE(S): Assimilation of principles of operation and construction of servosystems;
Acquiring the knowledge needed to design, design and maintain components of servosystems.
COURSE CONTENTS: Course: Servosystems - Requirements, Block Structure, Classifications; Mathematical Model, Response - Closed-circuit servosystems, analog, digital servosystems. Examples of servosystems; DC current servo motors: with brushes, brushless construction, features; AC servomotors: two-phase asynchronous, synchronous - construction, features; Universal collector actuators, step-by-step servomotors, features; Actuator control; Examples of servo system applications in electromechanical equipment. Laboratory: Labor protection training and PSI rules. Presentation of laboratory work; Servosystem study of servomotor of c.c.; Study of the asynchronous servomotor servosystem; Studio system with brushless c.c servomotor; Study of the electronic switch of a brushless cc servomotor; The pulse control study of the c.c; Final Evaluation. Project: Designing the servosystems needed to drive the joints of a four-axis robot designed to serve a technological line; Communication theme project and initial data, discussion on how to approach the theme; Robot description; Sequences of movement; Selection of servomotors and transmission mechanisms for axis θ; Selection of servomotors and transmission mechanisms for axis r; Selection of servomotors and transmission mechanisms for axis ϕ; Choice of position transducers; Supporting the project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC TRACTION

COURSE OBJECTIVE(S): Knowledge of terrestrial electric transport systems on road and rail (surface and underground). Studying and acquiring the construction and operation of electric traction vehicles. Acquiring modern design methods for electric traction vehicles.
COURSE CONTENTS: Course: The general composition of electrical traction systems. Classifications and types; Mechanical parts of electric vehicles; The useful movement of vehicles and convoys; Fixed power traction systems in c.c; Contact line of c.c; Locomotives and electric frames with asynchronous traction motors; Locomotives and electric frames with synchronous traction motors; Locomotives and electric frames with

traction motors of c.c. Laboratory: L1 Laboratory presentation. Performing NTS and PSI training; L2 Mechanical study of VEM; L3 Teaching equipment for studying phenomena from electric traction; L4 Strength Strength Study; L5 Simplifying the profile of a railway line; L6 Useful VEM; L7 The principle of transformer regulation and electromechanical graduation study; L8 Study of the architecture of the main circuits of monocontinuous motor vehicles; L9 Phase control with rectifiers in economical version of mono-continuous VEM; L10 Electrical braking (RTO and recuperation) of VEM with c.c. motors; L11 Self-compressed braking study; L12 Particularities of the asynchronous motor use in electric traction; L13 Study of the 4-quadrant converter used on VEM; L14 End of laboratory activity. Recovery session.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MONITORING AND DIAGNOSIS OF ELECTROTECHNICAL EQUIPMENT

COURSE OBJECTIVE(S): Theoretical and practical foundation of the techniques for monitoring and diagnostics of electrical equipment.
COURSE CONTENTS: Course: Monitoring systems. Importance. Current stage. Getting Started with Control and Monitoring of Electrical Systems; Surveillance and control systems. SCADA - Supervisor Control and Data Acquisitions; Applications of SCADA systems in our country. SCADA in energy; Monitor High Voltage Switches. Parameters supervised by a high-voltage circuit breaker; Methods and techniques of diagnosis; Expert systems; Applications of expert systems. Seminar: Processing algorithms for two sampled process sizes; Study of the status of electrical contacts; Study of dielectric rigidity variation of oil; Calculation of the synthetic values of the sampled electrical quantities; Calculation of the phase shifting of the sampled electrical quantities; Processing algorithms for two sampled process sizes. Laboratory: The CLIPS language. Expert systems to simplify the truth table of a complex logic circuit; Implementing rules in CLIPS (I); Design and analysis of fault trees for the analysis of the reliability of electrical systems. Primary and secondary fault tree; Construction and analysis of fault trees for the analysis of the reliability of the electrical networks.; Expert systems for the diagnosis of electrical machinery The graph of system states. Implement rules in CLIPS language; Expert systems for the diagnosis of electrical transformers. The graph of system states. Implement rules in CLIPS language; Expert systems for diagnosis of power rectifiers. The graph of system states. Implement rules in CLIPS language; Laboratory testing.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: REGULATIONS IN ELECTRICAL ENGINEERING

COURSE OBJECTIVE(S): It contributes to the formation of future electrical engineers, familiarizing them with the main theoretical, legislative and practical aspects related to the composition, characteristics, functioning of the electric, power, national power system, etc.
COURSE CONTENTS: Organizing the energy system; Organizing the power system; Electricity Law, Law 13/ 2007Complemented and Amended by GEO 33/2007 and GEO 172/2008; Considerations on the national energy system and the evolution of the electricity market; Law 199/2000 on the efficient use of energy (republished); Law no. 372/2005 on the energy performance of buildings; Government Emergency Ordinance no. 18/2009 on increasing the energy performance of housing blocks published in the Official Gazette, no. 155/12 March 2009; The manufacturer's guide to renewable energy; Policies and directives of the European Union on the use of renewable energy resources; The production and consumption of electricity in the world
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: LIGHTING TECHNIQUE

COURSE OBJECTIVE(S): Acquisition by students of the knowledge and skills necessary to acquire professional skills in order to understand and manage the theoretical and computational bases of electrical lighting installations (construction, operation, exploitation and design of these installations (light sources and luminaires) specific to electrical engineering.
COURSE CONTENTS: Course: Electrical lighting (Overview. Light - visible radiation); Photometric sizes and units; Light electrical sources (Characteristic sizes. Classification); Luminaires (Photometric characteristics. Classification. Lighting quality conditions); Design of indoor lighting installations (Classification of electrical lighting installations. Quantitative and qualitative parameters of lighting installations. Setting of illuminance level. Layout of general luminaires); Methods of technical lighting calculating of the lighting installations (Specific power method. Method of usage factor. Point by point method for point sources and linear sources. The use of automated calculation for the design of lighting installations); Dimensioning of the interior networks for light receivers/ circuits and light columns (Dimensioning of the section at heating in permanent regime. Checking of the section at the voltage drop and at the framing within minimum admissible limits. Choice of protection, switching and measuring afferent equipment). Seminar: Predimensioning in terms of technical lighting of an interior lighting installation by the use of usage factor method. Presentation and demonstration with

the program for the design and analysis of indoor lighting systems and for open surfaces - ELBALux4.4; Checking of the illuminance at a point of the useful plan by point by point method for linear sources; Dimensioning of the interior power supply network for light receivers. Dimensioning of the section at heating in permanent regime. Checking of the section at the voltage drop. Framing within minimum admissible limits from a constructive point of view. Choice of protection, switching and measuring equipment; Numerical applications for the variation of the electric and photometric sizes of the lamps according to the temperature of the filament and the supply voltage; Numerical applications for the calculation of the photometrical sizes. Laboratory: Study of the tubular fluorescent lamp; Practical circuits fitted with tubular fluorescent lamps; Study of the high-pressure mercury vapour discharge lamp; The study of the high-pressure sodium vapour discharge lamp; Study of the possibilities of changing of the luminous flux emitted by light electrical sources; Monoblock high power LED lighting systems. Determination of the light distribution emitted by LED street luminaires; Final evaluation of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

FIELD: ENERGY ENGINEERING
PROGRAMME TITLE: ELECTRO-ENERGETIC SYSTEMS ENGINEERING
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY

COURSE OBJECTIVE(S): Acquire by students of knowledge of theoretical background of linear algebra and analytical geometry, as well as skills training in the use of dedicated computing techniques.

COURSE CONTENTS: Vector spaces; Linear applications; Bilinear forms; Euclidean spaces; Euclidean spaces: Cases E2 and E3; Analytical geometry of space E3; Quadric surfaces. Quadric curves (recapitulation from high school).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MATHEMATICAL ANALYSIS I

COURSE OBJECTIVE(S): Assimilation of mathematical methods with application in engineering, physics mechanics, resistance of materials, informatics, numerical methods, technology of materials.

COURSE CONTENTS: Course: Elements of Set Theory; Real Sequences and Series; Continuity of real –valued functions; The Derivative; Graphs of Functions; The Definite Integral; The Improper Integral; Power Series. Laboratory: Set Theory; Real Sequences and Series; Continuity of real –valued functions; The Derivative; Graphs of Functions; The Definite Integral; Improper Integral; Power series.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: CHEMISTRY

COURSE OBJECTIVE(S): Students acquire knowledge of the theoretical support for the notions of atomic structure, chemical bonds, solutions, semiconductors, and the ability to work with utensils and laboratory equipment.

COURSE CONTENTS: Course: Considerations of the structure of the atom; Chemical bonds; Chemical kinetics. Chemical balance; Solutions; Electrochemical notions; Semiconductors. Laboratory: Presentation of laboratory work and labor protection in the Chemistry laboratory; Determining the Diesel Index; Determination of corrosion speed; Determination of viscosity in lubricants; Protection of metal surfaces against corrosion; Conductometric analysis; Final assessment of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERAL ECONOMY

COURSE OBJECTIVE(S): Students acquire the basic knowledge of economic theory and modern methods specific to the field in order to identify, define, explain, interpret and apply economic concepts at micro and macroeconomic level to formulate hypotheses and propose solutions to economic problems.

COURSE CONTENTS: Course: Economics - Social Science and Form of Human Action; Market economy; Economic goods. Their utility and value; Factors of production and their use; Demand; Offer; The money market; Capital market; Labor market; Occupation and unemployment; Inflation. Laboratory: Economy - science of economic action and form of human action; Economic goods. Their utility and value – applications; Factors of production and efficiency of their use – applications; Demand and supply – applications; The system of markets: the money market, the capital market and the labor market; Unemployment and Inflation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION I

COURSE OBJECTIVE(S): Acquiring the theoretical, practical and methodological skills of practicing physical exercise in an organized or independent manner in order to acquire a healthy lifestyle.

COURSE CONTENTS: Gymnastics: basic exercises, aerobic gymnastics; Application paths combined with running, jumps, equilibrium exercises, escalation, climbing skills, etc; Main sports skills of football game (boys), basketball (girls); Bilateral games under similar competition conditions; Evaluation tests.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ASSISTED GRAPHICS I (TECHNICAL DRAWING)

COURSE OBJECTIVE(S): It is one of the basic disciplines of basic engineering training of the curriculum of these specializations, having the role of presenting to the students the theoretical and applied bases of the spatial and spatial representations of the bodies. At the same time, it aims to familiarize students with the main rules of representation in technical and industrial design.

COURSE CONTENTS: Course: Introduction to the study of the technical drawing; Representation of projections; Representation of views and sections; Quotation in the technical drawing; Representing, quoting and marking the threads; The overall drawing. Seminar: Clamp, indicator, composition table; Representation of the geometric figures (square, rectangle, circle, oval, diamond, parallelogram, triangle, trapezoid) at 1:10 scale; Representation of projections; The representation of geometric bodies (cube, rectangular parallelepiped, hexagonal prism, square pyramid, square pyramid trunk, cylinder); Representation of geometric body purgatives (cube, rectangular pyramid, cone, cylinder, square pyramid trunk, hexagonal prism);

3D representation of a piece; View and section of a 3D piece; Quotation; Electrical and Thermal Symbols and Schemes; Representation and quotation of hexagonal threaded parts; Represents a threaded piece; Assembling two pieces with nut with nut; Section through valve with valve.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: APPLIED INFORMATICS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire specialized knowledge and skills in the structure and operation of computer networks.
COURSE CONTENTS: Course: Methods of representation of information. Structure of a personal computer; Internal data representation. Numerical systems. Representation of algebraic numbers; Representation of floating-point numbers; Microprocessor. Microprocessor performance; Interfaces. Ports. Computer networks; Software components for computer networks. Ethernet networks. Token-based networks; Operating systems - structure, functions, components. Seminar: Overview of algorithms; Arithmetic phrases; Algorithms - logical schemes; Conversions on Base 2, 8, 10. Laboratory: Structure of a PC: CPU, HDD, Motherboard, Internal Memory; Operating systems. Specifying files and managing them with Windows Explorer, Office Software: WordPad, Paint, Calculator and Application-Based Communication via the Cliboard, HDD Image; Using your computer for word processing: Word; Using the computer to make presentations: Power Point; Laboratory test - the final assessment of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PROFESSIONAL COMMUNICATION

COURSE OBJECTIVE(S): Developing the communication and interaction skills (oral and written) of the students required for adequate communication in the field of qualification and socially accepted, acquiring specific knowledge, skills and attitudes in professional environments and communities.
COURSE CONTENTS: Course: Definitions, models and theories of communication; Professional abstracts and papers; Telephone communication; IT-assisted communication; The Art of Taking an Interview; Professional and scientific presentations; Preparation of a professional file - CV, letter of intent. Seminar: Inaugural speech; The professional project; The professional poster; Presentation of research results - poster exhibition; Presentation of research results – public presentation of the professional project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNOLOGY OF MATERIALS

COURSE OBJECTIVE(S): Contributes to the formation of future engineers s, familiarizing them with the main theoretical and practical aspects related to the characteristics and operation of the material production facilities.
COURSE CONTENTS: Course: General considerations. The object and importance of the technology of materials. Structure of technological processes. Design of technological processes. Technical and economic indicators. Structural balance charts; Technology of manufacturing of products made of metallic materials. Ferrous and Non-Ferrous Metals Technology; Powder technology; Technology of manufacturing of composite materials. General notions on composite materials. Reinforcing fiber manufacturing technologies; Technologies for the manufacture of metal matrix composites. Technologies for the manufacture of polymeric matrix composite; Ceramics products manufacturing technologies; Technologies for manufacturing intelligent materials. Laboratory: Preparation and expression of the results obtained in the practical works; Experimental determinations for lengths and diameters; Study of the Fe-C diagram; Experimental determination of the properties of foundries alloys; Experimental Determination of the Mixture of Powder Particles Properties; Evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS II

COURSE OBJECTIVE(S): Assimilation of mathematical methods with applications in engineering, physics, mechanics, machine organs, resistance of materials, informatics, numerical methods, study and technology of materials
COURSE CONTENTS: The n – Space R^n. Vectors; Fuctions of Several Variables: Limits and Continuity, Partial Derivatives, Extrema, Constrained Extrema; Curve Integrals. Applications; Double Integrals. Applications; Triple Integrals. Applications; Surface Integrals. Applications; Vector Fields, Curl and Divergence of a Vector Field, Green's Theorem, Gauss – Ostrogradski's Theorem, Stokes' Theorem.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION II

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.

COURSE CONTENTS: Gymnastics: Front and Band Exercises; Aerobics/ Fitness Gymnastics; Application trails combined with treadmills, jumps; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports: Football; Bilateral games in similar contest conditions.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MECHANICAL ENGINEERIG ELEMENTS I

COURSE OBJECTIVE(S): Knowledge, understanding and deepening of the basic notions of mechanics. Learning by students of the knowledge and skills necessary to acquire professional skills for understanding and managing the essential aspects of mechanics regarding statics, kinematics and system dynamics.

COURSE CONTENTS: Course: The theory of sliding vectors; Geometry of the masses; The kinematics of the material point; The solid rigid kinematics and rigid systems kinematics; Dynamics of the material point; Methods of study in dynamics of solid rigid and rigid systems. Getting analytical mechanics. Reduced models of mechanical systems. Laboratory: The theory of sliding vectors; Mass centers; Moments of inertia; The kinematics of the material point; The solid rigid kinematics; Dynamics of the material point; Dynamics of solid rigid

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICS

COURSE OBJECTIVE(S): Acquiring necessary knowledge and familiarization of students with the theoretical methods which describes, at the fundamental level, physical phenomena involving in applications of electrical, energy, aerospace engineering. Formation of skills and abilities necessary to manipulate calculus techniques used in theoretical models which describe physical systems with applicability in electrical, energy, aerospace engineering.

COURSE CONTENTS: Course: Classical (Newtonian) mechanics. Mechanics of a point-particle. Dynamics of a system of particles. Non-inertial frame. Inertial forces; Notions of the mechanics of fluid. Dynamics of ideal fluids. Dynamics of real fluids; Elements of analytical mechanics. The Lagrangian formalism. The Hamiltonian formalism; Elements of classical electrodynamics. The Maxwell equations in vacuum. Electrostatics and magnetostatic of vacuum. Electromagnetic wave in vacuum; Thermodynamics. Principles. Thermodynamics potentials. Equilibrium and phase transition. Elementary notions of classical statistical physics; Elements of relativistic mechanics. Relativistic kinematics and relativistic dynamics. Relativistic energy and Einstein's formula; Introduction to quantum mechanics. Pre-quantum physics. Wave quantum mechanics. Schrödinger equation; Elementary notions of nuclear physics. Nuclear fission and nuclear fusion. Seminar: Elements of vector algebra; Elements of vector calculus; Applications of Newtonian classical mechanics; Usually applications of fluid mechanics in different engineering fields; Applications of Lagrangian mechanics. Applications of Hamiltonian method; The fundamental problem of electrostatics and magnetostatic of vacuum. Applications; Simple thermodynamic systems. Perfect gas and real van der Waals gas. Applications; Applications of relativistic dynamics; Applications of quantum mechanics. Potential barrier. Tunnelling effect.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED DESIGN II

COURSE OBJECTIVE(S): Students training for understanding and acquiring the theoretical concepts of geometrical modeling and their implementation in SolidWoks system.

COURSE CONTENTS: Course: The importance of the CAD system in a manufacturing cycle; CAD system's components; the functionality of CAD software; GEOMETRICAL MODELING FUNDAMENTALS: Methods and techniques of geometrical modeling; 3D geometric modeling. General considerations; INTRODUCTION TO SKETCHING IN SOLIDWORKS 2016: frameworks and sketching methods; geometric navigation; drawing tools; INTRODUCTION TO SKETCHING IN SOLIDWORKS 2016: tools for editing sketches; FEATURE MODELING: extrude, revolve, sweep, loft, , fillet, chamfer, rib, shell, draft, hole; ASSEMBLY DRAWING. Modeling of the parts in the context of the assembly; 2D DOCUMENTATION 2D: views, sections, details, drawing designs. Laboratory: SOLIDORKS BASICS AND THE USER INTERFACE; INTRODUCTION TO SKETCHING: Applying the theoretical knowledge to create a new part; insert a new sketch, add sketch geometry, establish sketch relations between pieces of geometry, extrude the sketch into a solid; FEATURE MODELING. Achieving the proposed parts by applying the theoretical notions; EXAMPLE OF SHEET METAL MODELING PART; ASSEMBLY MODELING consisting of a subassembly and six other components; GENERATION OF 2D DOCUMENTATION for the parts made during the previous seminar.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTRODUCTION TO ENERGY ENGINEERING

COURSE OBJECTIVE(S): The discipline contributes to the formation of future energy engineers, familiarizing them with the main aspects of the theoretical and computational bases of the main physical phenomena occurring in the special installations for the production, transport, distribution and use of electric and thermal energy.

COURSE CONTENTS: Course: Introduction to energy; Basic thermodynamic notions; General notions of heat transfer; Energy fuels; Graphic symbols used to create thermomechanical schemes; Electrotechnical concepts; General characteristics of the power systems. Seminar: Measuring units of the international system. Physical size. Use of the connection relations between the measuring units of the main electrical, hydraulic and thermal parameters: power, energy, pressure; Determination of mechanical work, energy, heat exchanged in isocorous processes, isobar, isotherms, adiabate; Analytical determination of the lower calorific value and of the excess air coefficient at the burning of different types of fuels: solid, liquid, gaseous; Use of Electric Circuit Laws: Ohm's Law, Kirchhoff's Laws.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties: Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools; application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics:

Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: SPECIAL MATHEMATICS I

COURSE OBJECTIVE(S): Ordinary differential equations, fundamental topics and solving such equations. Fundamentlat topics in Statistics;
COURSE CONTENTS: Course: Fundamental topics for differential equations; First order differential equation. General form, normal form. General, particular, singular solution. Cauchy problem. Geometric interpretation of a differential equation, of the solution of a differential equation, of the Cauchy problem solution; First order differential equations integrable by elementary methods. Differential equations with separable variables. Homogenous differential equations. Linear differential equations. Bernoulli, Riccati, Clairaut, Lagrange differential equations. Exact differential equations. Integrating factor. Finding line fields; Existence and uniqueness theorems for Cauchy problem of first order. Stability theorems for differential equations of first order; Linear differential equations of higher order, homegenous and nonhomogenous. Linear independence. Fundamental solution systems. Linear differential equations with constant coefficients. Euler equations; Linear systems of differential equations of first order. Fundamental solution matrix. General solution for a homogenous, nonhomogenous linear system. Linear systesm with constant coefficients; Basic topics in statistics. Random variables. Characteristiv values of a statistical series. Statistical indicators. Variation indicators. Correlation and regression. Regression analysis. Linear Regression. Laboratory: Equations with separable variables. Homogenous equations and reducible to homogenous equations; Linear differential equations. Bernoulii and Riccati equations. Implicit differential equations, Clairaut and Lagrange equations. Exact differential equations and integrating factor method. Finding line fields. Equations that can be reduced to lower order equations; Existence and uniqueness problems for Cauchy problem of first order. Solution dependence problems. Stability problems for differential equation of first order; Solving differential equations of higher order. Finding a fundamental solution system for linear differential equations with constant coefficients. Euler linear differential equations; Linear systems of differential equations of first order. Computing fundamental matrix for linear sistems with constant coefficients. Euler's method to determine a fundamental solution matrix; Study of concrete statistical phenomenon, using characteristic values of statistical generated series, statistical indicators and variation indicators. Making prediction for further behavior of such phenomenon, by using corelation, regression and linear regression.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of fundamental control structures and computer programming.
COURSE CONTENTS: Course: Fundamental types of data: Fundamental, constant, variable types; Arithmetic phrases. Pictures; Attribution instructions; Operations with full bit numbers. Travel operators. Logical operators. Fundamental control structures – algorithms: Relative phrases. Boolean phrases; Operators while, do-while, for; Operators if,?, Switch. Functions: Definition of functions; Passing function parameters; Recursion - Functions templates. Pointers, references, drawings, type C strings: Pointers; References Pointers and one-dimensional paintings; Pointers and multidimensional paintings; Type C strings. Type C files: Text files - Binary files. Structures and unions type C: Structures and unions; Apps: time functions. Classes: The concepts of object programming; Defining a class. Pointerul this. Namespaces - Builders and destroyers; Friendly functions; Standard C ++ files - C ++ standard strings. Overloading operators. Overloading the assignment operator - Overloading arithmetic

operators - overloading the incoming/ outgoing operators. Inheritance: Pointers to objects; Inheritance; Types of access; Virtual Functions. Polymorphism; Data and static functions. C ++ files: Text files; Binary files. Treating exceptions: Exceptions; Functional exceptions; Standard exceptions. Standard Template Library: Generic functions; Lists. Vectors. Working with complex numbers. Laboratory: Fundamental types of data; Arithmetic phrases. Attribution Instruction; Accuracy of calculations. Travel operators. Operators ++ and -. Bit logic operators; Fundamental control structures; Functions; Pointers and references. Operations with type C strings; Processing files in C language; Classes. Operations with C ++ strings; Inheritance; Virtual Functions. Polymorphism; Processing files in C ++; Standard Template Library.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: FUNDAMENTALS OF ELECTRICAL ENGINEERING I

COURSE OBJECTIVE(S): The students in power energy domain should acquire knowledge in the main aspects related to the electromagnetic field and its particularities for the different time-varying regimes of the electrical and magnetic quantities.
COURSE CONTENTS: Course: Introduction. General notions of electromagnetic field; The electrostatic field. Coulomb's formula. Electric field strength. Electric flux density. Electrical voltage. Electrostatic potential. The law of electric flux (Gauss' law). Polarization of bodies. Temporary polarization law. The electric capacitor. Capacitor networks. Maxwell's equations in capacities. Energies and forces in electric field. Generalized forces theorem in electric field; The electro-kinetic field. Direct current circuits. The conservation law of the electrical charge. The law of electric conduction. The theorem of energy transformation into conductors. Kirchhoff's theorems. The theorems of powers in direct current circuits. Theorems of equivalent resistances. Other useful theorems in direct current circuits. Nonlinear resistors; The magnetic field. Magnetic flux density. Magnetic field strength. The magnetization of bodies. Magnetic flux law. The law of temporary magnetization. Magnetic circuit law. The law of electromagnetic induction. Magnetic circuits. Reluctances. Inductances. Energies and forces in the magnetic field. Seminar: The electrostatic field. The field created by point charges: electric field strength, potential, forces; Apply the law of electric flux to determine the electric field created by electrical charged bodies; Electrical capacity. Capacitors networks; Energy and forces in static electric field. Generalized forces theorem in electric field; DC circuits. Kirchhoff's theorems. Equivalent resistances. Power in dc circuits; The magnetic circuit law - The Ampere's theorem. The law of electromagnetic induction; Calculation of self and mutual inductances of some simple systems
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION III

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Athletics: The long jump technique in place; Utility-application paths; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALOGUE ELECTRONICS

COURSE OBJECTIVE(S): The students will get the fundamental knowledge of analogical electronics, from the main functional and constructive characteristics point of view, but also from practical use posibility point of view. It will also be developed simulation abilities in the electronics domain, but also practical abilities.
COURSE CONTENTS: Course: Fundamentals regarding the continuous current, alternative current, sound waves and complex waves, parameters; Passive circuit components. Matrices of passive components. The transformer and auto-transformer; Amplitude modulation and frequency modulation; Semi-conductive diode; Bipolar transistor with jonctions. Amplifiers with TBJ; Transistors with field effect; Semi-conductive photoelectrical devices and multi-junction semi-conductive devices; Operational amplifiers. OA circuits; Rectifiers; Stabilizing circuits; Oscilators and signal generators; Filters. Laboratory: Labor rules. Presentation and use of the electronical equipment necessary for practical experiments; Presentation of the simulation programs and of the main analysis that will be done during the laboratory; Circuits with semi-condictive diods – simulation; Circuits with

semi-condictive diods – practice; Amplifier circuits with bipolar transistors – simulation; Amplifier circuits with bipolar transistors – practice; Amplifier circuits with OA – simulation; Amplifier circuits with OA – practice (it will use the platform Lab Kit PRO); Linear stabilizer – simulation; Linear stabilizer – practice; Signal generators – simulation; Signal generators – practice (it will use the platform Lab Kit PRO); Final eveluation of the laboratory activitie.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SPECIAL MATHEMATICS

COURSE OBJECTIVE(S): Intoduction to signal Fourier analysis, applications of fundamental transforms Laplace and Fourier, study of physics experiments using partial differential equations.

COURSE CONTENTS: Course: Complex Analysis. Exponential function; Fourier analysis, Fourier series. Periodic functions. Odd and even functions, periodic extensions. Trigonometric orthonormal system. Fourier coefficients, Fourier series of a function. Parseval formula. Bessel inequality. Fourier series expansion, sine and cosine expansion; Laplace and discrete Laplace (z) tranforms. Fundamental theorems. Laplace transforms of elementary functions. Applications to differential and integral equations. Elementary discrete signals. Detrmine signals obtained by superposing their delayed signals; Fourier transform. Integrable functions (signals). Inverse Fourier and Laplace transforms. Convolution, Parseval and Borel formulas. Sine and cosine transforms. Solving some integral equations, representation as Fourier integral; Linear partial differential equations of order II. Differential equations, initial conditions, boundary problems, Cauchy problem. Clasification of linear partial differential equations, canonical form; Main differential equations of mathematical physics. Separating variables method and superposing effects principle, applied to some fundamental equations, Dirichlet problem for a disk, vibrating string equation, heat equation in an infinite bar. Laboratory: Complex exponential function, properties; Odd and even extension of a function, computing Fourier coefficients, Fourier expansion, sine and cosine expansion, computing the sum of some numerical series; omputing Laplace transforms, finding the original, solving differential and integral equations. Discrete signals. Reccurence relations, superposing delayed signals; Computing Fourier transforms, sine and cosine transforms. Solving integral equations, representation as Fourier integral; Classification of linear partial differential equations of order II, canonical form; Using separating variables method and superposing effects to solve Dirichlet problem for a disk, vibrating string equation and heat in an infinite bar.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: FLUID MECHANICS

COURSE OBJECTIVE(S): Contributes to the formation of future power engineering specialists, familiarizing them with the main theoretical and practical aspects related to the construction elements, characteristics and operation of hydraulic networks

COURSE CONTENTS: Course: Introduction. The notion of fluid. Continuity hypothesis. Fluid properties; Statics of fluids. General equations of fluid statics. Fundamental equation of fluid statics. Graphic representation of pressure. Action of resting fluids on solid walls; Fluidic kinematics. Description of movement in fluid kinematics. Elements characteristic of fluid movement. Equation of continuity; Dynamics of ideal fluids. The equations of the ideal fluid movement. Bernoulli's relationship. Static, dynamic and total pressure; Dynamics of real flowing fluids. Definition of laminare movement. Navier-Stokes movement equations. Exact solutions to movement equations; Dynamics of real fluids in turbulent movement. Description of turbulent movement and movement equations. The turbulent movement in a circular cylindrical duct. Determining Darcy's coefficient. Local hydraulic resistors; Permanent effluent movements. Flow through holes. Flowing through nozzles. Flow over the spillway; Hydraulic pipe network calculation. Simple pipes. Pipe with variable sections. Calculation of pipe's networks. Characteristic curves for pipes. Seminar: Applications to fluid properties; Applications to fluid statics; Fluid kinematics applications; Applications to the general equations and theorems of the dynamics of ideal fluids; Applications to laminar movement of real fluids; Applications to turbulent flow of real fluids; Applications to permanent effluent movements; Applications to permanent movement in pressure pipes. Laboratory: Apparatus and methods of measuring the pressure; Experimental determination of flow rate in pipelines by different methods; Experimental demonstration of Bernoulli's law; Experimental determination of energy line, load piezometric line and linear and local loss coefficients for a variable geometry pipe; Experimental determination of flow regime in pipelines; Assessment of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: NUMERICAL METHODS FOR ENGINEERS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental notions regarding numerical algorithms with applications in systems engineering.

COURSE CONTENTS: Course: Getting Started. The importance of studying numerical methods. Types of errors; Generate and propagate errors; Using the elementary transformation method and the iterative method; Numerical methods in linear

algebra. Numerical solving of equation systems; Linear. Direct methods. The Gauss method; Pivot techniques. Solving linear systems by matrix factorization; Numerical methods for calculating determinants. Finding the inversion of a matrix; The method of successive approximations. Numerical solving of linear equation systems through iterative methods; Separating the roots of a nonlinear equation. Approximate solving equations and systems of nonlinear equations; Numerical methods for determining the characteristic polynomial, its vectors and its own values; Approximate functions. Polynomial interpolation of functions; Lagrange interpolation polynomial; Differential differences; Newton interpolation polynomial; Interpolation using spline functions. The least squares method; Numerical derivation. Finite difference method; Numerical evaluation of the integrals by the trapezium method; Numerical evaluation of integrals by Simpson method and Newton method; Numerical approximation of solutions of differential equations; Presenting mathematical software packages. Laboratory: Getting Started. The importance of studying numerical methods. Types of errors; Generate and propagate errors; Numerical methods in linear algebra. Numerical solving of linear equation systems. Direct methods. The Gauss method; Pivot techniques. Solving linear systems by matrix factorization; Numerical methods for calculating determinants.Finding the inversion of a matrix using the elemental transformation method and the iterative method; The method of successive approximations. Numerical solving of linear equation systems by iterative methods; Separating the roots of a nonlinear equation. Approximate solving equations and systems of nonlinear equations; Numerical methods for determining characteristic polynomial, vectors and of their own values; Approximate functions. Polynomial interpolation of functions. The polynomial of Lagrange interpolation. Differentiated divisions. Newton interpolation polynomial; Interpolation using spline functions. The least squares method; Numerical derivation. Finite difference method; Numerical evaluation of the integrals by the trapezium method; Numerical evaluation of integrals by Simpson method and Newton method; Numerical approximation of solutions of differential equations; Presenting mathematical software packages.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STRENGTH OF MATERIALS

COURSE OBJECTIVE(S): It contributes to the formation of future engineers, familiarizing them with the main theoretical and practical aspects related to the simple and complex mechanical stresses of various machine parts, appliances and electrical installations.

COURSE CONTENTS: Course: General notions on material resistance. Tensions and deformations. Characteristic curve of materials. Admissible resistances. Safety Coefficients; Elements of elasticity theory. Layout of stress and deformation. Hooke's generalized law. The relationship between elastic constants E. G, υ; Geometrical Surface Characteristics. Static Moments. Moments of inertia. Inertia rays. Resistance modules. Variation of inertia moments relative to parallel axes. Variation of inertia moments when rotation of coordinate axes; Axial Loads. Effect of own weight on straight axes with axial loads. Bars of equal strength subjected to axial stresses; Strength of electrical and telecommunication cables. The equation of the funicular curve. Calculation of the deformation, the strain and the length of the conductor; Bending loads for straight bars. The pure bending, Navier's formula. Bars of equal strength subjected to bending; Torsion loads. Strains and deformations in circular and ring-shaped bars, subjected to torsion loads.. Calculation of helical springs; Axles and shafts. Axle calculation. Calculation of straight shafts (pre-dimensional, fatigue calculation, rigidity calculation); Spindles and pivots. Simple computation of spindles. Ring with rings. Axial pivots - radial.. Laboratory: Tensile test of materials; Compression test of materials 3 Testing of static bending materials; Static bending test of materials; Dynamic bending test of materials; State the design theme and fix the features and performance of the designed product for each student; Calculating product dimensions based on kinematic, strength, etc; Transposition of the designed product into functional sketches, with the main calculated dimensions; Checking and marking the project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: THERMOTECHNICS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Student acquirement of specialized knowledge and skills regarding the efficient use of heat.

COURSE CONTENTS: Course: General notions of thermotechnics; Principles of thermodynamics; The perfect gas. The laws of the perfect gas. Simple transformations of perfect gas; General methods of analysis of thermodynamic processes; Real Gases; Water vapor cycles; Wet air; Dynamics of gas; Combustion of fuels; Compressors; Refrigeration installations. Heat pumps. Seminar: Applications. Principles of thermodynamics; Applications. The perfect gas. The laws of the perfect gas. Simple transformations of perfect gas; Applications. General methods of analysis of thermodynamic processes; Applications. Real Gases; Applications. Water cycles of water vapor; Applications. Wet air; Applications. Combustion of fuels. Laboratory: Temperature measurement; Determination of

adiabatic exponent; Determination of mass caloric capacity; Determination of wet air parameters; Determination of solid fuel humidity; Laboratory test - the final assessment of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 2ND SEMESTER

COURSE TITLE: FUNDAMENTALS OF ELECTRICAL ENGINEERING II

COURSE OBJECTIVE(S): The students in power energy domain should acquire knowledge in the main aspects related to the theory of electric circuits and methods of analysis of electrical circuits operating in different regimes.
COURSE CONTENTS: Course: Electrical circuits in permanent sinusoidal regime. Sinusoidal time variation quantities. Symbolic representations. The behavior of circuit elements in permanent sinusoidal regime. Theorems of equivalent impedances. Kirchhoff's laws. RLC series and RLC parallel circuits in sinusoidal regime; the resonance phenomenon. Magnetically coupled circuits. Methods of solving circuits in permanent sinusoidal regime. Powers in permanent sinusoidal regime; Three-phase circuits. Symmetrical systems. Connections. Solving balanced three-phase networks under symmetrical supply voltages. Solving unbalanced three-phase networks under symmetrical supply voltages. Powers in three-phase networks. Decomposition of a three-phase system into symmetrical components. Fault regimes; Electrical circuits in transient regime. Direct integration method. Circuits supplied with constant voltages, in transient mode. Circuits supplied with sinusoidal voltages, in transient mode. The operational (Laplace) method; Electrical circuits in permanent non-sinusoidal regime. Spectral decomposition. Circuit elements in non-sinusoidal regime. Resonance on harmonics. Powers in permanent non-sinusoidal regime. Seminar: Circuits in sinusoidal regime. Dipoles, symbolic representations, equivalent circuits; Methods for circuit analysis in sinusoidal regime; Solving three-phase networks supplied by symmetrical voltages; Solving electrical circuits in transient regime; Analysis of electrical circuits in permanent non-sinusoidal regime. Laboratory: Presentation of safety rules. Presentation of laboratory works. Organize the working groups; Experimental study of the direct current linear circuits; Study of the RLC series circuit in permanent sinusoidal regime; Experimental study of transient regimes in simple circuits; Experimental study of three-phase circuits in permanent sinusoidal regime; Experimental study of passive linear two-ports four-poles electric circuit; Finalizing the lab activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION IV

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Fitness - optimizing your physical condition; Utility-applicative skills; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERAL ENERGY AND ENERGY CONVERSION

COURSE OBJECTIVE(S): Forming future power engineering engineers, familiarizing them with the main theoretical and practical aspects related to the conversion phenomena underlying the processes of producing electric and thermal energy.
COURSE CONTENTS: Course: Energy. The heat. Principles of thermodynamics; The national energy system and its evolution; Sources and energy resources. Direct and indirect energy conversion systems; Indirect conversion. General notions. Structure of a power plants. The main energy transformations from an power plants. Schema of an power plant, component parts and main circuits; Thermal yield and overall yield. Methods to improve performance; Nuclear-electric conversion. Nuclear fuels. Nuclear reactions. Nuclear reactors. Nuclear power stations; Conversion of solar energy. General concepts, conversion types. Solar-thermal conversion. Principle of operation of solar-thermal collectors. Solar-thermal installation; Photovoltaic conversion. Photovoltaic cells. Conversion systems, features. Efficiency; Thermoelectric generator; Heat pumps; Electrochemical conversion. Primary cells. Secondary cells. Fuel cells. Seminar: Determination of thermal agent parameters using thermodynamic tables and diagrams; Calculation of the heat cycle efficiency of a thermoelectric plant in case of operation with or without intermediate overheating; The calculation of the evacuated electrical power

and the cooling water pump output from a Power plat; Calculating the parameters of a planar collector; Calculation of quantitative and qualitative returns for conversion facilities. Laboratory: Energy analysis of the operation of a solar thermal planner; Study of photovoltaic cells; PEM fuel cells; Professional Genius installation; Study of thermoelectric generators. The Peltier effect.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PROCESS INFORMATICS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire specialized knowledge and skills regarding the structure and functioning of industrial processes and computer products: the stages of the implementation of the computer systems and program products, modern means of communication used in the control systems as well as the development of abilities regarding the use of certain media programming and specialized software applications.
COURSE CONTENTS: Course: The computer in the management of industrial processes; introductory notions; General principles of computer products. Stages of computer systems implementation. Stages of product development; Technology for the realization of a computer product. General considerations. Modeling of computer systems or program products; Modern communication tools used in control systems; Strategies for conceiving and implementing an information system; The technological framework for the implementation and maintenance of information systems; Information systems for the operational management of NPS installations; Functions of computer systems for DLC. Seminar: Considerations on the application of information technology. Terminology. Systemic system representation. Components of system analysis; Technology for the realization of a computer product; Methods of making a computer product; Current issues of IMS applications; Techniques for obtaining information. Analysis techniques. Methods of realization. Laboratory: Modeling of computer systems or program products; Structure of the computer system (hardware and software architecture); Techniques and methods for achieving an IT product; Methods of project management. The Gantt method. The Critical Way Method; Modeling and simulation of control systems in MATLAB / SIMULINK; Calculation of transfer functions. Algebra of block schemas; Laboratory test - the final assessment of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT

COURSE OBJECTIVE(S): To familiarize students with the main concepts and practices in the field of management. To develop organizational and decision-making skills.
COURSE CONTENTS: Course: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Methods and techniques used in decision-making; Process organization; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Information management system: concept, components, functions; Principles of design and improvement of the management information system. The main shortcomings; General management methods and techniques; Specific management methods and techniques; Human resources management: concept and component activities; Managers: definition, features, types of managers, and managerial styles. Seminar: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Methods and techniques used in decision-making; Process organization; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Information management system: concept, components, functions; Principles of design and improvement of the management information system. The main shortcomings; General management methods and techniques; Specific management methods and techniques; Human resources management: concept and component activities; Managers: definition, features, types of managers, and managerial styles.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MICROCONTROLLERS AND PROGRAMMABLE LOGIC CONTROLLERS

COURSE OBJECTIVE(S): Forming future power engineering engineers, familiarizing them with the main theoretical and practical aspects related to the structure, operation and use of programmable microcontrollers and automation.
COURSE CONTENTS: Course: Introduction - The place and role of the microcontroller; Structure of a microcontroller; PIC Microcontrollers - Features. Terminal configuration. Internal structure; PIC microcontroller 16F690: generalities, structure, microcontroller pins, applications of the

microcontroller; Core microcontrollers 80C51; Applications of microcontrollers - Industrial applications. Signal and measurement processing applications. Embedded applications; General concepts PLC. Areas of PLC use; Architecture of programmable machines. Instruction format, variable types. Data bus. Central unit. Central memory, addressing, organization, and management techniques; Programming of PLC with a list of instructions; Graphic programming of programmable logic controllers (with symbols); Programming language for GRAFCET - based programmable logic machines; Applications of programmable machines. Laboratory: Microcontroller; Programming the microcontrollers Pic. Game with LED's; System of orientation of a photovoltaic panel with a microcontroller; AAR with PLC; Surveillance and control of non-electric parameters for an energy installation by means of a programmable controller.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: OPTIMIZATION TECHNIQUES IN ENERGETICS

COURSE OBJECTIVE(S): It passes on the basic knowledge needed to understand the optimization techniques used in the energy field.
COURSE CONTENTS: Course: The mathematical model of optimization problems; Linear programming problems: Forms. The simplex algorithm. Linear programming with integer variables; Dynamic programming method Sequential decision processes. The fundamental equation of dynamic programming. Dynamic programming algorithm; Unlimited convex nonlinear programming: Convex programming optimal conditions. Determining the travel step. Optimization methods that do not require the use of derivatives. Methods using first-order derivatives. Methods using second-order derivatives; Non-linear programming with consideration of restrictions. Lagrange's multiplier method. The conditions of Kuhn-Tucker. The gradient method designed. Low gradient method. Method of penalty functions. Internal Point Methods. Calculation of penalty coefficients using the low gradient method. Laboratory: Solving linear programming problems using the linprog function in MATLAB; Applications of the dynamic programming method; Resolving unrestricted non-linear programming problems using the fminsearch and fminunc functions in MATLAB; Solving Convex Optimization Problems by Cyclical Optimization Method along Coordinate Axes; Solving convex optimization problems by gradient methods; Solving convex optimization problems using the Newton method; Solving quadratic programming problems using the quadrprog function in MATLAB.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS THEORY AND AUTOMATIC CONTROL

COURSE OBJECTIVE(S): Introduction of the basic concepts of systems theory (the input-output theory) and of their description through specific characteristics, as well as of the basic issues of automated control. This creates the necessary openness for the dynamic-based approach, as well as the ability to use the automatic control tools – being a first step towards an interdisciplinary approach to engineering problems.
COURSE CONTENTS: Course: Introduction in Systems and signals theory; Input-output transfer of linear dynamical systems: mathematical description, properties; Structural block diagrams, systems output for typical input signals, stability of linear and time-invariant systems; Frequency characteristic and stability of feedback systems. Nyquist criterion; Control systems. Introduction in Control theory; Qualitative indices of step response. Exact synthesis of the controller based on imposed performances; The control problem. The precision of control systems. Stabilization by dynamical compensation; Typical transfer elements. PID control laws. Seminar: Direct and indirect Laplace transforms. Differential equations solving by means of Laplace transform; Transfer functions for linear, invariant and continuous-time technical-physical systems; Block diagrams. The method of elementary transformation of block diagrams; Computing step and impulse responses; The linear systems stability. Algebraic stability criteria; Nyquist criterion for stability of negative feedback systems; Controller conventional synthesis based on the placement of poles and zeros.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HEAT AND MASS TRANSFER

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire knowledge and skills in knowledge of fundamental heat exchange phenomena and the laws that govern them, experimental modeling of heat transfer, criteria, similarity laws, global transfer of heat exchange, techniques for intensification of heat, flowing fluids with and without changing the aggregation state.
COURSE CONTENTS: Course: Fundamentals about heat transfer. Conduction, convection and thermal radiation. Thermal conductivity; Differential equation of thermal conduction Unidirectional thermal conduction in permanent regime; Experimental modeling of the heat and mass transfer phenomenon, criteria, similarity laws as well as the criteria equations; Elements of thermal convection; Thermal radiation. Fundamental dimensions in thermal radiation. The laws of radiation; Complex heat transfer processes. Global Heat Exchange Rate; methods of intensifying heat transfer processes. Seminar: One-dimensional thermal conduction, permanent, body with flat,

cylindrical, spherical geometry; Two-dimensional thermal conduction in permanent mode; Simple geometry bodies in contact with two fluids; Composite geometry bodies in contact with two fluids. Heat exchange intensification; Thermal convection. Analytical determination of the convective heat exchange coefficient; Thermal radiation. Determination of the radiated heat flow. The influence of screens; Global heat transfer. Laboratory: Laboratory Specific Safety Standards. Presentation of papers; Determination of the thermal conductivity coefficient of the gases; Study of heat transfer through conduction; Study of the heat transfer by forced convection over the pipes and inside the pipes; Study of heat transfer by forced convection in the case of plate heat exchangers; Analyzing the possibilities of intensifying or reducing thermal transfer; Laboratory test - the final assessment of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 1ST SEMESTER

COURSE TITLE: ADMINISTRATION OF ELECTROENERGETIC PROCESSES

COURSE OBJECTIVE(S): It provides students with the knowledge to understand the principles of driving systems used in power plants.
COURSE CONTENTS: Course: Automated driving systems: structure, role, stabilized and transient performance indicators; Automatic adjustment systems; Non-automatic automatic adjustment systems: structure, quasi-continuous adjusting algorithms, direct design of numerical control algorithms; Leadership with the computer of power plants: computer and program requirements, hierarchical systems of integrated power management, computer systems for power systems management; SCADA systems: structure, functions, features of SCADA systems used in the energy field. Laboratory: Transformed z; Reconstruction of signals; Choosing and checking PI regulators; Choosing and checking the PID controllers; Calculation of order-I quasicontinuous regulation algorithms; Calculation of second-order quasi-continuous regulation algorithms; Assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL EQUIPMENT II

COURSE OBJECTIVE(S): The discipline aims at presenting the theoretical bases of electrical equipment operation (continuation of those presented in Part I), the constructive principles of the main equipment classes, the elements of modernity in the development of electrical equipment. The presentation of the equipment construction will be correlated with the main achievements of the prestigious construction companies in the field.
COURSE CONTENTS: Course: Systemic structure of electrical equipment. Basic components. Construction materials.Principles.of constructive solutions; The electric arc. Extinguishing methods and devices; Insulating systems of electrical equipment. Performances. Specific materials; High-voltage circuit breakers. Constructive solutions. The principle of oil switching. Switching principle in SF6. Specific materials and technologies. The SF6 switching. The principle of vacuum switching. Vacuum circuit breaker. Specific materials and technologies. Technical specifications. Criteria of circuit breaker selection; Driving mechanisms; Automatic low-voltage circuit breaker (ex. Oromax, or Moller type); Fuses. Operating. Discrimination. Specific materials and technologies. Technical specifications. Criteria of selection; Surge arreters-clasical and modern constructions. Criteria of selection; Conventional and digital protection systems; Medium voltage metal clad switchgear. Recloser. Criteria of selection; Gas insulated switchgear (SF6 GIS). Laboratory: Experimental study of high voltage distributions along the insulators chain, using a physical model of low voltage; Experimental study of electromagnetic relays (maximum current and minimum voltage); Study of induction disk relay; Experimental study of minimum frequency relay; Experimental study of electromagnetic contactors; Experimental study of electric arc; Experimental study of oil medium voltage circuit breaker; Experimental study of low voltage and high switching power circuit breaker types Oromax and Moller; Experimental fuses characteristics study; Experimental study of medium voltage metal clad switchigear and of surge arreters; Experimental study of directional relay; Final evaluation of students.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: THERMAL EQUIPMENT AND INSTALLATIONS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire specialized knowledge and skills in the structure and operation of energy equipment and installations.
COURSE CONTENTS: Course: Heat transfer based industrial installations. Heat exchangers. Getting, definition, classification. Basic equations of thermal calculation of heat exchangers. Average logarithmic temperature difference. Temperature charts; Calculation of heat exchangers - thermal calculation, hydraulic calculation. Thermal calculation methods. Consideration of deposition effects. Determination of Heat Exchange Characteristics; Heat Transfer Intensification Methods. Optimizing heat exchangers. Thermal Insulation. General. Standard dynamic insulation. Thermal insulation very low temperature; Steam generator. Presentation, energy fuels, characteristic sizes, heat exchange surfaces. Water-steam circuit;

air-combustion gases; Steam turbine. Classification; role; characteristics; yield; Condensation system. Role; characteristics; the thermal balance equation; Heat and mass transfer industrial installations. Fundamental equations of diffusion. Degassing water. Degassing plants. Calculation of thermal degassing; Drying installations. Main parameters of wet air and combustion gases. Constructive types. Calculation of air drying installations; Vaporization installations. Properties of binary solutions. Classification criteria; Thermal balancing of the vaporization system with a body; Heat pumps. Functional role, constructive features: air-water, water-water, soil-water; Ventilation and air conditioning systems. Functional role, constructive features. Seminar: Calculation of the design of a heat exchanger with pipe and jacket. Determining the required heat exchange surface; Calculation of the design of a plate heat exchanger; Thermal energy balance of a steam generator; Preparation of the thermal balance of a condensing installation - water cooler; Calculation of an air conditioning system. Laboratory: Work safety rules. Presentation of papers; 2.Analyzing the thermodynamic performances of a heat exchanger. Determination of the real and theoretical heat exchange global coefficient; compiling and analyzing the energy balance; Analysis of the thermodynamic performance of an air-conditioning system; The actual determination and the theoretical calculation of the combustion system heat losses; Combustion gas analysis; Preparation and analysis of the energy balance of an industrial furnace; Laboratory test - the final assessment of the laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: RELIABILITY

COURSE OBJECTIVE(S): It provides students with the necessary knowledge to understand the aspects of the reliability analysis of the complex systems that make up the power systems and how they collect and process the data needed for this analysis.

COURSE CONTENTS: Course: Findings and relationships of probability calculus and mathematical statistics; General terms used in the safety analysis; Reliability study of non-repairable element systems; Device failure rate; The Markov chain method for analyzing the reliability of irreparable element systems; Reliability Reliability Study. Values of reliability indicators; Reliability study of series and parallel systems made up of repairable parts; Methods of calculating the reliability of complex systems; The matrix method of the equation systems: Method of the general solution for the case of independent elements, Method failure groups, Monte-Carlo, Method of grid defining fault status; Safety in operation - part of the technical-economic methods. Seminar: Reliability of systems series of irreparable elements; Reliability of parallel systems of non-repairable elements; Reliability of series of repairable items; Reliability of parallel systems of repairable items; Analysis of the reliability of complex systems by the general solution method for the case of independent elements; Analysis of the reliability of complex systems by the fault group method; Analysis of the reliability of complex systems using the Monte-Carlo method; Analysis of the reliability of complex systems by means of the defect detection grid method; Determination of reliability indicators for a transformer station.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC DEVICES AND DRIVES I

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of electromechanical converters, very much used in systems engineering applications. The basic equations, their operating characteristics and test methods are presented.

COURSE CONTENTS: Course: General concepts for electric cars; Electric transformer. Constructive elements, operating principle and transformer equations, phasorical diagrams and equivalent schemes. Transformer operating queens: naked, short circuit and load. Parallel coupling and operation of transformers. Operation in non-symmetrical load of transformers; Asynchronous machine. Elements constructive principle and operating regimes. Equations of the asynchronous machine, phasor diagrams and equivalent schemes. Mechanical characteristics, start, speed control and braking of asynchronous motors; Synchronous machine. Constructive elements, principle of operation, equations and phasorical diagrams of synchronous generators. Electromagnetic torque and static angular characteristic. Coupling and parallel operation of synchronous generators. Synchronous motors: equations, operating characteristics and starting methods; DC machine.Constructive components, Generator c.c. derivation. Cc motors: mechanical characteristics, starting, adjusting speed and braking. Laboratory: Study of three-phase electric transformers: schemes and groups of connections; Coupling and parallel operation of three-phase transformers; Adjusting the speed of asynchronous motors by the rheostatic method; Start-up and V-sync features of the synchronous engine; Coupling and parallel operation of synchronous generators; Study of the c.c. with derivative excitation; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ORGANIZATION AND REGULATION IN ENERGY

COURSE OBJECTIVE(S): The Course on Organizing and Regulation in Energy contributes to the formation of future electro-energetic engineers, familiarizing them with the main theoretical,

legislative and practical aspects related to the composition, characteristics, functioning of the energy system, thermoenergetics, etc.
COURSE CONTENTS: Course: Organization of the energy system; Organization of the power system; Organizing the thermo energy system; Electricity Law, Law 13/2007, completed and amended by GEO 33/2007 and GEO 172/2008; Considerations on the national energy system and the evolution of the electricity market; The Law on Thermal Energy 325 / 14.07.2006; Law 199/2000 on the efficient use of energy (republished); Law no. 372/2005 on the energy performance of buildings; GEO no. 18/2009 on increasing the energy performance of housing blocks published in the Official Gazette, no. 155/12 March 2009; Guide for the producer of electricity from renewable energy sources; Policies and Directives of the European Union on the Use of Renewable Energy Resources; Production and consumption of electricity in the world. Seminar: Calculating the price of electric and thermal energy. Pricing. Pricing policy, price types. Prices under free market conditions. Prices and tariffs; Calculation methodology necessary to establish regulated prices and tariffs; Methodology of January 21, 2010, establishing and adjusting the prices for electricity and heat produced and delivered from cogeneration plants benefiting from the support scheme, respectively the bonus for high efficiency cogeneration; The power balance of a pump; Determining the energy performance of a building; Calculating the efficiency of renewable energy sources; Calculation of synthetic indicators of energy equipment operation
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SENSORS AND TRANSDUCERS

COURSE OBJECTIVE(S): Formation of future power engineering engineers, familiarizing them with the main theoretical and practical aspects related to the use of sensors and transducers for the measurement of non-electrical quantities occurring in energy processes.
COURSE CONTENTS: Course: The measurement process; Sensors and transducers; Temperature measurement - General notions. Means of temperature measurement. Temperature transducers with reservoir (thermometric). Manometric thermometers; Thermometers with resistance - thermal resistances. Thermoelectric transducers (thermocouples). Non-contact temperature transducers - radiation pyrometers; Pressure measurement U - tube apparatus. Tank apparatus. Apparatus with inclined tube (micromanometers); Elastic tube devices (with Bourdon tube). Devices for the measurement of pressure by electrical methods (capacitive, piezoelectric); Flow measurement. Diaphragms. Venturi tube. Rotametric methods; Ultrasonic flowmeters. Electromagnetic flow transducers; Level measurement; Speed measurement. Tahogenerators of c.c. and c. a. Speed transducers with photoelectric elements; Measurement of movement. Use of resistive, capacitive, inductive sensors; Proximity transducers. Laboratory: Units of measurement; Measurement of temperature and pressure (experimental determinations and calculations); Testo 350/454 gas analyzer; Measurement of flow using ultrasonic transducer and rotameter; Skywatch Geos N °11.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 2ND SEMESTER

COURSE TITLE: DATA ACQUISITION AND MONITORING IN ENERGY

COURSE OBJECTIVE(S): It contributes to the formation of future energy engineers, familiarizing them with the main theoretical and practical aspects related to the composition, operation and exploitation of data acquisition and monitoring systems in the energy sector. The activity is aimed at acquiring specialized knowledge / skills regarding the structure and functioning of purchasing and monitoring systems in the energy sector, the interface with the energy process, information and communication support systems, SCADA systems.
COURSE CONTENTS: Course: Introduction to data acquisition and monitoring in power plants / energy instalation; Types of data acquisition systems; The architecture of data acquisition systems; acquisition systems with one channel or multichannel; Signal multiplexing; analog and numerical multiplexers; Interface with the tehnological energy process; basic components of the interface modules; Sampling / storage circuits; Communication interfaces (RS 232, RS 485,USB); SCADA (Supervisory Control And Data Aquisition): Functions, Architecture, Components. Dedicated SCADA systems; Terminal equipment for data acquisition and management of the RTU (Remote Terminal Unit) and MTU (Master Terminal Unit); Monitoring by RTU and MTU Terminal Equipment within Energy Monitoring and Driving Systems. Examples; Information communication support; Dedicated procurement systems. Monitoring the consumption of electricity and compressed air. Principles and equipment used in this respect; Introduction to the Lab View programming environment - for data acquisition systems. Laboratory: Work safety rules. Presentation of the laboratory; Surveillance and control of some electrical and non-electric parameters for an energy installation; Portable monitoring and data acquisition equipment used in power engineering. Software processing of purchased data. Applications; Complex systems for acquisition and monitoring of energy installations - Simulator SCADA RESY - NES by AUTOMATION X.

Simulations – applications; Complex system for data acquisition and monitoring of electricity consumption; Monitoring and acquisition of data for a compressed air production, transport and distribution system; General notions about the Lab View programming environment. Dedicated acquisition system: NI - Temperature monitoring; Laboratory colloquium.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC DRIVES

COURSE OBJECTIVE(S): Acquiring basic notions about electric drives using power electronics.
COURSE CONTENTS: Course: Elements of electric drives; Mast. with separate excitation; Mast Drive Systems and static converters; Drives with three-phase asynchronous motors; Drive systems with three - phase asynchronous motors and Static converters; Choice and testing of electric motors. Laboratory: Work safety rules. Presentation of the laboratory; The M.c.c drive study with separate engine excitement; The M.c.c drive study with separate braking excitation; The study of driving with M.A. with the rotor in short-circuit in engine mode; The study of driving with M.A. with the rotor wound in engine mode; The study of driving with M.A. with the rotor wound in brake mode; Study of the drive system with M c.c. and rectifier ordered; Study of the drive system with M c.c. and V.T.C; Cascade-driven accelerator motor with unassembled rectifier and DC machine; Drive system study with M.A. and Frequency Modulation Voltage Inverter; Drive system study with M.A. and PWM Modulation Inverter (ALTIVAR); Drive system study with M.A. and voltage inverter with sinusoidal modulation; Drive system study with M.A. and the vectorial modulation tensiunecu inverter; The final lab test
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENERGY AND ENVIRONMENT

COURSE OBJECTIVE(S): Presenting the interaction between energy production methods and equipment and the elements of the environment.
COURSE CONTENTS: Course: Energy - environment. General; The impact of fuels on the environment; Air pollution - limiting solutions; Power stations - sources of pollution; The impact of nuclear energy use on the environment; Sound pollution; Air pollution caused by particles; Greenhouse effect and global warming; Prevention of pollution; Environmental impact assessment; Future energy-environment trends; Environmental management systems according to ISO 14001; Internal environmental audit for the implementation of environmental management systems; Environmental policy. Seminar: Calculation of environmental impact at an energy capacity: Electromagnetic pollution of the environment; The environment is at the level of the 4 SV Oltenia region; Presentation of environmental audit activities; Environmental impact assessment; Internal environmental audit report at S.C. Turceni Energetic Complex S.A.; Implementation of environmental management system
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HYDRAULIC MACHINES

COURSE OBJECTIVE(S): It contributes to the training of future power engineering specialists, familiarizing them with the main theoretical and practical aspects related to the construction, characteristics and operation of hydraulic machines.
COURSE CONTENTS: Course: Rotodynamic machines theory. Classification and energy parameters of hydraulic machines. The fundamental equation of the rotodynamic machines. The theoretical rotor model with an infinite number of blades; The similarity of the rotodynamic machines. Determination of similarity relationships. Unit sizes. Specific speed and characteristic speed; Centrifugal pumps. Axial pumps; Fans. Centrifugal fans. Axial fans; Hydraulic turbines. Getting Hydroenergetics. Pelton, Francis, Kaplan and bulb turbines. Calculation of the main parameters. Operating and adjustment features; Volumetric pumps. Piston pumps, simple and double effect. Radial pumps. Pumps with axial pistons. Other types of volumetric pumps; Hydraulic transformers; Hydraulic drives. Generators and hydrostatic motors. Hydrostatic control and distribution. Seminar: Applications to the similarity of rotodynamic machines; Applications to centrifugal pumps; Applications to fan calculators; Applications for the calculation of hydraulic turbines; Applications in the calculation of piston pumps, simple and double effect; Applications for calculating pumps with radial and axial pistons and gear pumps; Applications for the calculation of hydraulic drives. Laboratory: Selecting pumps, using the WILO catalog and the WILO Select program; Experimental determination of the energy characteristics of a centrifugal pump; Experimental determination of the energy characteristics of a series assembly of two centrifugal pumps; Experimental determination of the energy characteristics of a parallel assembly of two centrifugal pumps; Analysis of the risks of operation in parallel to centrifugal pumps; Experimental determination of the energy characteristics of an axial fan; Experimental determination of the energy characteristics of a parallel assembly of two axial fans; Experimental determination of the energy characteristics of a centrifugal fan; Experimental determination of the energy characteristics of a gear pump; Experimental determination of the energy characteristics of a hydraulic linear motor drive; Experimental determination of the energy characteristics of a pump-hydropower assembly;

Determination of the performance of pressure control elements used in hydraulic circuits; Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNICAL MATERIALS

COURSE OBJECTIVE(S): Learning outcomes of the course unit. Students acquire basic knowledge necessary to acquire skills in understanding and explaining chemical, physical, electrical and mechanical phenomena related to electrotechnical materials. Getting started with the application of electrotechnical materials to the electrotechnical and energy industry.

COURSE CONTENTS: Course: Introduction. Theoretical and practical importance of studying the properties of electrotechnical materials and their use in the electrotechnical, electronics, energy, etc. Industries; Structure of electrotechnical materials. Electronic structure of the atom. The effects of crystalline networks. Technical and technological properties of electrotechnical materials; Electrical conduction. Electric conduction in conductive, semiconductor and insulating materials. Superconductivity; Insulation of materials (solid, liquid, gaseous); Electrical polarization. Types of polarization. Dielectric gratings; Magnetization. General magnetic properties. Ferromagnetism. Iron losses; Industrial uses of electrotechnical materials. Laboratory: PM training and emergency situations. Presentation of the laboratory's electrical installation. Working in teams; Analysis of crystalline structures; Roentgen structural analysis of materials; Computation of roentgenogram Debye-Scherrer; Non-destructive methods for analysis of electrotechnical materials; Determination of dielectric rigidity of solid electro-insulating materials; Study of electrical characteristics of brushes of electrical machines; Determination of volume and surface resistivity in solid materials; Determination of capacitance, permittivity and loss factor of solid and liquid dielectric materials; Grapho-analytical determination of permeability variation in the core of a magnetic amplifier; Determination of characteristics of magnetic materials with the Ferrotester; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL AND THERMAL ENERGY GENERATION

COURSE OBJECTIVE(S): Students will aquire basic knowledge regarding both electrical and thermal energy generation, and also the development of skills specific to the energy field.

COURSE CONTENTS: Course: Centralised energy generation. Introduction; Steam turbine power plants. Methods to increase the efficiency of the electrical energy generation; Steam turbine combined heat and power plants. Cogeneration efficiency; Internal combustion engines CHP plants. 5. Schemes, operation regimes; Advantages of distributed energy generaron; Gas turbine power plants. Methods to increase the efficiency; Combined cycle power plants; Wind turbines; Hydro power plants energy generation; Nuclear power plants energy generation. Seminar: Steam turbine power plants. Methods to increase the efficiency; Gas turbine power plants. Methods to increase the efficiency; Combined cycle power plants; Internal combustion engines power plants; Nuclear power plants.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER NETWORKS I

COURSE OBJECTIVE(S): It contributes to the formation of future power engineers, familiarizing them with the main theoretical and practical aspects related to the structure, characteristics, operation and operation of the electrical networks.

COURSE CONTENTS: Course: Power networks - introductory notions; Electrical parameters and equivalent schemes of network elements; Topological and matrix methods for the study of electrical networks; Three-phase power networks in symmetrical operation; Three-phase electrical networks in unsymmetrical operation; Energy and power losses in power networks; Analysis of permanent operation of distribution networks. Seminar: Calculation of state quantities in AC circuits Phasoral diagrams; Calculus of power in AC circuits; Calculus of the parameters of power transformers with two and three windings; Calculus of electrical line parameters; Incidence matrices and parameter matrices. Topological and parametric equations; Calculus of the nodal admittance matrix for a network configuration; Load flow in a distribution network. Laboratory: Study of the operation of the power lines (Leyboldt platform); Study of the functioning of the transformers (platform Leyboldt); Study of neutral treatment in power networks.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ELECTRICAL SAFETY IN ENERGY FACILITIES

COURSE OBJECTIVE(S): The course forms the engineers of electro-energetic profile, familiarizing them with the main theoretical and practical aspects related to the composition and functioning of the main equipment and electro-security installations. The activity aims at acquiring knowledge / competences regarding the phenomena characteristic of electric current passing through the electro-biological / earth conductors, the neutral treatment systems in electrical installations and the methods for protection against dangerous phenomena.

COURSE CONTENTS: Course: Introduction: elements of legislation on electrosecurity, risk factors; Phenomena characteristic of the passage of electric current through the earth; Effects of electric current flow through electrobiological conductors (living organisms); Neutral treatment systems in electrical installations; Analysis of defective electrical networks. Calculation of touch voltages and currents through humans; Dimensioning of earthing devices. Calculation of Earth Inlets. Verification of the thermal stability of the earth plugs; Selection and coordination of insulation; Methods of protection against dangerous touching tensions; Overvoltage protection; Hypotheses and cases of electric shock accidents; First aid in case of electric shock. General rules. Removing power from the accident; Economic Implications of Events (Accidents / Electric Shocks) in Energy Installations. Seminar: Calculation of currents passing through electrobiological conductors. Hypotheses; Calculation of fault currents. Calculation of touch and pitch voltages; Dimensioning of earthing devices. Choice and verification; Null connectors for electrical receivers; Calculating the technical implications of an accident by electrocution; Economic calculation of events (accidents) within energy installations. Laboratory: Labor protection rules in the laboratory; General notions about electrosecurity. Means of protection in the field of electro-security; Measuring the dispersion resistance of a grounding plug. Measurement of soil resistivity. Application; Methods of isolation and earthing of an electrical line (RESY - NES Simulator); Measurement of insulation resistance. Applications; Simulator for the Study of Dangerous Touch Voltages. Simulations; Checking the RCD type protection equipment; Laboratory colloquium.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.
COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties: Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools; application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging

opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics: Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.

LANGUAGE OF INSTRUCTION: English

COURSE TITLE: ELECTRICAL INSTALATION OF POWER PLANTS AND STATIONS

COURSE OBJECTIVE(S): The course familiarises future engineers with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of the electrical installations of the plants and stations. The activity aims to acquire specialized knowledge / competencies regarding the structure / operation of the electrical installations of the power plants and stations: power supply systems for the internal services of power stations and stations, selection and verification of electrical equipment.

COURSE CONTENTS: Course: General considerations regarding the electrical side of power plants and stations. Internal food supply systems; Working environments. General notions. Classification; Electrical schemes. General notions. Classification. Typical schemes; Schemes of transformer power stations and interconnections. Electrical network diagrams. Maneuvers and bottlenecks; Transformation posts. General notions. Sizing of transformation stations. Scheme. Transformer power sizing criteria; Dimensioning the section of the electrical conductors. Criteria for choice and verification; Parameters of electrical installations: generators, lines, transformers, motors, coils, capacitors; Treating the neutral. General notions. Methods of treatment; Calculation of short-circuit currents. General notions. Hypotheses and methods for calculating short-circuit currents; Selection and verification of primary voltage electrical equipment; Choice and testing of electrical switchgear, low-voltage measurement and protection; The power factor. Improvement methods; Electricity crashes. Reduction methods. Laboratory: Labor protection rules in the laboratory; Classic applications for maneuvers in electrical stations; Dedicated application for maneuvers – simulator; Power factor study; Types of electric cells. Symbolization of electrical equipment and cells; Special electrical installations and intelligent protection systems; Schemes of electrical stations. Electrical equipment (symbols, features); Materials used for bar systems. Types; Installation drawings for transformer panels; Electrical conductors. Choosing and checking the conductor section. Application; DC systems (battery packs, charging sources); Actuators and controls; Distributed control and control system for electrical installations; Schemes and notations for secondary circuits; Laboratory test. Project: Explanation of the project theme. Calculating the parameters for the equipment in the scheme for each student / group of students; Dimensioning and selection of transformers from the transformer station and the distribution station; Calculation of the section of conductors for the electrical lines in the diagram; Calculation of short-circuit currents at indicated points; Selection and verification of the switching and measuring equipment for the distribution station and the transformer station; Dimensioning of the reactive power compensation device; Supporting, verifying and marking the project.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): The discipline contributes to the formation of the future power engineering engineers, familiarizing them with the main, theoretical and practical aspects, related to the composition, characteristics, operation and operation of the main equipment and thermal

installations, at source level as well as at the level of transport, consumption.
COURSE CONTENTS: Course: The structure of the district heating, production, transport, distribution; Comfort of buildings; Thermotechnics for buildings; Methods of assessing the heat demand for heating and hot water consumption; Heat supply sources; Thermal points; Adjustment of the system and the heat and hot water supply systems; Energy audit. Seminar: Determination of thermal comfort parameters in enclosures; Determining the heat demand for heating a building, using the thermal characteristics of the building and the method on the outside contour of the building; Determining the heat demand for heating a building by the global thermal insulation coefficient method; Assessing the heat demand for DHW preparation; Dimensioning of heat exchangers for heating and hot water consumption; Determination of hydraulic losses on the thermal energy supply pipes of buildings; Calculation of sizing of thermal equipment: circulation pumps, expansion vessels; Laboratory: Introduction to heat transfer (Thermal) by conduction and convection, for homogeneous, non-homogeneous flat walls and cylindrical walls; Heat transfer by conduction for homogeneous and non-homogeneous flat walls; Heat transfer by conduction for cylindrical walls; Heat transfer by convection for flat and cylindrical walls; Variation of heat and temperature losses inside a flat wall; Calculation of heat demand for heating a building - SR 1907/1997.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER-BASED DESIGN OF POWER SYSTEMS
COURSE OBJECTIVE(S): It contributes to the formation of the future power engineers, by familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of the power systems and assuring the development of their assisted design skills with the help of specialized software packages for the modeling, simulation and analysis of power systems.
COURSE CONTENTS: Course: Current software packages used for modeling, simulation and analysis of power systems; Mathematical models, electrical parameters and equivalent schemes of components of power systems; Analysis of permanent operation of the electrical networks. Direct methods. Iterative methods; Mathematical model and short circuit calculation. Matrix method; Synthesis of electrical networks; The general theory of optimisation of complex systems; Economic operation of the power systems. Project: Computer-based modeling and simulation of the permanent regime operation of a HV benchmark power network – software packages Paladin DesignBase / ELCAD.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC PROTECTIONS I
COURSE OBJECTIVE(S): It provides the students with the necessary knowledge to understand the aspects related to the characteristics of the emergency regimes, the structure and the principle of operation of the electrical protection installations, as well as the way of realization, regulation and exploitation of the protection systems related to the electric generators.
COURSE CONTENTS: Course: The role and structure of a system of protection, requirements, basic, backup and auxiliary protection; Equipment used in protective systems: relays, transformers, filters; Abnormal defects and abnormalities in power systems: three-phase short-circuit, non-symmetrical short-circuit analysis by symmetrical component method, comparison of fault currents, short-circuit impedance calculation, transformer influence on unbalanced short circuits, abnormal modes; Types of protection and methods of ensuring selectivity; Protection of synchronous generators. Laboratory: Elaborate the equivalent scheme for calculating the symmetric three-phase short-circuit current and determine the equivalent positive impedance impedance; Calculate the equivalent negative impedance impedance; Calculate the equivalent zero sequence impedance; Calculation of single-phase short-circuit current; Calculation of isolated short-circuit current; Calculation of short-circuit current with earthing. Laboratory: Verification of current measuring transformers; Verification of voltage measuring transformers; Study of operation and regulation of current and voltage relays; Function study and differential relay adjustment; Protection of low-power electric generators; Assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER NETWORKS II
COURSE OBJECTIVE(S): The discipline aims at familiarizing students with the modeling of electrical networks and numerical simulation of their operating modes (permanent and short-circuit) with tools developed by students or dedicated software programs.
COURSE CONTENTS: Course: Electric line models. Calculation of electrical line parameters; Electrical transformer models. Calculation of parameters of electric transformers with two and three windings and respectively with load regulation; Global network models. Network representation based on the nodal admittance matrix. Construction of the nodal admittance matrix; Formulation of the problem of calculating power flows. Identifying relationships that express the dependence of nodal powers on nodal state sizes. Types of nodes (PU, PQ, balance). Models with concentrated and

distributed balance node respectively; Presentation of calculation methods of power circuits in electric networks. Own and / or degenerate solutions and identification of their attraction areas; Calculation of power flows in extended electric networks by Gauss and Gauss-Seidel methods. Solutions to accelerate convergence; Calculation of Power Circuits in Newton-Raphson-Extracted Electricity Networks: Full, Unplugged, Quickly Disconnected; Approximate calculation of power flows in electrical networks. "Cc method"; Calculation of losses in extended electrical networks; Calculation of sensitivities of transitions on sides at nodal injections. Matrix of sensitivity of sides-nodes; Powerful modeling of long power lines. Natural power, characteristic impedance, electrical length of lines; Modeling the operation of long electric outlines and natural load; Operation of long lines with equal tensions at the ends. Compensation of long lines; Calculation of short-circuit currents and short-circuit nodal voltages. Laboratory: Modeling power lines; Modeling transformers; Construction of the nodal admittance matrix; Calculation of Power Circuits in Electrical Networks by Gauss and Gauss-Seidel. Accelerate convergence; Calculation of Power Circuits in Electrical Networks Newton-Raphson methods: complete, unplugged, fast disconnected; Deletion of power flows in electrical networks by "cc method"; Calculation of losses in extended electrical networks; Calculation of sensitivities of transitions on sides at nodal injections. Matrix of sensitivity of sides-nodes; Determination of the natural power, the characteristic impedance and the electrical length of the lines; Simulation of the operation of long electric outlets and natural load; Operation of long lines with equal tensions at the ends. Compensation of long lines; Calculation of short-circuit currents and short-circuit nodal voltages.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER NETWORKS II - PROJECT

COURSE OBJECTIVE(S): The discipline aims at familiarizing students with the modeling of electrical networks and numerical simulation of their operating modes (permanent and short-circuit) with tools developed by students or dedicated software programs.
COURSE CONTENTS: Determining the LEA sequence parameters; Determination of transformer sequence parameters; Calculation of power flow; Determination of total network losses; Identify a solution for 5% reduction of transit through a line or transformer (at your choice); Identifying a solution for 2% change of voltage in a consumer node (optional); Studying the voltage regime on an electric line (starting from an autoprocessing scenario for the evolution of the network load); Analysis of the opportunity to offset an electrical line (starting from a self-propelled scenario for network load evolution); Calculation of currents and short-circuits in the nodes of the network and in the middle of the lines; Formulating proposals to improve network performance.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 2ND SEMESTER

COURSE TITLE: ANALYSIS AND ENGINEERING OF VALUES

COURSE OBJECTIVE(S It contributes to the formation of future electro-energetic engineers, familiarizing them with the main theoretical, legislative and practical aspects related to the composition, characteristics, and method of value engineering analysis.
COURSE CONTENTS: Course: Theoretical Fundamentals of Value Engineering; Methodology for applying value engineering to products; Analysis of social need; Analysis and evaluation of the existing situation; Conceiving or reconstituting the product; Approval of the optimal solution; Making and controlling the approved solution. Seminar: Practical appraisals of the objectives pursued in the value engineering study; Practical implementation of the stage: preparatory measures; Practical implementation of the stage: analysis of the social need; Practical implementation of the stage: analysis and evaluation of the existing situation; Practical implementation of the step: designing or reconstituting the product; Practical implementation of the stage: approving the optimal solution; Practical implementation of the stage: achievement and control of the approved solution.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER QUALITY

COURSE OBJECTIVE(S): The course contributes to the formation of the future power engineers, acquainting them with the main theoretical, practical and legislative aspects related to the problems of the power quality occurring in the operation of the electrical networks.
COURSE CONTENTS: Course: Electromagnetic disturbances in power systems. Types of disturbances. Causes and Effects. Means of detection and mitigation measures; Power quality parameters. Frequency deviations. Surge. Slow voltage variations. Voltage gaps. Short and long interruptions. Harmonics. Voltage fluctuations. Unbalances; Regulations on the power quality in power systems. European Standard EN 50160. UNIPEDE Standard. IEC Standards. National regulations; Harmonics and interharmonics. Sources of distortion. Effects of non-sinusoidal systems in electrical networks. Indicators of the non-sinusoidal regime. Systems for measuring the level of harmonic disturbances. Harmonics mitigation. Assigning the level of disturbance. Harmonic impedance; Non-symmetric electrical networks.

Causes of voltage unbalance in electrical networks. Effects of non-symmetrical patterns in electrical networks. Indicators on voltage and current unbalance. Measurement of asymmetry. Equivalent patterns in symmetric components of network elements. Experimental determination of the parameters corresponding to the symmetrical sequences for an electrical network. Asymmetry mitigation. Equipment for load symmetrization; Variations in supply voltage. Voltage measuring. Voltage regulation in electrical networks. Admissible limits of voltage variations. Variation of power load with supply voltage; Goals and interruptions. Indicators for the evaluation of voltage gaps. Means of limitation of voltage gaps and short-term interruptions. Indicators for assessing long-term interruptions. Means for limiting damage due to long-term interruptions; Overvoltages. evaluation. Use of special curves (CBEMA, ITIC); Fluctuations of voltage (flicker). Indicators. Evaluate the flicker level. Flicker mitigation. Laboratory: Analysis of the harmonics produced by metal vapor discharge light sources; Study of the influence of the three-phase transformer connection group, respectively of the rectifier type used (star or bridge) on the rank of the harmonics introduced in the network; Study of load current symmetrization equipment; Harmonic propagation analysis in a network modeled using the Paladin DesignBase program; Design of harmonic filters assisted by the Paladin DesignBase subroutines.

ANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties: Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools; application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer

components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics: Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: ELECTRIC PROTECTIONS I

COURSE OBJECTIVE(S): Transmit students to knowledge of the understanding of the issues related to how to achieve, regulate and exploit the protection systems related to the regulation of the electricity and energy systems and the principles for the realization, parameterization and use of the numerical protection systems.
COURSE CONTENTS: Course: Protection of collector bar systems; Protection of transformers and autotransformers; Protection of power lines; Protection of medium voltage motors; Numerical protection systems; Principles for the processing of the magnetoelectricity and the numerical protection systems. Laboratory: Maximum current protection of transformers; Transformer current cut-off; Differential protection of power transformers; Securing currents of radial power lines; Maximum current protection of radial power lines; Distance protection; Protection of medium voltage motors; Study about complex surveys; Parameterization of numerical relays; Assessment of laboratory activity. Project: Presentation of the project theme; Calculation of short-circuit currents; Calculation of current protections; Calculation of differential protection; Calculation of sensitivity coefficients; Checking the selectivity of the protection system; Project support and final grade.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROENERGETIC SYSTEMS

COURSE OBJECTIVE(S): The discipline aims at familiarizing students with dispatching of power systems and with the main technological system services.
COURSE CONTENTS: Course: The problem of representation by system equivalents. Passive System Equivalents (Newton, Kron); Active System Equivalents - Ward Equivalents. Taking into account the voltage regulation of neighboring systems - the extended Ward equivalences. Dimo-REI equivalents; Contingency analysis. Simulation methods; Calculation of nodes-lag distribution factors and calculation of cross-fertilization factors between the sides; Analysis of contingencies by the distribution factor method and by the adjustment method, respectively; Criterion N-1. Selection and filtering of contingencies. Security analysis; Voltage regulation in electrical networks. Voltage drops. The importance of tuning. Impact on loss and transport capacity; Centralized voltage regulation. Calculation of sensitivity of nodal stresses to RAT recording values, reactive power injections and TRS socket switching; Primary frequency setting in power systems. Astatic adjustment. Static adjustment in isolated systems and interconnected systems; Secondary frequency control in isolated systems. Frequency-power setting in synchronous interconnection systems. The AGC function. Zonal error signals. Setting limits. Tertiary frequency adjustment. Reservoirs for slow and fast tertiary adjustment; Optimal dispatching of production in power systems. Theoretical Formulation; Optimal dispatching of production in power systems. Loss Considerations. Merit list with and without considering network restrictions. Seminar: Passive system equivalences. Newton equivalences. Ward equivalences; Active System Equivalents. Equivalents Ward, Ward extended, Dimo-REI; Contingency analysis. Simulation methods. Calculation of nodes-sides distribution factors and determination of cross-fertilization factors between the sides; Voltage regulation: Calculation of nodal stress sensations at RAT voltage voltages, reactive power injections and TRS socket switching, respectively; Primary frequency control in isolated systems. Astatic adjustment. Static adjustment. Influence of dead band and ramp. Primary frequency setting in interconnected systems; Secondary frequency control in isolated systems. Frequency-power adjustment in synchronous interconnected systems.

The AGC function. Tertiary frequency control at the dispatcher's control; Optimal dispatching of production in power systems. Laboratory: System equivalences: passive equivalents and equivalents; Contingency analysis. Determination of PTDF factors. Checking the N-1 criterion; Centralized voltage control: The numerical simulation of nodal stress sensations at the RAT recording voltages, reactive power injections and TRS socket switching; Primary frequency control in isolated systems. Astatic adjustment. Static adjustment. Influence of dead band and ramp. Primary frequency setting in interconnected systems; Secondary frequency control in isolated systems. Frequency-power adjustment in synchronous interconnected systems. The AGC function. Tertiary frequency control at the dispatcher's control; Optimal dispatching of production in power systems. Modeling and introducing cost features; Optimal Dispatch with and without Loss Considerations
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HIGH VOLTAGE ENGINEERING

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the basic concepts of physical discharge and high voltage equipment and installations.
COURSE CONTENTS: Course: Introduction; Atmospheric overvoltages; Internal overvoltages; Coordination of insulation; Electrical insulation at high and very high voltage; High Voltage Test Methods and Installations. Laboratory: Measuring high voltages with the spherical spline; Study of unbalanced electric field discharge, weakly uneven and strongly uneven, at continuous voltage; The study of unbalanced electric field discharge, weakly uneven and strongly uneven, at alternating voltage; Study of dielectric screens; High voltage alternative industrial frequency test; Test for voltage pulse; Study of the distribution of high stresses on insulating chains.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: AEROSPACE ENGINEERING
PROGRAMME TITLE: AVIATION SYSTEMS AND EQUIPMENT
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: LINEAR ALGEBRA AND ANALYTICAL AND DIFFERENTIAL GEOMETRY

COURSE OBJECTIVE(S): Acquire by students of knowledge of theoretical background of linear algebra and analytical geometry, as well as skills training in the use of dedicated computing techniques.

COURSE CONTENTS: Vector spaces; Linear applications; Bilinear forms; Euclidean spaces; Euclidean spaces: Cases E2 and E3; Analytical geometry of space E3; Quadric surfaces. Quadric curves (recapitulation from high school).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MATHEMATICAL ANALYSIS I

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.

COURSE CONTENTS: Course: Elements of multimillion theory (multitudes, functions). Space Rn; Strings and vector vectors in Rn; Continuous functions of several real variables; Different functions and applications at the extremes of functions; Default functions and applications; Applications on curves and surfaces; Power series; Fourier series. Seminar: Exercises for mathematical analysis - recapitulation of the notion of string limit and properties fixed in high school; Exercises with strings and vector vectors in Rn; Exercises with continuous functions of several real variables; Exercises with differentiable functions and applications at extremes of functions; Exercises with default functions and applications; Applications on curves and surfaces; Exercises with series of powers; Exercises with Fourier series.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: CHEMISTRY

COURSE OBJECTIVE(S): Acquisition of fundamental notions and dimensions of chemistry, explanation and understanding of the principles that control the reactivity of chemical elements and combinations. Structure and substance properties, notions of thermochemistry, chemical kinetics, notions of electrochemistry and electrochemical conversion of energy; corrosion and corrosion protection methods, materials used in the electrotechnical industry.

COURSE CONTENTS: Course: Periodic system and structure of electronic envelopes. Structure of molecules. Properties of substances; Chemical bonds: ionic bonding; the covalent bond; metal bond (electron gas theory, energy band theory, valence bond theory); Characteristic properties of metals (optical, physico-mechanical and chemical). The ability of metals to form alloys; Representative types of alloys. Amalgams; Electrochemistry and electrochemical conversion of energy (potential of electrode, electrical cells, electrolysis, electrochemical conversion of energy); Corrosion and corrosion protection (chemical corrosion, electrochemical corrosion, methods of metal protection against corrosion); Macromolecular compounds (structure, classification, properties, types of polymers used in electrotechnics). Laboratory: Labor protection rules in the chemistry laboratory and presentation of laboratory work; Protection of metallic surfaces against corrosion by copper; Determination of Diesel fuel index; Determining the viscosity of a lubricant with the Engler viscometer; Determination of metal corrosion rate; Analysis of alloys by electrographic method.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GENERAL ECONOMY

COURSE OBJECTIVE(S): The general economy course contributes to the formation of future electrical engineers, familiarizing them with the main theoretical, legislative and practical aspects related to the composition and functioning of an economy as a whole.

COURSE CONTENTS: Economy; Economy market; Factors of production; Productivity of production factors; Cost and Profitability; Fundamental Income; Main macroeconomic indicators; Economic indicators of investment projects; Cost issues for the decision-making process; The technique of updating money.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION

COURSE OBJECTIVE(S): Acquiring the theoretical, practical and methodological skills of practicing physical exercise in an organized or independent manner in order to acquire a healthy lifestyle.

COURSE CONTENTS: Gymnastics: basic exercises, aerobic gymnastics; Application paths combined with running, jumps, equilibrium exercises, escalation, climbing skills, etc; Main sports skills of football game (boys), basketball (girls); Bilateral games under similar competition conditions; Evaluation tests.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED GRAPHICS I

COURSE OBJECTIVE(S): Familiarizing students with the principles and methods of conventional representation of forms, drawing/ computer aided design of parts, subassemblies and assemblies. Student preparation for the use of specific computer-aided design software in their specific technical field, as well as for the processing of diagrams, graphics and other graphic representations in electronic form and their embedding into other types of documents.

COURSE CONTENTS: Course: Technical drawing and descriptive geometry. Lines used in engineering graphics. Representation of the point and the straight line in double and triple orthogonal projection. Elevational representation; The representation of straight lines and of particular straight lines. Representation of planes and particular planes. Intersections. Representation of geometric bodies; Descriptive geometry methods. Rotation method. The method of projection plane changes. The rebate method. Lifting method; Formats used in engineering graphics. Dimensions and orientation of formats. The indicator and the table of components; Representation of views and sections in the technical drawing. Rules of representation and layout. Drawing and drafting of sketches. Dimensioning and writing of drawings; Aggregate drawing. Rules of representation, positioning of elements, layout and completion of the table of components; Representation of assemblies and gears. Threaded assemblies, rivet assemblies. Representation of cogwheels and gears. Seminar: Representation of the point and the straight line in double orthogonal projection and in triple ortogonal projection; Representation of the plan. Line-plane intersections, particular straight lines of the plane, parallel lines and perpendicular to the plane lines; The method of projection planes changing , the rotation method, the rebate of the point, of the straight line, of the plan, of flat figures. Body representation and intersections; Representing of views and sections of items. Rules of representation; Drawing a sketch and drawing at the appropriate scale. Dimensioning and writing; Aggregate drawing. Representation and positioning of component parts, completion of the table of components. Laboratory: Drawing the format frame. Draw and fill the indicator; Lines used in engineering graphics. "Line Game"; Drawing up the sketch with a graphic editing dedicated software; Three-views representation of an item, after physical model and/ or after axonometric graphical model; Threaded item representation; Aggregate drawing after physical model; Threaded assemblies and riveting assemblies representations.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTRODUCTION TO AEROSPACE ENGINEERING

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers familiar with aeronautical and aeronautical language to provide students with the information they need to understand how to think about designing and operating a flight instrument.

COURSE CONTENTS: Course: Classification of air and space vehicles: Balloons, gliders, planes, helicopters, satellites and missiles; Design regulations and instruments: National and international regulations, classical design, computers and programs, aerodynamic tunnels, flight tests; Aircraft components and controls: Fuselage wing, amplitudes, landing gear, throttle handle, engine control; Structure of the wing strength: Structure of the beam with blades, long-haired, flat, ribbed, envelope, integrated structures; Structure of fuselage resistance: Coca, monocoque, semimonococcus, cadre, lyses, longhairs, integrated structures; Structure of fuselage resistance: Coca, monocoque, semimonococcus, cadre, lyses, longhairs, integrated structuress. Seminar: Presentation of various configurations of gliders, planes, missiles; National and international regulations, units of measurement used in aviation; Presentation of component parts of airplanes; Presentation of instrumentation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instill in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.

COURSE CONTENTS: Unit 1. An introduction into Engineering: Vocabulary: Branches of Engineering, Sciences and Tools characteristic to each field; Grammar: Nouns – Articles; Demonstratives - Pronouns - Possessives – Quantifiers; Reading: the most important historic events and inventions in the fields of Engineering; Listening: listening to job descriptions and requirements in Engineering; Speaking: describing pros and cons of using new technologies in different fields of Engineering; Writing: the importance of technology in modern society. Unit 2. Materials and properties: Vocabulary: Types of materials: qualities, costs and properties, Metal processes; Grammar: Present Simple and Present Continuous; Reading: properties of materials; basic metal processes; Listening: descriptions of materials and metal processes; Speaking: exchanging information about the qualities of materials; Writing: a summary of the main types of materials. Unit 3. Technical drawing: Vocabulary: Technical drawing tools Computer aided design system (CAD), Computer aided manufacturing program (CAM); Grammar: Past Simple and Past Continuous; Reading: the basic tools of the drafter; from manual drawing to computerised drawing; Listening: description of CAD/CAM systems; Speaking: creating CAD drawings, acting out roles about dimensions, battery size, screen size; Writing: complete the engineer's notes about a new product. Unit 4. Machine tools: Vocabulary: Machine tools: features and applications, Computerised numerical, control machines (CNC); Grammar: Present Perfect vs. Past Simple; Reading: main features of machine tools;

application of CNC machines to manufacturing processes; Listening: automation of machine tools in manufacturing processes; Speaking: talking about simple machines used every day and their uses; Writing: completing a table about the main features of metalworking processes. Unit 5. Electric circuits: Vocabulary: Circuit components, Types of electric circuits, Fuses and protective devices; Grammar: Means of Expressing the Future; Reading: description of the main circuit components; safety devices; Listening: types of circuits; Speaking: discussing about products that batteries are used in and battery problems; Writing: describing the basic circuit components. Unit 6. How energy is produced: Vocabulary: Conventional power plants, Alternative power sources, Electrical distribution system; Grammar: The Comparison of Adjectives and Adverbs; Reading: types of power plants; fossil fuels vs. alternative power sources; Listening: different steps in the electrical distribution system; Writing: completing a table about the advantages and disadvantages of alternative power sources; Speaking: discussing the results of a quiz on energy saving. Unit 7. What is electronics?: Vocabulary: Main electronic inventions, Electronic circuits, Mobile phones and radio signals; Grammar: Conditionals/ IFs in Engineering; Reading: short history of the main inventions in electronics; types of electronic circuits; Listening: mobile phones and radio signals; Writing: describing the main advantages and disadvantages of an electronic device used everyday; Speaking: exchanging information about mobile phones. Unit 8. Telecommunications and networks: Vocabulary: Means of transmission, Ground and air transmission, Main network components, Network topologies; Grammar: Bare Infinitive vs. To-Infinitive vs. –ING form; Reading: ground and air transmission; network components; Listening: network topologies; Writing: an article about the uses of computer networks; Speaking: exchanging opinions on the use of everyday means of communication. Unit 9. Information technology and Computer systems: Vocabulary: Computer components: hardware and software, USB flash drives, Types of computers, Internet connections; Grammar: The Passive Voice; Reading: computer components; types of computers, different types of Internet connections; Listening: USB flash drives; Writing: a summary of the origins of the Internet; Speaking: describing the features of your own computer. Unit 10. Automation and robotics: Vocabulary: Automation technologies, Robot applications, Sensors and transducers; Grammar: Modal verbs; Reading: advantages and disadvantages of automation, applications of automation technologies; types of sensors; Listening: robot applications; the optical mouse; Writing: describing automation technologies; Speaking: discussing the impact of automation on your life. Unit 11. Technical assistance: Vocabulary: Preventive and corrective maintenance, Car components (the exterior, the interior, under the bonnet), Auto maintenance; Grammar: Prepositions of Time/Place/Movement; Reading: types of maintenance; car maintenance tasks; Listening: a dialogue between a mechanic and his customer; Writing: describing the features of different types of maintenance; Speaking: comparing the results of a quiz about car maintenance. Unit 12. Health and Safety at work: Vocabulary: Health and safety regulations and objectives, Safety signs and colours, Safety equipment, Fire safety plan; Grammar: Questions and Answers (Yes/No Questions - Wh- questions - Subject/ Object Questions - Indirect Questions - Question Tags); Reading: safety and welfare in multinational companies; safety sign categories and meanings; safety equipment; Listening: safety rules and accident procedures; dialogues about safety equipment and how to prevent accidents; Writing: describing health and safety regulations and objectives; Speaking: discussing. Unit 13. Final revision. Unit 14. Final Evaluation.

LANGUAGE OF INSTRUCTION: English

COURSE TITLE: ENVIRONMENT PROTECTION

COURSE OBJECTIVE(S): Students will acquire basic knowledge regarding the environmental protection and of the specific pollution protection measures in the energy and industrial field.

COURSE CONTENTS: Introduction; Phonic pollution; Vibrations in plant operation; Air pollution due to particles; Air pollution inside buildings; Soil pollution; Pollution prevention; Evaluating the environmental impact; Tendencies in energy – environment field.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PROFESSIONAL COMMUNICATION

COURSE OBJECTIVE(S): Developing the communication and interaction skills (oral and written) of the students required for adequate communication in the field of qualification and socially accepted, acquiring specific knowledge, skills and attitudes in professional environments and communities.

COURSE CONTENTS: Course: Definitions, models and theories of communication; Professional abstracts and papers; Telephone communication; IT-assisted communication; The Art of Taking an Interview; Professional and scientific presentations; Preparation of a professional file - CV, letter of intent.. Seminar: Inaugural speech; The professional project; The professional poster; Presentation of research results - poster exhibition; Presentation of research results – public presentation of the professional project.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNOLOGY OF MATERIALS

COURSE OBJECTIVE(S): Contributes to the formation of future engineers s, familiarizing them with the main theoretical and practical aspects related to the characteristics and operation of the material production facilities.

COURSE CONTENTS: Course: General considerations. The object and importance of the technology of materials. Structure of technological processes. Design of technological processes. Technical and economic indicators. Structural balance charts; Technology of manufacturing of products made of metallic materials. Ferrous and Non-Ferrous Metals Technology; Powder technology; Technology of manufacturing of composite materials. General notions on composite materials. Reinforcing fiber manufacturing technologies; Technologies for the manufacture of metal matrix composites. Technologies for the manufacture of polymeric matrix composite; Ceramics products manufacturing technologies; Technologies for manufacturing intelligent materials. Laboratory: Preparation and expression of the results obtained in the practical works; Experimental determinations for lengths and diameters; Study of the Fe-C diagram; Experimental determination of the properties of foundries alloys; Experimental Determination of the Mixture of Powder Particles Properties; Evaluation of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS II

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental notions of mathematical analysis with applications in systems engineering. At the same time, the development of mathematical logic and computational abilities is required, necessary for the use of mathematical methods in other disciplines in system engineering.

COURSE CONTENTS: Course: Riemann Integrity and its Extensions (Incorrect Integral with Parameters) and Applications (Functions G and b); Integrated curvilinear of the first type and applications; Double Integral and Applications; Triple Integral and Applications; Surface integrity and applications; Field theory elements; operators of field theory; particular fields; Field integration and integral formulas; The reverse of field theory. Seminar: Exercises with integral Riemann and its extensions (incomplete integral with parameters) and applications (functions G and b); Exercises with integral curves of the first type and applications; Exercises with double integers and applications; Exercises with triple integers and applications; Exercises with surface integrals and applications; Exercises with field theory elements, field theory operators and particular fields; Exercises with integral formulas; The reverse of field theory.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROTECHNICS

COURSE OBJECTIVE(S): Students acquire the knowledge and skills necessary to acquire professional skills to understand and manage the electromagnetic field phenomena and electric circuits on which the operation of electrical engineering equipment is based. Laboratory work develops practical skills (reading an electrical scheme, making an electrical installation, using measuring instruments) through experimental observations that allow qualitative interpretations and quantit.

COURSE CONTENTS: Course: Electrostatic: Electric charge. Conservation and quantification of electric charge. The Coulomb Theorem. The electric field. Electrical field strength. Electrical flux law. Gauss' theorem. Electrical voltage. Link law between D, E and P. Electrical capacitors. The theorems of equivalent capacity transfiguration. The energy of the electrostatic field. Generalized forces theorems in electrostatic field; Electrokinetic: Electricity. Electricity Conservation Law. The Law of Electric Driving. Dividing circuit elements. The ideal resistor. Ideal power supply. Electric power transfer at the electric current flow (Joule-Lentz effect). Transformation theorems of the resistors connected in series and parallel. Voltage and current resistor divider. DC circuits. Topology. Methods of resolving DC circuits; Electromagnetism: The magnetic field. Magnetic sizes. Magnetization. Magnetic Flow Law. Magnetic circuit law. Ampere's theorem. The Law of Electromagnetic Induction. Magnetic properties of electrotechnical amaterials; Sinusoidal mode: Variable sizes. Complex representation of sinusoidal quantities. Ideal circuits in the c.a. Power in the c. Seminar: The electrostatic field. The Coulomb Theorem. Explanation calculation; Gauss's theorem. Examples of calculation; Electrical capacitor. Examples of calculation; Electrical induction law. Explanation of calculation; The Ampere theorem. Examples of calculation; Circuits of c. Calculation methods; Final evaluation of student activity at the seminar. Laboratory: Instruction on PM standards and tremendous earthquakes. Presentation of papers; Experimental study of some phenomena in electrostatic field; Resistors. Electrical resistance. Connecting the resistors to cc circuits; Condensers; apacities. Connecting capacitors; Coils. Inductances. The principle of electromagnetic induction law; Electronic circuits; Verifying testimonies. Final assessment of student activity at the lab

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION II

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.

COURSE CONTENTS: Gymnastics: Front and Band Exercises; Aerobics/ Fitness Gymnastics; Application trails combined with treadmills, jumps; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports: Football; Bilateral games in similar contest conditions.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MECHANICAL ENGINEERIG ELEMENTS I

COURSE OBJECTIVE(S): Knowledge, understanding and deepening of the basic notions of mechanics. Learning by students of the knowledge and skills necessary to acquire professional skills for understanding and managing the essential aspects of mechanics regarding statics, kinematics and system dynamics.

COURSE CONTENTS: Course: The theory of sliding vectors; Geometry of the masses; The kinematics of the material point; The solid rigid kinematics and rigid systems kinematics; Dynamics of the material point; Methods of study in dynamics of solid rigid and rigid systems. Getting analytical mechanics. Reduced models of mechanical systems. Laboratory: The theory of sliding vectors; Mass centers; Moments of inertia; The kinematics of the material point; The solid rigid kinematics; Dynamics of the material point; Dynamics of solid rigid

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER AIDED GRAPHICS II

COURSE OBJECTIVE(S): Familiarizing students with the principles and methods of conventional representation of forms, drawing/ computer aided design of parts, subassemblies and assemblies. Student preparation for the use of specific computer-aided design software in their specific technical field, as well as for the processing of diagrams, graphics and other graphic representations in electronic form and their embedding into other types of documents.

COURSE CONTENTS: Course: Representation agreements in engineering graphics. Aspects specific to computer aided graphics; Organizing a file or a work session. User-computer interface programming. Using auxiliary modules. Working with coordinates; Drawing straight lines and segments. Construction lines. Selection and properties of line types. Multilines; Fundamental planar geometric figures (rectangle, circle, ellipse, circle and ellipse arcs). Polylines. Regular polygons. Drawing editing techniques (templates, contours modifying, hatching, dimensioning, writing). Laboratory: Lines used in engineering graphics. "Line Game"; Drawing the format frame. Draw and fill the indicator; Drawing up contours using drawing and editing commands; Drawing up items with symmetrical contours; Threaded item representation; Representation of items in bi or tri-projection system, by model; Execution drawings for parts of an assembly, by model; Representation of the assembly (aggregate drawing). Drawing and completing the table of components. Processing of imported graphic objects (drawings).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SPECIAL MATHEMATICS I

COURSE OBJECTIVE(S): Ordinary differential equations, fundamental topics and solving such equations. Fundamentlat topics in Statistics;

COURSE CONTENTS: Course: Fundamental topics for differential equations; First order differential equation. General form, normal form. General, particular, singular solution. Cauchy problem. Geometric interpretation of a differential equation, of the solution of a differential equation, of the Cauchy problem solution; First order differential equations integrable by elementary methods. Differential equations with separable variables. Homogenous differential equations. Linear differential equations. Bernoulli, Riccati, Clairaut, Lagrange differential equations. Exact differential equations. Integrating factor. Finding line fields; Existence and uniqueness theorems for Cauchy problem of first order. Stability theorems for differential equations of first order; Linear differential equations of higher order, homegenous and nonhomogenous. Linear independence. Fundamental solution systems. Linear differential equations with constant coefficients. Euler equations; Linear systems of differential equations of first order. Fundamental solution matrix. General solution for a homogenous, nonhomogenous linear system. Linear systesm with constant coefficients; Basic topics in statistics. Random variables. Characteristiv values of a statistical series. Statistical indicators. Variation indicators. Correlation and regression. Regression analysis. Linear Regression. Laboratory: Equations with separable variables. Homogenous equations and reducible to

homogenous equations; Linear differential equations. Bernoulii and Riccati equations. Implicit differential equations, Clairaut and Lagrange equations. Exact differential equations and integrating factor method. Finding line fields. Equations that can be reduced to lower order equations; Existence and uniqueness problems for Cauchy problem of first order. Solution dependence problems. Stability problems for differential equation of first order; Solving differential equations of higher order. Finding a fundamental solution system for linear differential equations with constant coefficients. Euler linear differential equations; Linear systems of differential equations of first order. Computing fundamental matrix for linear sistems with constant coefficients. Euler's method to determine a fundamental solution matrix; Study of concrete statistical phenomenon, using characteristic values of statistical generated series, statistical indicators and variation indicators. Making prediction for further behavior of such phenomenon, by using corelation, regression and linear regression.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of fundamental control structures and computer programming.
COURSE CONTENTS: Course: Fundamental types of data: Fundamental, constant, variable types; Arithmetic phrases. Pictures; Attribution instructions; Operations with full bit numbers. Travel operators. Logical operators. Fundamental control structures – algorithms: Relative phrases. Boolean phrases; Operators while, do-while, for; Operators if,?, Switch. Functions: Definition of functions; Passing function parameters; Recursion - Functions templates. Pointers, references, drawings, type C strings: Pointers; References Pointers and one-dimensional paintings; Pointers and multidimensional paintings; Type C strings. Type C files: Text files - Binary files. Structures and unions type C: Structures and unions; Apps: time functions. Classes: The concepts of object programming; Defining a class. Pointerul this. Namespaces - Builders and destroyers; Friendly functions; Standard C ++ files - C ++ standard strings. Overloading operators. Overloading the assignment operator - Overloading arithmetic operators - overloading the incoming/ outgoing operators. Inheritance: Pointers to objects; Inheritance; Types of access; Virtual Functions. Polymorphism; Data and static functions. C ++ files: Text files; Binary files. Treating exceptions: Exceptions; Functional exceptions; Standard exceptions. Standard Template Library: Generic functions; Lists. Vectors. Working with complex numbers. Laboratory: Fundamental types of data; Arithmetic phrases. Attribution Instruction; Accuracy of calculations. Travel operators. Operators ++ and -. Bit logic operators; Fundamental control structures; Functions; Pointers and references. Operations with type C strings; Processing files in C language; Classes. Operations with C ++ strings; Inheritance; Virtual Functions. Polymorphism; Processing files in C ++; Standard Template Library.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ELECTROTECHNICS II

COURSE OBJECTIVE(S): Students acquire the knowledge and skills necessary to acquire professional skills to understand and manage phenomena related to the theory of electrical circuits on which the operation of aerospace engineering equipment is based. Laboratory work develops practical skills (reading an electrical scheme, making an electrical installation, using measuring instruments) through experimental observations that allow qualitative interpretations and quantitative assessments of the phenomena studied.
COURSE CONTENTS: Course: Electrocinetique: Electricity. Electrical conduction law. Theorems of transfiguration of resistors and voltage sources (serial and parallel connection). Resistive voltage and current divider; Electric current circuits: Elements of network topology. Methods for resolving circuits of c.c. The balance of powers. Example of application; AC current circuits: Sinusoidal sizes. Complex representation of sinusoidal quantities. Passive linear dipole. Circuit Elements in c.a. Power in the c. Resonance R, L, C and parallel circuit R, L, C series. Methods of resolving circuits of ca. Application examples. Power factor; Cuadripol. Electrical filters: Equations of the diopter. Equivalent schemes for quadriplets in T and P. Interconnection with TailPoints. Electrical filters. Classification. Constructive types. Examples of calculation; Electrical circuits in transient mode. General aspects: Direct integration method. Operational method for the analysis of transient regimes. Transforming Laplace. Theorems of transfiguration in operational form. Heaviside's formulas. Examples of use; Three-phase electric circuits: General aspects. Three-phase systems. The star connection. Triangle connection. General method of calculation of three-phase circuits in symmetrical mode. The circuit of three-phase circuits in unsymmetrical regime. Powers in three-phase circuits. Examples of calculation. Seminar: Study of DC electric circuits. Examples of calculation; Complex representation of sinusoidal quantities. Study of diport circuit in c.a. Examples of calculation; Study of alternating current circuits.

Examples of calculation; Study of passive filters and passive filters. Examples of calculation; Study of transient electrical circuits. Calculation methods. Calculations; Three-phase electric circuits study. Calculations; Final evaluation of student activity at the seminar. Laboratory: Instruction on PM standards and earthquake behavior. Presentation of papers. Working in teams; Experimental study of electrical circuits in stationary mode; Study of R, L, C Series in permanent sinusoidal mode; Experimental study of transient modes in simple circuits; Experimental impedance study; Experimental study of three-phase electric circuits; Verifying testimonies. Final assessment of student activity at the lab.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION III

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.
COURSE CONTENTS: Athletics: The long jump technique in place; Utility-application paths; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALOGUE ELECTRONICS

COURSE OBJECTIVE(S): The students will get the fundamental knowledge of analogical electronics, from the main functional and constructive characteristics point of view, but also from practical use posibility point of view. It will also be developed simulation abilities in the electronics domain, but also practical abilities.
COURSE CONTENTS: Course: Fundamentals regarding the continuous current, alternative current, sound waves and complex waves, parameters; Passive circuit components. Matrices of passive components. The transformer and auto-transformer; Amplitude modulation and frequency modulation; Semi-conductive diode; Bipolar transistor with jonctions. Amplifiers with TBJ; Transistors with field effect; Semi-conductive photoelectrical devices and multi-junction semi-conductive devices; Operational amplifiers. OA circuits; Rectifiers; Stabilizing circuits; Oscilators and signal generators; Filters. Laboratory: Labor rules. Presentation and use of the electronical equipment necessary for practical experiments; Presentation of the simulation programs and of the main analysis that will be done during the laboratory; Circuits with semi-condictive diods – simulation; Circuits with semi-condictive diods – practice; Amplifier circuits with bipolar transistors – simulation; Amplifier circuits with bipolar transistors – practice; Amplifier circuits with OA – simulation; Amplifier circuits with OA – practice (it will use the platform Lab Kit PRO); Linear stabilizer – simulation; Linear stabilizer – practice; Signal generators – simulation; Signal generators – practice (it will use the platform Lab Kit PRO); Final eveluation of the laboratory activitie.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENGLISH

COURSE OBJECTIVE(S): Instil in students the belief that technical English is essential for their insertion into the labour market. Therefore, this academic discipline aims to equip them with technical English communication skills.
COURSE CONTENTS: Unit 1. An introduction into Engineering ; Unit 2. Materials and Technology (Production phase, usage, recycling), Present Simple and Continuous; Unit 3. The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Unit 4. Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; Unit 5. High voltage cables (description, materials, uses), means of expressing the Future; Unit 6. Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Unit 7. Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Unit 8. Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Unit 9. Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice; Unit 10. Engineering design - working with drawings (plan, crosssection, exploded view, elevation, schematic, specification), describing details; Unit 11. Inventions: the incandescent lamp, present and past tenses revision; Unit 12. Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Unit 13. Final revision; Unit 14. Final Evaluation.
LANGUAGE OF INSTRUCTION: English

COURSE TITLE: SPECIAL MATHEMATICS

COURSE OBJECTIVE(S): Intoduction to signal Fourier analysis, applications of fundamental transforms Laplace and Fourier, study of physics experiments using partial differential equations.

COURSE CONTENTS: Course: Complex Analysis. Exponential function; Fourier analysis, Fourier series. Periodic functions. Odd and even functions, periodic extensions. Trigonometric orthonormal system. Fourier coefficients, Fourier series of a function. Parseval formula. Bessel inequality. Fourier series expansion, sine and cosine expansion; Laplace and discrete Laplace (z) tranforms. Fundamental theorems. Laplace transforms of elementary functions. Applications to differential and integral equations. Elementary discrete signals. Detrmine signals obtained by superposing their delayed signals; Fourier transform. Integrable functions (signals). Inverse Fourier and Laplace transforms. Convolution, Parseval and Borel formulas. Sine and cosine transforms. Solving some integral equations, representation as Fourier integral; Linear partial differential equations of order II. Differential equations, initial conditions, boundary problems, Cauchy problem. Clasification of linear partial differential equations, canonical form; Main differential equations of mathematical physics. Separating variables method and superposing effects principle, applied to some fundamental equations, Dirichlet problem for a disk, vibrating string equation, heat equation in an infinite bar. Laboratory: Complex exponential function, properties; Odd and even extension of a function, computing Fourier coefficients, Fourier expansion, sine and cosine expansion, computing the sum of some numerical series; omputing Laplace transforms, finding the original, solving differential and integral equations. Discrete signals. Reccurence relations, superposing delayed signals; Computing Fourier transforms, sine and cosine transforms. Solving integral equations, representation as Fourier integral; Classification of linear partial differential equations of order II, canonical form; Using separating variables method and superposing effects to solve Dirichlet problem for a disk, vibrating string equation and heat in an infinite bar.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: FLUID MECHANICS

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineering specialists, familiarizing them with basic theoretical and practical aspects related to fluid mechanics. It is one of the basic disciplines of engineering training, having the role of presenting the fundamental notions of fluid mechanics, which will be used as a starting point for disciplines in the general aviation training - aerodynamic elements, flight dynamics - as well as for the disciplines from the training branch specific to the specialization EQUIPMENT AND AVIATION INSTALLATIONS - Hydropneumatic equipment and systems on board, Theory and construction of instrument cluster, Automatic pilots, Automation of flying machines.

COURSE CONTENTS: Course: General properties of fluids; Hidroaerostatica; Mechanics of perfect incompressible fluids; Theories of vortex theory; Axial-symmetrical irotation movements; Mechanics of viscous fluids; Dimensional analysis. Theory of Similarity; Physical modeling of phenomena and processes; fluid; Mathematical modeling of thermal processes. Seminar: Equation of movement of perfect fluids in cylindrical and spherical coordinates; Statics of fluids. The law of Archimedes. Pressure on the walls of the tanks; Equation of continuity. Bernoulli's equation. Lagrange equation; The impulse theorem. The kinetic moment theorem. The energy theorem; Spin speed induced by a whirlpool system. Axial-symmetrical movements; Flat movements; Mechanics of viscous fluids. Laboratory: Laboratory Safety Standards. Presentation of the Fluid Mechanics Laboratory; Experimental determination of the archimedic force on a submerged body. density meters; Pressure measurement using liquid pressure gauges; Flow measurement via piping using the Venturi tube; Flow measurement in pipelines with diaphragm flowmeter; Visualization of aerodynamic tunnel flows; Viewing power lines with Helle-Shaw; Determining the viscosity of a fluid by the rotating roller method; Study of pressure drops on pipelines; The experimental study of the impulse theorem; The experimental study of the kinetic moment theorem; Numerical simulation of the gears induced by different vortex configurations; Numerical simulation of axial-symmetric flows; Numerical simulation of plane flows.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MECHANICS II

COURSE OBJECTIVE(S): Assimilation by the students of fundamental theoretical problems of kinematics and solid dynamics, studying the laws of motion of the solid and variable mass body (rocket motion in accordance with Tiolkovski's problems), as well as tackling the issue related to the motion of satellites and artificial planets into the extraterrestrial space.

COURSE CONTENTS: Course: Dynamics of free particle - special issues; Dynamics of relative motion of particle and rigid solid; Calculation of kinetic energy accumulated by the rigid solid; Moments of inertia - special issues; Dynamics of rigid solid with a fixed axis; Dynamics of rigid solid with a fixed point; Dynamics of variable mass solid. Rocket flight; Motion of satellites and artificial planets in the extraterrestrial space. Laboratory: Dynamics of free particle and subjected to

connections; Dynamics of relative motion of particle and rigid solid; Kinetic energy accumulated by the rigid solid; Moment of inertia, dynamics of the rigid with a fixed axis; Dynamics of the rigid with a fixed point; Dynamics of variable mass solid. Rocket flight; Motion of satellites and artificial planets in the extraterrestrial space.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: NUMERICAL METHODS FOR ENGINEERS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental notions regarding numerical algorithms with applications in systems engineering.
COURSE CONTENTS: Course: Getting Started. The importance of studying numerical methods. Types of errors; Generate and propagate errors; Using the elementary transformation method and the iterative method; Numerical methods in linear algebra. Numerical solving of equation systems; Linear. Direct methods. The Gauss method; Pivot techniques. Solving linear systems by matrix factorization; Numerical methods for calculating determinants. Finding the inversion of a matrix; The method of successive approximations. Numerical solving of linear equation systems through iterative methods; Separating the roots of a nonlinear equation. Approximate solving equations and systems of nonlinear equations; Numerical methods for determining the characteristic polynomial, its vectors and its own values; Approximate functions. Polynomial interpolation of functions; Lagrange interpolation polynomial; Differential differences; Newton interpolation polynomial; Interpolation using spline functions. The least squares method; Numerical derivation. Finite difference method; Numerical evaluation of the integrals by the trapezium method; Numerical evaluation of integrals by Simpson method and Newton method; Numerical approximation of solutions of differential equations; Presenting mathematical software packages. Laboratory: Getting Started. The importance of studying numerical methods. Types of errors; Generate and propagate errors; Numerical methods in linear algebra. Numerical solving of linear equation systems. Direct methods. The Gauss method; Pivot techniques. Solving linear systems by matrix factorization; Numerical methods for calculating determinants.Finding the inversion of a matrix using the elemental transformation method and the iterative method; The method of successive approximations. Numerical solving of linear equation systems by iterative methods; Separating the roots of a nonlinear equation. Approximate solving equations and systems of nonlinear equations; Numerical methods for determining characteristic polynomial, vectors and of their own values; Approximate functions. Polynomial interpolation of functions. The polynomial of Lagrange interpolation. Differentiated divisions. Newton interpolation polynomial; Interpolation using spline functions. The least squares method; Numerical derivation. Finite difference method; Numerical evaluation of the integrals by the trapezium method; Numerical evaluation of integrals by Simpson method and Newton method; Numerical approximation of solutions of differential equations; Presenting mathematical software packages.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STRENGTH OF MATERIALS

COURSE OBJECTIVE(S): It contributes to the formation of future engineers, familiarizing them with the main theoretical and practical aspects related to the simple and complex mechanical stresses of various machine parts, appliances and electrical installations.
COURSE CONTENTS: Course: General notions on material resistance. Tensions and deformations. Characteristic curve of materials. Admissible resistances. Safety Coefficients; Elements of elasticity theory. Layout of stress and deformation. Hooke's generalized law. The relationship between elastic constants E. G, υ; Geometrical Surface Characteristics. Static Moments. Moments of inertia. Inertia rays. Resistance modules. Variation of inertia moments relative to parallel axes. Variation of inertia moments when rotation of coordinate axes; Axial Loads. Effect of own weight on straight axes with axial loads. Bars of equal strength subjected to axial stresses; Strength of electrical and telecommunication cables. The equation of the funicular curve. Calculation of the deformation, the strain and the length of the conductor; Bending loads for straight bars. The pure bending, Navier's formula. Bars of equal strength subjected to bending; Torsion loads. Strains and deformations in circular and ring-shaped bars, subjected to torsion loads.. Calculation of helical springs; Axles and shafts. Axle calculation. Calculation of straight shafts (pre-dimensional, fatigue calculation, rigidity calculation); Spindles and pivots. Simple computation of spindles. Ring with rings. Axial pivots - radial.. Laboratory: Tensile test of materials; Compression test of materials 3 Testing of static bending materials; Static bending test of materials; Dynamic bending test of materials; State the design theme and fix the features and performance of the designed product for each student; Calculating product dimensions based on kinematic, strength, etc; Transposition of the designed product into functional sketches, with the main calculated dimensions; Checking and marking the project; Assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 2ND SEMESTER

COURSE TITLE: THE BASICS OF AERODYNAMICS

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to aircraft aeronautics. Students present the main issues related to aerodynamics of subsonic and supersonic flows. The theoretical, computational and experimental bases give students a clear picture of the aerodynamic phenomena that accompany the flight of the aircraft. By the notions acquired in this discipline the students can then approach the courses specific to the specialization Aviation equipment and installations.

COURSE CONTENTS: Course: Axial-symmetrical iotational movements; Flat movements; Use of conformational transformations in fluid mechanics; Low speed aerodynamics; Aerodynamics of high speeds. Seminar: General gas flow applications, sound speed, induced speeds; Flat plane applications: power lines, speeds; Applications to axially symmetrical iterating movements: velocity potential, current function, complex potential; Applications for the use of complex variable functions for flat movements; Apps to use conformal transformations; Applications to aerodynamic profiles in the case of small disturbances; Aircraft applications in compressible mode. Laboratory: PM and PSI instruction. General Laboratory Overview; Study of the oscillations of an incompressible fluid in pipelines; Determination of fluid viscosity; Measuring the speeds in an air flow using the Pitot tube; Determination of aerodynamic tunnel flow rate and coefficient of utilization; Determination of the Cx coefficient for various symmetrical axial bodies; Study of the main flow parameters of an air flow through the Venturi tube; Experimental determination of pressure distribution on a cylinder; Experimental determination of pressure distribution on a wing profile; Study of the Coanda effect; Noise dampers and Coandă effect fluid ejectors; Recovering works. Final evaluation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PHYSICAL EDUCATION IV

COURSE OBJECTIVE(S): Overall objective: The discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle. Specific objectives: Awareness of the students about the role and importance of practicing physical exercise; Strengthening the theoretical, scientific and practical notions of physical exercise in free time by students; Developing volitional moral features, aesthetic sense, discipline, fair play and communication and teamwork skills; Preserving and maintaining health through exercise, in order to increase the potential for physical and intellectual work; Fostering growth processes and harmonious physical development of the body; Physical and mental recovery after various activities; Harmonious blending of intellectual activities with physical activity.

COURSE CONTENTS: Fitness - optimizing your physical condition; Utility-applicative skills; Exercises for the development of general force; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games in similar contest conditions.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT

COURSE OBJECTIVE(S): To familiarize students with the main concepts and practices in the field of management. To develop organizational and decision-making skills.

COURSE CONTENTS: Course: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Methods and techniques used in decision-making; Process organization; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Information management system: concept, components, functions; Principles of design and improvement of the management information system. The main shortcomings; General management methods and techniques; Specific management methods and techniques; Human resources management: concept and component activities; Managers: definition, features, types of managers, and managerial styles. Seminar: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Methods and techniques used in decision-making; Process organization; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Information management system: concept, components, functions; Principles of design and improvement of the management information system. The main shortcomings; General management methods and techniques; Specific management methods and techniques; Human resources management: concept and

component activities; Managers: definition, features, types of managers, and managerial styles.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AIRCRAFT MECHANICS I (CONSTRUCTION OF AEROSPACE STRUCTURES)

COURSE OBJECTIVE(S): Acquiring specialized knowledge and skills on the structure and operation of aircraft on-board structure assemblies and subassemblies.
COURSE CONTENTS: Course: Characteristics of aerospace vehicles; Stresses of aerospace vehicle structures; Basics of aerospace design and structure construction; Interior design, equipping and alignment of aerospace vehicles; Notions of calculation of resistance structures of aerospace vehicles; Notions of aeroelasticity theory of aerospace structures; Notions of fabrication of aerospace vehicles structures. Laboratory: Airplane structure. Technological and exploitation bonds; The construction, elements and assemblies of the front-fuse structure; Construction and elements of the empennage structure; Aircraft manufacturing.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: FINE MECHANICS AND MECHANISMS FOR ON-BOARD EQUIPMENT

COURSE OBJECTIVE(S): The discipline intends to present to the students the fine mechanics equipment and the mechanisms which are the basis of the built-up of avionics and other equipment and systems of the aircraft. It is the intermediate link between the basic training and specialty disciplines, related to the built-up and design of the instrumentation.
COURSE CONTENTS: Course: Constructive and operational principles of avionics and on-board equipment; Transducers for avionics. Elastic membranes and capsules. Silphons. Manometric tubes. Bimetalic sensors; Transmission and multiplication mechanisms. Coupling and drive systems. Articulated mechanisms. Belt transmissions. Transmitted and worm gears. Friction wheel drive; Guiding and support elements. Axles and shafts. Bearings. Flexible shafts. Guidance with elastic elements; Dampers (shock absorbers). Liquid Shock Absorbers. Gas shock absorbers. Dampers with dry and inertial friction. Magnetoinductive dampers; Optical equipment for on-board equipment. Choice and embedding of optical equipment. Mobile mechanical-optical devices. Optoelectronic receivers. Seminar: Elastic membranes and capsules. Characteristics calculation. Dimensioning and resistance calculation; Couples. Dimensioning and resistance calculation; Calculation elements for articulated mechanisms; Calculation elements for speed variators; Calculation of optical equipment of automatic targeting systems. Laboratory: Transducers and sensors for high and low pressures measuring; Elastic membranes study; Baro-altimetric compensation mechanisms; Lever mechanisms study; Study of mechanisms with cogwheels; Study of mechanisms with friction wheels. Speed variators; Optical targeting equipment for sighting devices..
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS THEORY AND AUTOMATIC CONTROL

COURSE OBJECTIVE(S): Introduction of the basic concepts of systems theory (the input-output theory) and of their description through specific characteristics, as well as of the basic issues of automated control. This creates the necessary openness for the dynamic-based approach, as well as the ability to use the automatic control tools – being a first step towards an interdisciplinary approach to engineering problems.
COURSE CONTENTS: Course: Introduction in Systems and signals theory; Input-output transfer of linear dynamical systems: mathematical description, properties; Structural block diagrams, systems output for typical input signals, stability of linear and time-invariant systems; Frequency characteristic and stability of feedback systems. Nyquist criterion; Control systems. Introduction in Control theory; Qualitative indices of step response. Exact synthesis of the controller based on imposed performances; The control problem. The precision of control systems. Stabilization by dynamical compensation; Typical transfer elements. PID control laws. Seminar: Direct and indirect Laplace transforms. Differential equations solving by means of Laplace transform; Transfer functions for linear, invariant and continuous-time technical-physical systems; Block diagrams. The method of elementary transformation of block diagrams; Computing step and impulse responses; The linear systems stability. Algebraic stability criteria; Nyquist criterion for stability of negative feedback systems; Controller conventional synthesis based on the placement of poles and zeros.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNICAL THERMODYNAMICS

COURSE OBJECTIVE(S): It is one of the disciplines of general engineering training, aiming to present to students the phenomenology and the theoretical and computational basis of thermodynamic systems, with direct application to thermal machines, in general, and to aerospace propulsion systems in particular.
COURSE CONTENTS: Course: Fundamental concepts of thermodynamics. Topic of study. Thermodynamic systems. Physical state transformations. Irreversible and reversible evolutions. Mechanical work and Heat; First Principle of Thermodynamics. Internal energy. Enthalpy; The perfect gas model. State equation, internal energy law. Particular evolutions of perfect gases. The specific heat of perfect gas. Perfect gas mixtures; The second principle of thermodynamics. The Carnot Cycle. Clausius' Integral. Entropy and entropy calculation. Entropy charts; Open thermodynamic systems. First

Principle for open systems. Gas mixtures in motion. Flow through variable section pipes. Flowing through nozzles. Flow through long pipes, with friction, flow through thermal nozzles. Shock waves; Real gases concepts. Water and steam. Van der Waals state equation; Principles of Internal combustion reciprocating engines. Otto engine. Diesel engine. Mixt heat exchange engine (Seiliger). Overboosted engines; Ideal cycles of refrigerating machines. Functional principle. Gas refrigeration installations. Heat pump. Thermoelectric refrigeration plant; Compressor. Principles of operation. Volumetric compressor. Multi-stage compression. Centrifuge compressor; Internal combustion turbo-engines. Principles of operation. Terestrial turbo-engine. Heat recovery turbo-engine. Turbo-engine power augmentation methods. Aircraft turbo-engines. Seminar: State equation and perfect gases log-laws; Perfect gases mixtures; Particular transformations of perfect gas. Energy exchanges related to perfect gas transformations; Thermodynamic cycles. Energy exchanges and efficiency of cycles; Flows through convergent and convergent-divergent (Laval) nozzles; Flows through long pipes with friction; Thermal machines (engines, compressors, refrigeration plants). Laboratory: Computer aided study of irreversible and reversible evolutions; Computer aided study of polythropic evolutions; Four stroke engine (Walther Minor) with spark ignition study; Calculation and plotting of the ideal Otto engine cycle; Calculation and plotting of the ideal Diesel engine cycle; Calculation and plotting of the ideal Seiliger engine cycle; Calculation and plotting of the ideal cycle of overboosted Seiliger engine with shaft driven compressor; Calculation and plotting of the ideal cycle of overboosted Seiliger engine with turbo-compressor; Study of volumetric compressor (without and with dead room); Calculation and plotting of the terestrial turbine-engine. Performance and optimization; Calculation and plotting of the terestrial turbine-engine with heat recovery; Calculation and plotting of the terestrial turbine-engine with staged compression and expansion.

LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 1ST SEMESTER

COURSE TITLE: FUNDAMENTALS OF AEROSPACE PROPULSION

COURSE OBJECTIVE(S): The discipline presents the theoretical and computational fundamentals, as well as the constructive and operational types of the existing aerospace propulsion systems. The student is expected to obtain information about the main types of nowadays aerospace propulsion systems, about their main parts, as well as how to determine their performances and characteristics. The lab of the discipline aims to offer to the students practical elements and to familiarize them with the operation of the propulsion systems and their main parts.

COURSE CONTENTS: Course: Propulsion of aerospace vehicles. Classification of Propulsion Systems. The working fluid of the air-breathing jet engines; Description and operation of the turbo-jet engine (TR), ideal TR cycle and real TR cycle. Traction, efficiency, and specific parameters of TR; TR Performances. Influence of main operational parameters on its thrust and on its specific fuel consumption; Intakes, description and operation. Subsonic and supersonic intakes; Engine's combustor; description and operation; Axial Compressor. Classification. Compressor stage. Multistage compressor. Compressor characteristic. Compressor stall and surge; Turbine, description and operation. Axial turbine stage. Multistage axial turbine. Characteristic of the axial turbine; Turboprop, construction and operation. Optimal distribution of turboprop enthalpy. Influence of operational parameters on turboprop performance; Turbofan, construction and operation, performance. Optimal distribution of twin-jet turbofan enthalpy; Thrust augmentation methods. Afterburning. Coolant injection into the compressor and into the combustor; Other propulsion systems. Ramjet, scramjet. Combined and mixed propulsion systems. Unconventional propulsion systems. Laboratory: Engine starting studies. Cold start and hot start of the turbo-jet engine; Turbo jet engine working fluid. .Determination of the air excess ratio in the engine combustor; Calculating and plotting of jet engine thermodynamic real cycle at sea level and in flight; Calculating and plotting of jet engine with afterburning thermodynamic real cycle at sea level and in flight; Combustor's thermal limitation system studies. Exhaust nozzle opening system studies; Supersonic inlet optimal geometry design and speed characteristic determination; Final evaluation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL DASHBOARD EQUIPMENT

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of digital processing equipment.

COURSE CONTENTS: Course: Representation of analog and digital signals through integral transformations. Analysis of Fourier Transform Signals; MSI and LSI circuit design: Boolean algebra elements; 2 inputs with 4 inputs and 8 inputs; Two-output demultiplexer with 4 outputs and 8 outputs; Extending demultiplexers; Pulse modulation; Aerodynamic Data Calculator (ADC).fault functions and applications; Applications on curves and surfaces; Power series; Fourier series. Laboratory: Minimize using Veitch-Karnaugh diagrams; Processing of information from ADC transducers with National Instruments acquisition cards; Serial transmission simulation according to RS232 standard; Graphical presentation of the parameters (select) on the 1553B bus.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ON-BOARD EQUIPMENT AND NAVIGATION I

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of airborne equipment and navigation equipment.

COURSE CONTENTS: Course: Components of instrument cluster; Flight altitude measurement; Flight rate measurement; Vertical speed measurement; Aerodynamic stations; Determination of flight direction. Laboratory: Power supply system for static and total pressure equipment from Pitot tubes. Standard atmosphere; Modeling aerodynamic parameters using the standard atmosphere; Barometric altimeter; Cabin altimeter and differential manometer; Variometers; Speedometer; Combined speedometer; Machmetrul; Aerodynamic stations; Study of magnetic and inductive compasses; Measurement of fluid flow position (measurement of incident and slip angle). Project: Designing a BAROMETRIC ALTITUDE to equip a helicopter; Designing a BAROMETRIC ALTITUDE to equip a four-way airplane; Designing a BAROMETRIC ALTITUDE to equip an IAR-93 aircraft; Designing a BAROMETRIC ALTIMETER designed to equip a three-engine transport aircraft; Designing a BAROMETRIC ALTIMETER for equipping a bimonthly supersonic hunting airplane; Designing a BAROMETRIC ALTIMETER designed to equip a bimotor transport aircraft; Designing an AERODYNAMIC SPEEDOMETER designed to equip a helicopter; Designing an AERODYNAMIC SPEEDOMETER designed to equip a four-way airplane; Designing an AERODYNAMIC SPEEDOMETER designed to equip an IAR-93 aircraft; Designing an AERODYNAMIC SPEEDOMETER designed to equip a three-engine transport aircraft; Designing an AERODYNAMIC SPEEDOMETER for equipping a supersonic bomber hunting plane; Designing an AERODYNAMIC SPEEDOMETER for equipping a bimotor transport aircraft; Designing a BAROMETRIC ALTITUDE to equip a helicopter; Designing a BAROMETRIC ALTITUDE to equip a four-way airplane; Designing a BAROMETRIC ALTITUDE to equip an IAR-93 aircraft; Designing a BAROMETRIC ALTIMETER designed to equip a three-engine transport aircraft; Designing a BAROMETRIC ALTIMETER for equipping a bimonthly supersonic hunting airplane; Designing a BAROMETRIC ALTIMETER designed to equip a bimotor transport aircraft; Designing an AERODYNAMIC SPEEDOMETER designed to equip a helicopter; Designing an AERODYNAMIC SPEEDOMETER designed to equip a four-way airplane; Designing an AERODYNAMIC SPEEDOMETER designed to equip an IAR-93 aircraft.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GYROSCOPIC EQUIPMENT AND SYSTEMS I

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, aiming at the students' knowledge of the construction elements and the operation of the main gyro equipment and systems, with applications for stabilization, navigation and flight instrumentation.

COURSE CONTENTS: Course: Gyroscope theory elements; Speed gyroscopes and integrated gyroscopes; Fast astatic gyroscope in external cardanic suspension; Vertical gyroscopic equipment; Gyroscopic equipment and complex systems for determining the direction of flight; Fast astatic gyroscope in inner cardanic suspension. Laboratory: Study of DUS-155K and DUS-155T gyrocopes (transducers); EUP-53 turn and slide indicator study; Study of the VK-53 RV type gyrocopic switch; Study of AGI-1 types; Study of AGD-1 type gyrohorses; Study of the gyromagnetic compass with DGMK-3 (girobusola); Study of KSI course system.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HYDROPNEUMATIC EQUIPMENT AND SYSTEMS I

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineering specialists, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of hydraulic aviation installations. It is one of the disciplines in the training branch specific to the Aviation Systems and Equipment specialization. It aims at presenting hydraulic and pneumatic equipment and systems on board aircraft, these systems being of particular importance in the development of various systems of operation and command of modern aircraft.

COURSE CONTENTS: Course: Introductory considerations; Hydraulics of pipelines and hydraulic system computational problems; Hydraulic machines; Hydraulic accumulators and tanks; Distribution and safety devices; Filtration of hydraulic fluids; Continuous dispensers. Laboratory: Labor protection rules in the on-board hydropneumatic equipment and systems lab; Symbols used in hydraulic and pneumatic installations; Laboratory stabilized hydraulic source. Hydraulic and pneumatic systems used on board aircraf; Landing gear drive systems; Secondary flight control systems; Aircraft braking systems; Bottle jam orientation systems; Main flight control systems; Actuator systems for controlling engine operation; Hydraulic and pneumatic drive systems.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AIRCRAFT MECHANICS II

COURSE OBJECTIVE(S): It is one of the disciplines in the general aviation training. It aims at presenting the knowledge of airplane flight mechanics and its flight dynamics as well as specific flight and pilot flying issues. The knowledge gained in this course are basic elements for disciplines in the branch of disciplines specific to Aviation Systems and Equipment - Theory and construction of instrumentation, Automatic Pilots, Flight Automation, Guiding Systems.

COURSE CONTENTS: Course: Introductory issues; Airplane performance; Techniques for the execution of aircraft developments; Forces and moments in the general movement of the plane; Balance and command of the plane in longitudinal plane; Static lateral stability; Dynamic airplane stability. Laboratory: Labor Safety Standards in Flight Dynamics Laboratory; Aerodynamic qualities of the plane; Airplane Performance Study - Horizontal Flight, Flight Tilt, Take-Off, Landing; The experimental study of the longitudinal static stability of the airplane; Experimental Airplane Movement Movement; Study of own ways of longitudinal movement; Study of the own ways of the lateral-directional movement.

LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 2ND SEMESTER

COURSE TITLE: BASICS OF RADIONAVIGATION

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and exploitation of radionavigation systems.

COURSE CONTENTS: Course: Radiotechnical methods for determining the coordinates of aircrafts; Radio altimeter: The purpose and parameters of radio altimeters; Aviation radiotelegraphs; Radionavigation systems: Remote radionavigation system; OMEGA; TACAN radionavigation system; Radionavigation system RSBN; Goniometric navigation systems: Destination and classification of radiogonometers; Automatic terrestrial radiogonometers; Automatic on-board radar compasses; Landing radiotechnique systems. ILS system. Laboratory: Study of passive circuits; Enhanced single circuit amplifier. Numerical simulation; Dual Amplifier. Numerical simulation; Study of amplitude demodulation; Frequency demodulation study; Study of some radio altimeter modules.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ON-BOARD EQUIPMENT AND NAVIGATION II

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of airborne equipment and navigation equipment.

COURSE CONTENTS: Course: Coordinate systems and transformations used in inertial navigation; The gravitational model of Earth; Conical movements; Compensation of inertial sensor errors; Numerical integration methods used in inertial navigation; Inertial strap-down techniques. Laboratory: Modeling accelerometers and studying their errors; Modeling of gauges and study of their errors; Integration of inertial sensors into redundant architecture; Coordinate transformations; Determining the attitude with the Wilcox quaternionic method; Determining attitude with the Savage quaternionic method; Study of a two-dimensional two-dimensional strap-down navigator in the vertical plane; Study the inertial two-dimensional vertical-plane inertial navigation errors; Study of a two-dimensional horizontal two-dimensional strap-down navigator; Study the errors of an inertial two-dimensional strap-down navigator horizontally; Study of an inertial navigator strap-down in non-terrestrial terrestrial systems.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: GYROSCOPIC EQUIPMENT AND SYSTEMS II

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, aiming at the students' knowledge of the construction elements and the operation of the main gyro equipment and systems, with applications for stabilization, navigation and flight instrumentation.

COURSE CONTENTS: Course: Monoaxial force gyrostabilizers: Introduction; GAO monoaxial force gyrostabilizer; Monoaxial gyrostabilisers of integrator type; Monoaxial gyrostabilisator with phase-correcting correction network, integrating or integrating differentiator; Monoaxial office power gistabilizer; The mathematical model of the monoaxial force giro stabilizer with GAR placed on a mobile base; The mathematical model of the gyroscope monoaxial gyro-stabilizer integrator located on a mobile base; Monoaxial girostabilisers with indirect strobing placed on mobile bases. Monoaxial gyrostabilisers for orientation and stabilization: Guiding head with GAR; Gyrosystems for the stabilization and orientation of cosmic flight machines; Dynamics of nonlinear monoaxial gyrosystems for orientation and stabilization. Biaxial and triaxial force gyrostabilisers: Biaxial force gyrostabilisers; Triaxial force gyrostabilisers. Laboratory: Study of the ASP-3 NM type sighting device; Study of the ASP-PF-21 type sighting device; Study of the head and vertical SFIM; Study of Gyroscopic Guiding Head with Gyroscope in Inner

Cardan Suspension; Study of guiding gyroscopic heads; Study of monoaxial force gyrostabilizers.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ON-BOARD HYDROPNEUMATIC EQUIPMENT AND SYSTEMS II

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineering specialists, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of hydraulic aviation installations
COURSE CONTENTS: Course: Mathematical modeling of simple hydraulic control systems; Servo electro-hydraulic; Hydraulic servo-amplifiers for control surfaces. Seminar: Exercises for mathematical analysis - recapitulation of the notion of string limit and properties fixed in high school; Exercises with strings and vector vectors in Rn; Exercises with continuous functions of several real variables; Exercises with differentiable functions and applications at extremes of functions; Exercises with default functions and applications; Applications on curves and surfaces; Exercises with series of powers; Exercises with Fourier series.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STABILITY AND COMMAND IN FLIGHT THEORY

COURSE OBJECTIVE(S): The discipline contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the non-linear and linear dynamics of the aircraft, the stability analysis and other parameters that characterize the general movement of the aircraft.
COURSE CONTENTS: Course: Non-linear mathematical models of the aircraft's general movement; Study of longitudinal movement; Study of lateral movement; Stabilization of flight attitude. Laboratory: Study of longitudinal motion for an unstable plane; The lateral movement study for an unstable aircraft; Study of longitudinal motion for a stable airplane. Transfer functions continuously and discreetly. Indicative responses; Side flight study for a stable airplane. Transfer functions continuously and discreetly. Indicative responses; Parametric estimation of longitudinal motion using the least squares method; Parametric estimation of the lateral movement using the least squares method.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: THEORY AND CONSTRUCTION OF ONBOARD AIRCRAFT DEVICES

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of the instrument cluster.
COURSE CONTENTS: Course: Pressure measurement on board; Temperature measurement on board; Speed measurement on board; Devices and systems for the measurement of fuel quantity and flow. Laboratory: Calibration dipsticks (liquid manometers); Air pressure gauges; Pressure relays, flow relays, level relays, thermal relays; Flowmeters with inductive transducers; Signaling board equipment; Litrometre; Instruments for measuring energy parameters; Measure the temperature of the lubricating oil using the thermosetting thermometer; Temperature measurement using thermocouples thermometers; Airborne Speed Measurement (magnetoinductive tachometers); The flight parameter recording system (SARPP-12).Project: Designing an OIL MANOMETER to equip a helicopter; Designing an OIL MANOMETER for equipping a three-engine courier airplane; Designing an OIL MANOMETER for equipping a hunting plane - single subsonic bombardment; Designing an OIL MANOMETER for equipping a turboprop bimonth transport; Designing an OIL MANOMETER to equip an IAR-93 aircraft; Designing an OIL MANOMETER designed to equip a quadrimotor transport aircraft; Designing an OIL MANOMETER for equipping a hunting plane - supersonic bomber bombardment; Design of a DOUBLE GAS MOTOR THERMOMETER designed to equip a helicopter with two turbo engine; Design of a DOUBLE GAS MOTOR THERMOMETER for equipping a hunting plane - supersonic bomber bombardment; Design of a DUAL GAS MOTOR THERMOMETER for equipping a bimotor transport aircraft; Designing a DOUBLE GAS MOTOR THERMOMETER for equipping a bomber hunting jet aircraft; Designing a DOUBLE GAS MOTOR THERMOMETER designed to equip a four-way turboprop; Designing a DOUBLE GAS MOTOR THERMOMETER designed to equip a supersonic single-engine hunting plane; Design of a DOUBLE GAS MOTOR THERMOMETER designed to equip a three-engine transport aircraft; Designing an OIL MANOMETER to equip a helicopter; Designing an OIL MANOMETER for equipping a three-engine courier airplane; Designing an OIL MANOMETER for equipping a hunting plane - single subsonic bombardment; Designing an OIL MANOMETER for equipping a turboprop bimonth transport; Designing an OIL MANOMETER to equip an IAR-93 aircraft; Designing an OIL MANOMETER designed to equip a quadrimotor transport aircraf.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 1ST SEMESTER

COURSE TITLE: AIRCRAFT AUTOMATION I

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineers with the objective presenting students with the automation systems present on subsonic and supersonic

aircraft, mathematical models, calculation and design elements of these systems, analysis of dynamic processes, their construction and operation.
COURSE CONTENTS: Course: Automatic air intake cone position and anti-drift vane control system. Other tracking systems; Automatic positioning system for reagent nozzle positioning; Altitude corrector and positioning systems; Flow Acceleration System In the flap limit layer; Automatic defrosting systems (anti-slip systems); Automatically adjust the effectiveness of the longitudinal control; Automatic flight control systems. Seminar: Automatic air intake cone position control system; Automatic control system for anti-dive vouchers; Automatic positioning system for reagent nozzle positioning; Automatic control of the efficiency of the longitudinal control; Altitude correction system; Coordination system; Non-linear positioning system. Laboratory: Automatic systems for adjusting the effectiveness of the longitudinal flight control; Catapult and its control systems; Automatically control the position of the air intake cone and the vane counters; Reactive Nozzle Position Adjustment Systems; Altitude corrector; Automatic brake-defrost electropneumatic system; ANTISKID electrohydraulic system; The ASL system.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ON-BOARD ELECTRICAL INSTALLATIONS I

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of electrical installations on board aircraft.
COURSE CONTENTS: Course: Power board systems; Organization of onboard electrical networks; Methods of calculating the onboard electrical networks d.c; Electrical calculation of c.c. on board; Electro-electrical board electrical protection equipment; Calculation of electrical networks a.c; Electrochemical sources for aircraft. Laboratory: Laboratory safety standards; Components of the on-board electrical installation; Landing light for aircraft; Control group control system; ST-2 electrostatic starter; Starter-starter electrical start-up device GSR-ST-12000VT (starter mode); Operation of PO single-phase rotary converters; Operation of three-phase rotary type PT motors; PRND launch station; Starting turbojet engines using aerodrome and on-board power supplies; A system for controlling, protecting and automatically regulating the voltage of the on-board DC generators. Project: Designing a DC power system (SSE) and power supply for an IAR-99 type airplane; Designing an AC power system (ACS) and power supply for a MIG-21 type airplane; Designing a DC power system (SSE) and supply network for a BAE HAWK T.MK.21 aircraft; Designing a DC power system (SSE) and supply network for an aircraft type L 39; Designing a DC power system (SSE) and supply network for an A-4 SKYHOWK aircraft; Designing a DC power system (SSE) and supply network for an ALPHA JET type airplane; Designing a DC power system (SSE) and power supply for a BAC 200 aircraft.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: FLIGHT CONTROL SYSTEMS I

COURSE OBJECTIVE(S): The discipline contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to pressurization systems, air conditioning systems, oxygen and fuel.
COURSE CONTENTS: Course: Automating the management process; Automatic control of longitudinal and lateral loading; Automatic altitude control; Flight speed control systems; Automatic landing movement command of the airplane. Laboratory: Static automatic flight angle control system, E.E. with rigid reaction and driving law of type P.D. called Matlab/ Simulink blocks; Static automatic steering angle control, without constraining flight speed, E.E. with rigid reaction and driving law of type P.D. Matlab/ Simulink block schematics; Astatic automatic cruise control angle control system, E.E. with Angle Speed Reaction and P.I.D. Matlab/ Simulink block schematics; Static automatic steering angle control system with slip angle constraint, E.E. with rigid reaction and driving law of type P.D. Matlab/ Simulink block schematics; Astatic automatic steering angle control system with skid angle constraint, E.E. with Angle Speed Reaction and P.I.D. Matlab/ Simulink block schematics; Static automatic steering angle control system, without constraining angle of slip, E.E. with rigid reaction and driving law of type P.D. Matlab/ Simulink block schematics; Automatic steering angle steering system, without constraining the skidding angle, E.E. with Angle Speed Reaction and P.I.D. Matlab/ Simulink block schematics; Static automatic roll control system with E.E. with rigid reaction and driving law P.D. Matlab/ Simulink block schematics; Assatic automatic control of the roll angle, with E.E. with reaction at angular speed and driving law P.I.D. Matlab/ Simulink block schematics; Astatic automatic flight speed control system. Matlab/ Simulink block schematics; Astatic automatic flight altitude control system. Matlab/ Simulink block schematics; Static automatic control of the lateral movement. Matlab/ Simulink block schematics. Project: Computer-aided study of an automatic cruise control system, flight speed constraint, E.E. with rigid reaction and driving law of type P.D. - light airplane, medium plane, heavy airplane; Computer-assisted study of a Static Automatic Cruise Control System, without constraining flight speed, E.E. with rigid reaction and driving law of type P.D. - light airplane, medium

plane, heavy airplane; Computer-aided study of an automatic cruise control system, with flight velocity constraint, E.E. with Angle Speed Reaction and P.I.D. - light airplane, medium plane, heavy airplane; Computer-aided study of a static steering angle automatic steering system, E.E. with rigid reaction and driving law of type P.D. - light airplane, medium plane, heavy airplane; Computer-aided study of an automatic steering angle steering system with skidding constraint, E.E. with Angle Speed Reaction and P.I.D. - light airplane, medium plane, heavy airplane; Computer-aided study of a static automatic steering angle control system, without constraining the slip angle, E.E. with rigid reaction and driving law of type P.D. - light airplane, medium plane, heavy airplane; Computer-aided study of an automatic steering angle steering system, without constraining the skidding angle, E.E. with Angle Speed Reaction and P.I.D. - light airplane, medium plane, heavy airplane; Computer-assisted study of a static automatic rotation angle control system with E.E. with rigid reaction and driving law P.D. - light airplane, medium plane, heavy airplane; A computer-assisted study of an automatic automatic rotation angle control system, with E.E. with reaction at angular speed and driving law P.I.D. - light airplane, medium plane, heavy airplane.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AEROSPACE NAVIGATION SYSTEMS

COURSE OBJECTIVE(S): The course and laboratory activity aims to acquire specialized knowledge and skills regarding the structure and functioning of the aerospace navigation systems: principles of position determination with aerodynamic methods, Doppler and satellite system; NAVSTAR/ GPS; aerodynamic navigator theory; theory of Doppler navigators; NAVSTAR/ GPS System Theory. The laboratory has the role of fixing the theoretical knowledge and of understanding the phenomena through analyzes using the Matlab environment, the operation of local or global navigation systems from the above mentioned categories.
COURSE CONTENTS: Course: Aerodynamic navigation method; Determination of coordinates based on information obtained from the Doppler system; NAVSTAR/ GPS global navigation system. Laboratory: Aircraft components relative to different reference systems; Three-dimensional SAN in rectangular coordinates; Two-dimensional SAN in conventional horizontal coordinates; Two-dimensional SAN in geographic coordinates; Bi-dimensional SAN in horizontal polar coordinates; Simulating a Doppler navigation system; Positioning techniques using TDOF and cross-correlation; Positioning techniques using triangulation and TOF; Generate pseudo-alert codes; Position determination with a GPS receiver coupled with a PC on RS – 232; Aircraft components relative to different reference systems.
LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 2ND SEMESTER

COURSE TITLE: AUTOMATION OF THE FLYING OBJECTS II

COURSE OBJECTIVE(S): The discipline contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to pressurization systems, air conditioning systems, oxygen and fuel.
COURSE CONTENTS: Course: Atmospheric and physiological conditions of high altitude flight. Technical assurance of high altitude flight; Pressurizing hermetic cabins; Pressure regulation in hermetic cabins; Automatic air temperature control in aircraft cabinets (air conditioning systems); Automatically adjusting the oxygen concentration in the helmet and in the pilot's suit (oxygen installations); Fuel systems. Laboratory: Automatic air pressure control systems in the cabin for supersonic aircraft; Air temperature control systems In cabin with nonlinear controllers; Air temperature control system In cabin with electronic regulator RTC; The oxygen concentration control system in the helmet and in the costume for supersonic aircraft; Fuel systems; Oxygen concentration control system In headset and In suit for subsonic aircraft; Automatic air pressure control system In cabin for subsonic aircraft; Propeller pitch adjustment systems; Positioning systems.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AUTOMATIC PILOT CONSTRUCTION

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the divergence of driving laws that ensure the stabilization and control of the various parameters characterizing the movements of the aircraft.
COURSE CONTENTS: Course: Optimal motion control of flight machines: The quadratic linear problem formulation (LQP); - Solving Riccati equations by a Newton-Raphson algorithm; The ALGLX algorithm for calculating the amplification matrix; The ALGLP algorithm for stabilizing aircraft when taking into account the perburms; ALGLY algorithm for calculating the amplification matrix; Parametric estimation system and discreet optimal control of A; Designing optimal controllers using the Ackermann formula; Algorithm for determining matrix of amplification of automatic control systems according to the state vector (ALG_00K algorithm). Adaptive motion control of flight machines: Adaptive driving structures; Neuro-adaptive ordering hierarchy structures; - Identify dynamic

aircraft models using neural networks; Dynamic inversion of nonlinear systems; - Adaptive controllers with linear dynamic compensators and neural networks; Adaptive command systems for aircraft movements using neural networks. Airplane flight control using the backsight method - Reverse step method of integrator type: Backward generic method; Use the back step method to stabilize the aircraft when parachuting loads; Control the attitude of mini UAVs using the step back method. Laboratory: Implementation of the ALGLX algorithm in 2 cases of movement (longitudinal and lateral) of an aircraft; Implementation of the ALGLP algorithm in 2 cases of movement (longitudinal and lateral) of an aircraft; Implementation of the ALGLY algorithm in 2 cases of movement (longitudinal and lateral) of an aircraft; Designing optimal controllers using the Ackermann formula; Implementation of the algorithm ALG_00K in 2 cases of movement (longitudinal and lateral) of an aircraft; Computer-aided design of adaptive controllers with linear dynamic compensators and neural networks; Computer-aided design of the adaptive command system for longitudinal aircraft movement using neural networks; Computer-aided design of the helicopter pitch control system using the dynamic inversion principle; Computer-aided design of an adaptive flight attitude and speed control system using dynamic inversion; Ultra-Stick 25E mini UAV control using the step back method; Sekwa mini UAV's attitude control using the step back method.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ON-BOARD ELECTRICAL INSTALLATIONS II

COURSE OBJECTIVE(S): Contributes to the formation of future aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the composition, characteristics, operation and operation of electrical installations on board aircraft.

COURSE CONTENTS: Course: Generators of d.c. for aircraft; Automatically adjust the voltage of the generators on board; Functioning in parallel with d.c. sources of on board; Command and protection of on-board electrical power sources; Production of alternativ current on board aircraft; Automatic adjustment of synchronous generators; Automatic start of aircraft engines; Uses of electricity on board. Laboratory: Powering and starting turbojet engines of IAR-93 type subsonic aircraft; Starting the turbo engine; On-board DC power supply onboard MIG-2 supersonic aircraft; MIG-21 supersonic aircraft type control system; Tester for checking the KAF equipment in the automatic control system of the turbo engine operating systems; Tester for checking the KPR-15 equipment of the automatic control system of the turbo engine operating systems; Tester for checking the DMR, AV-7 44, AZP, AZS, contactors and relays of the turboreactor starting electrical system; Anti-jam system; A d.c. of the IAR-93 type aircraft electrical networks; Electrical startup of VIPER motors.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AEROSPACE GUIDANCE SYSTEMS

COURSE OBJECTIVE(S): It contributes to the formation of future aerospace engineers, aiming at the students' knowledge of the principles and methods of routing, the equipment and the structure of the steering systems, as well as of the systems of stabilization of the flight instruments.

COURSE CONTENTS: Course: Methods of routing: General notions on methods and routing systems; Kinematic equations and kinetic trajectories by direct method in two points; Equations and kinematic trajectories by parallel approach method. Flight devices as subsystems of routing systems: The motion equations of the table center in the vertical plane; The equations of motion of the flying device around the center of the table in the plane vertical; Equations of space flight of the aircraft in real and complex description; Flight control devices. The equipment and structure of the routing systems: Coordinators; Steering heads; Laws on the formation of routing signals; Motion equations and the structure of two-point guidance systems; Parallel approach method. Dynamics of two-point flight control: Dynamic features of direct self-management in two points; Dynamic characteristics of self-management by the parallel approach method; Dynamic features of direct forward guidance. Laboratory: The computer-assisted study of the dynamics of a vertical stabilization system for cross-sectioned rocket missiles using a free gyroscope; Computer-aided study of the dynamics of a vertical stabilization system for cross-sectioned missile missiles using a free gyroscope with correction network; Computer-aided study of a dynamic balistic rocket stabilization and carrier rocket system; Angular rocket stabilization systems using a differential gyroscope; Computer-aided study of the dynamics of rocket stabilization systems with integrated gyroscopes and accelerometers; Differential gyroscope rocket stabilization systems and proportional integrator correction network (PI), made by connecting an ideal integrator with an amplifier.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: ENVIRONMENT ENGINEERING
PROGRAMME TITLE: ENGINEERING AND EVIRONMENT PRTECTION IN INDUSTRY
BACHELOR'S DEGREE

3RD YEAR, 1ST SEMESTER

COURSE TITLE: COMMUNICATIONS

COURSE OBJECTIVE(S): Students acquire knowledge of communications systems, standards and protocols used, and their use in monitoring environmental parameters.
COURSE CONTENTS: Course: Introduction to communications. Structure of communication systems. Hierarchy of communication structures in industrial environment. Levels of a communication system; Study of the ISO reference model; Physical level study in communication systems. Propagation media. Wifi technologies. Optical fiber communications. Influence of environmental parameters on communication systems; Ethernet protocol; Industrial protocols. Profibus and Profinet protocols; Radio communications. Study of analog and digital radio systems. RFID technology; The Internet and communication technologies. VPN networks; Mobile communications. GSM system. Structure. Operation. Applications; Satellite communications. Structure. Operation. Applications. GPS system. Laboratory: Remote radio transmission of environmental parameters; Fiber optic communication system; Wireless control of a mobile robot; Study of a GSM communication module; Establishment of a serial communication system RS-232; Study of an Ethernet communication system for remote control; Study of global positioning solutions; Study of AT commands for the RIL module; Study AT commands to connect to the Internet network; Data Security elements of communication systems; Study of RFID technology; Study of industrial communications networks.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTROMECHANICAL CONVERTERS

COURSE OBJECTIVE(S): Introduction, understanding and deepening of fundamental concepts of electromechanical converters, very much used in systems engineering applications. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: General concepts of electric cars; Electric transformer. Constructive elements, operating principle and transformer equations, phasorical diagrams and equivalent schemes. Transformer operating queens: naked, short circuit and load. Parallel coupling and operation of transformers. Operation in non-symmetrical load of transformers; Asynchronous machine. Elements constructive principle and operating regimes. Equations of the asynchronous machine, phasor diagrams and equivalent schemes. Mechanical characteristics, start, speed control and braking of asynchronous motors; Synchronous machine. Constructive elements, principle of operation, equations and phasorical diagrams of synchronous generators. Electromagnetic torque and static angular characteristic. Coupling and parallel operation of synchronous generators. Synchronous motors: equations, operating characteristics and starting methods; DC machine.Constructive components, Generator c.c. derivation. Cc motors: mechanical characteristics, starting, adjusting speed and braking. Laboratory: Work safety training. Presentation of the laboratory; Study of three-phase electric transformers: schemes and groups of connections; The efficiency of the transformer determined by the direct method; Coupling and parallel operation of three-phase transformers; The three-phase asynchronous motor operating characteristics (direct method); Determination of the asynchronous motor efficiency by the indirect method; Adjusting the speed of asynchronous motors by the rheostatic method; Self Synchronous Generator Study; Start-up and V-sync features of the synchronous engine; Coupling and parallel operation of synchronous generators; Study of the c.c. with separate excitation; Study of the c.c. with excitation bypass; Study of the c.c. with series excitation; Final assessment of laboratory activity
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STATIC CONVERTERS AND ENVIRONMENT I

COURSE OBJECTIVE(S): Acquiring basic knowledge on the using the power semiconductor devices in the structure of the power static converters, as well as on the principles, operation, performances, design and impact on the environment of the Alternating Current) AC/ (Direct Current) DC static converters, with applications in the environmental engineering.
COURSE CONTENTS: Course: The place of the static converters in the energy flow. Characterization of the electrical energy at the output of a power static converter. Classification of the static converters. Quantification of the environmental impact. Applications of power static converters in the environmental engineering; Power semiconductor devices: characteristics and control; Losses in power semiconductor devices. Choice and thermal verification of the power semiconductor devices. Managing the dissipated heat; Protection of the power semiconductor devices against switching over-voltages, external over-voltages and over-currents; General theory of the controlled rectifiers with natural commutation: principle scheme; operation; natural commutation point; no-load average output voltage; operation regimes; commutation process; average output voltage

taking into account the commutation; control and voltage versus current characteristics; control methods; quality indicators; Practical schemes of controlled and half-controlled rectifiers, with natural commutation and reduced negative impact on the environment; Bidirectional rectifiers with natural commutation; Control of the rectifiers with natural commutation; Rectifiers with reduced energy consumption and improved impact on the environment. Laboratory: Study of the control circuit and switching characteristics of the Gate Turn-Off thyristor (GTO); Study of the control circuit and switching characteristics of the Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET); Study of the phase angle control of the rectifiers; Study of the full-wave control of the rectifiers; Study of the Pulse Width Modulation (PWM) based control of the rectifiers; *The model - based study of the single-phase* half-controlled bridge rectifier; *The experimental study of the single-phase* half-controlled bridge rectifier; *The model - based study of the single-phase* full-controlled bridge rectifier; *The experimental study of the single-phase* full-controlled bridge rectifier; *The model - based study of the three-phase* full-controlled bridge rectifier; *The experimental study of the three-phase* full-controlled bridge rectifier; Study of the bidirectional rectifier.Project: Design a practical scheme of rectifier; Power scheme, operation and idealized waveforms of the main quantities; Calculation of the characteristic quantities; Choice of the power semiconductor devices; Thermal verification of the power semiconductor devices; Choice and calculation of the protection circuits; Control circuit.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: WATER ENGINEERING

COURSE OBJECTIVE(S): Students are acquiring knowledge about the theoretical support to analyse the notions of water management and water treatment (water sources, water characteristics, water uses, water pollution and water pollution implications, wastewater treatment and purification techniques, etc.), as well as training the practical skills of applying the basic methods of technological calculation of urban and industrial wastewater treatment plants and the use of specific laboratory equipment.

COURSE CONTENTS: Course: Water Engineering: Object and Issue, "Water Engineering". Water cycle in nature. Hydrological balance; Water Hydrometric: Dynamics of Water. Measure the speed of the river water. Determination of water flow; Water economy. Quantity and quality of water for various uses. Water consumption norms; Water Hydrophysics: Water and its general properties: molecular structure of water, physical and organoleptic properties (temperature, turbidity transparency, color, density, conductivity, radioactivity, taste, smell); Water Hydrochemistry: Chemical properties of water (water action on metals, nonmetals, oxides, electrochemical neutrality, acidity, fixed residue, hardness, pH, salinity); Water quality indicators (suspensions, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand); Pollution of water (sources of pollution, typology of pollution). self-cleaning; Water management: Methods of analysis and control of polluting substances in waters; Design of water treatment processes and treatment of industrial wastewater (pre-feasibility / feasibility studies, classical wastewater treatment plants, selection of industrial wastewater treatment scheme, calculation of required wastewater treatment); Unit processes for the physico-chemical treatment of waste water: sedimentation, settling, filtration; Physical and chemical wastewater treatment plant and equipment (grates, separators, trowels, screens, filters); Unit processes for the physico-chemical treatment of waste water: flocculation, osmosis, neutralization, etc; Procedures and equipment for biological treatment. Laboratory: Work instructions in the laboratory "Environmental Factors Engineering". Laboratory Safety Techniques for Laboratory Work; Hydrochemistry. Applications: Fundamental parameters. Measurement units; Hydrophysics. Applications: Measurement of physical parameters. The relationship between the system and the external environment; Establishing the characteristics of a surface water. Water sampling; Determination of ammonium content of water samples; Determination of nitrite content of water samples; Determination of nitrate content of water samples; Determination of phosphate content of water samples; Determination of iron content of water samples; pH determinations; Water hardness; Electrolysis and osmosis; Sedimentation study. Magnetic filtration; Recovery of laboratory work. Verification test. Project: Investment project: Choosing and defining the design theme and the context; Calculate the required purification degree (efficiency); Choosing the treatment method and establishing the purification plant scheme; Calculation elements for grate dimensioning; Calculation elements for sizing decanters; Calculation elements for sizing filters; Project presentation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TRANSLATORS, INTERFACES AND DATA ACQUISITIONS

COURSE OBJECTIVE(S): Study of electrical transducers, interfaces and data acquisition systems on: architectures, signal conditioning circuits, analog-to-digital and analogue-to-analog converters, and software for data acquisition. The lab has the role of fixing theoretical knowledge and creating practical skills for application development using virtual instruments.

COURSE CONTENTS: Course: Electrical transducers; Communication interfaces; Data acquisition systems; Modules for data acquisition; Data acquisition with LabVIEW 8.5 and with LabVIEW SignalExpress. Laboratory: Labor protection training; Presentation of laboratory work; Study of resistive transducers; Study of numerical transducers; Introduction to LabVIEW; Elements of the front panel of a virtual instrument. Controls window; Block diagram elements of a virtual tool. Function Window (Functions); Creating, editing, and correcting a Virtual Instrument; Creating and using SubVIs; Analog switches - Applications: Numerically programmed voltage divider; Automatic switching of amplifier factor; Numerical-analogue data conversion circuits - DAC 08; Analog-numeric data conversion circuits - CAN with successive approximations; Analog-digital data conversion circuits: three-digit integrated voltmeter; LabVIEW applications for data acquisition and generation; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

3RD YEAR, 2ND SEMESTER

COURSE TITLE: ELECTROMECHANICAL CONVERTERS II
COURSE OBJECTIVE(S): Introduction, understanding and deepening of the basic concepts of electromechanical converters II. The basic equations, their operating characteristics and test methods are presented.
COURSE CONTENTS: Course: Synchronous machine: constructive elements, operating range and industry response. Operation equations and phasorical diagrams of synchronous generators. Power, electromagnetic torque and static angular characteristic. Parallel coupling and operation of synchronous generators. Operation in non-symmetrical load of synchronous generators. Synchronous motors: phasorical equations and diagrams, operating characteristics, starting methods. Synchro compensator. The geometric location of the synchronous machine current; DC machine: construction elements, DC coils, t.e.m. induced and electromagnetic torque. Direct current generators: with separate excitation, intermittent and mixed: operating characteristics. DC motors: with separate excitation, derivation, series and mixed: functional and mechanical characteristics. Starting, speeding and braking of DC motors. Laboratory: Work safety training. Presentation of the laboratory; Self Synchronous Generator Study; Starting and operating characteristics of the synchronous motor; Starting and curves in V on the synchronous motor; Parallel coupling and operation of synchronous generators; Determining the parameters of the synchronous machine in symmetrical stationary mode; Determining the parameters of the synchronous machine in unstable stationary mode; Study of the c.c. with separate excitation; Priming and studying the c.c. with dithering excitation; Study of the c.c. with mixed excitement; Study of the c.c. with dithering excitation; Study of the c.c. with excitement series; Study of the c.c. with mixed excitement; Final assessment of laboratory activity. Project: Assignment of project themes (low-voltage three-phase asynchronous motor with short-circuit rotor); Calculation of the main dimensions; Dimension of stator windings and rotor; Magnetic circuit dimensioning, magnetization current determination; Calculation of machine parameters (resistors and reactants); Calculation of losses and operating characteristics; Supporting and evaluating projects.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: STATIC CONVERTERS II
COURSE OBJECTIVE(S): Knowledge of the construction, operation and design of static converters c.a.-c.a., c.c.cc.c. and c.c.-c.a.
COURSE CONTENTS: Course: STATIC CONVERTERS C.A.-C.A. WITH NATURAL COMUTATION: Single-phase alternating voltage variator; Principle, scheme (triac and thyristor), operation; Waveforms and specificities depending on the type of task; VTA three-phase; applications; Problems solved. Cicloconvertoare; Principle, scheme, operation, waveforms; STATIC CONVERTERS C.C.-C.C: DC low voltage (Buck); Principle, schema of principle, operation, modalities of command; External and command features. Problems solved; High Voltage Continuous Voltage (Boost) Voltage Transducer; Principle, schema of principle, operation, command; External and command features; Problems solved; Voltage switch continues in four dials; Scheme; Control variants; Applications; STATIC SWITCH-OFF CONVERTERS C.C.-C.A. AND C.A.-C.A .; Static voltage and frequency converters; Inverters principle; One-phase voltage inverter; Characteristic dimensions; Static three phase voltage converter and indirect voltage frequency with amplitude modulation; Problems solved; Static voltage and frequency converters with time modulation; The principle of modulation in duration; Types of sinusoidal modulation for single-phase inverters; Static three phase voltage converter and indirect voltage frequency with time modulation; Other modulation strategies over time (in frequency, vector, bang-bang, pre-calculated). Laboratory 1: One-phase VTA study; The voltage variation study continues downward; Continuous elevation voltage variance study; Frequency modulation voltage inverter study; Continuous modulation voltage inverter study; Study and parameterization of an industrial inverter; Testing. Laboratory 2: A forced static (VTC or inverter) static converter will be designed; The force scheme and the calculation of the characteristic quantities; Choosing and checking the transistors; Design of overcurrent protection;

Synthesis and digital design of the control circuit; Support and evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AIR CONDITIONING SYSTEMS

COURSE OBJECTIVE(S): Familiarizing students with aeraulic and thermal phenomena in refrigeration and air conditioning plants by: knowledge of techniques and equipment for obtaining artificial air and air conditioning; the formation of analytical, synthesis and comparison skills to ensure the ability to accurately assess the results of specific climate determinations performed on a numerical model, on an experimental or on-site basis.

COURSE CONTENTS: Course: Thermodynamic sizes and processes; Heat transmission elements and fluid flow. Wet air characteristics; Technics for obtaining low temperatures; Mechanical steam compressors; Evaporator feed schemes. Refrigerating compressors; Climate systems with absorption, ejection and thermoelectric; Automatically adjust physical size; Automatic air conditioning protection; General and Specialized Equipment for Air Conditioning; Ventilation and air conditioning structures. Laboratory: Refrigerator refrigerator study; Absorption refrigerant study; Air conditioning study; Study of the refrigeration plant and thermoelectric (Peltier); Determination of the main characteristics of a mechanical compressor system with vapor compression; Determining the parameters of the White-Westinghouse air conditioning equipment; Study of the air conditioning of a car; detecting defects and remedying them; Automatic temperature adjustment in a refrigeration and air conditioning system; Complex air treatment in an air conditioner; Experimental determination of the characteristics of electrical and textile filters; Experimental determination of pressure variation in air channels; Cooling the air with a refrigerant battery; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ECOLOGICAL MANAGEMENT II

COURSE OBJECTIVE(S): Acquiring knowledge on sustainable development by stimulating creativity and skills development of students based on a synthesis of theoretical and experimental results, in order to design eco-products.

COURSE CONTENTS: Course: Environment protection - a key priority for the European Union; Environment law elements; Sustainable development in international context; Ecotechnologies and ecoproducts; Romania politic concernng environment protection; International Organization for Standardization (ISO) and environment protection; ISO 9000 and ISO 14000 standard families presentation. Seminar: Basic elements of ECODESIGN software; ECODESIGN drawing sheet for an ecoproduct; Basic elements of ECO-BILAN software; Study concerning the impact of product / ecoproduct on environment by using ECO-BILAN software; Product life cycle analysis; Pollution study (emissions / noise) in Oltenia Region; Proposing solutions for sustainable development in SW Oltenia region. Laboratory: Stage 1: Analyze and familiarize with the project theme/Teams constituting; Brainstorming: Team name / Slogan, Business profile / Company name / Logo, Product choosing; Stage 2: Gantt Diagram elaboration; Stage 3: Company presentation; Stage 4: Competitor analyze, Target group setting. Design, implementation and interpretation of questionnaires, Product Overview - Presentation of innovative ideas (EcoProdus), Filling worksheets and strategic diagram for an ecological design, Design elements, ECODESIGN Sheet elaboration: *Impact toward environment analysis sheet*, according the product type (A, B, C, D, E), Study concerning the product impact toward environment by using ECO-BILAN software, Product life cycle analyze; Stage 5: SWOT analyze; Proposal for sustainable development solutions: Company's environment politic, Eco – responsability, Company's strategy for a sustainable development (Work Sheet); Stage 6: Power Point presentation design Stage 7: Project presentation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SENSORY SYSTEMS IN ENVIRONMENTAL ENGINEERING

COURSE OBJECTIVE(S): Acquiring fundamental notions about the construction and operation of the main sensors and sensory systems used by modern environmental quality monitoring systems.

COURSE CONTENTS: Course: General aspects of sensors and sensing systems: definition, block diagram, types, static and dynamic features; Classification of sensors and functions of sensory systems used in environmental engineering; principles and methods of measurement; metrological characteristics of sensory systems; the place of the sensory block in modern environmental quality monitoring systems; Types of sensors used in environmental quality monitoring systems (inductive, capacitive, resistive, chemical, optical, etc.): structural and principal schemes; constructive elements; selecting, checking and calibrating sensors used in environmental engineering; Electronic adaptive circuits - conditioning - signal processing provided by sensors used in environmental engineering. Smart sensors; Sensor elements used in modern air monitoring equipment; PM analyzer with TEOM 1405 DF / Thermo Scientific accessories; • SHARP 5030i Suspension Powder Analyzer. Laboratory: Labor protection training; presentation of the laboratory / works, organization of working groups; Study of temperature sensors with: thermocouple, thermoresistance, semiconductors; Study of humidity sensors; Study of gamma radiation sensors (Geiger Muller counter); Study of sensors for measuring the emission of gases; Sensor system with microcontroller μC for gamma radiation measurement; Analog sensor system for measuring the emission of gas; Using the LabVIEW programming environment to model a sensory system; Photovoltaic sensors for measuring solar radiation; Conditioning and data acquisition circuits used in sensory systems in environmental engineering; Calibration of a temperature sensor used in a microprocessor sensing system μP; Calibrating a moisture sensor used in a microprocessor sensing system μP; Virtual Measurement System for Solar Radiation Measurement; Final assessment of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ELECTRIC DRIVES I

COURSE OBJECTIVE(S): Determination of the functional interdependence between the electric motor and the working machine in order to choose the electric drive motor, the starting method, the speed control method, the braking method and the determination of the corresponding parameters.

COURSE CONTENTS: Course: Introduction; Static characteristics of working machinesDefinition of static characteristics of working machines: Signing and movement of energy convention; Static static couples; Angular speed-dependent static couples Static couples dependent on linear displacement; Static torque-dependent static couples. Static torque diagram: Classification of working machines according to static torque diagram; Determining the Static Torque Diagram from Experimental Data; Basic equations of motion in electromechanical drive systems: Fundamental equation of motion; Reporting static torques and static forces; Reporting moments of inertia and masses; Motion diagrams of electromechanical drive elements; Choosing and checking the power of electric drive motors: Heating and cooling of electric motors; The principle of choosing the power of electric motors; Typical services of electric motors; The general algorithm for selecting and checking the power of electric drive motors; Selection and verification of engine power for S1, S2, S3, S4, S5, S6, S7, S8 engines; Mechanical electromechanical drives with separate excitation motors: Mechanical and electromechanical static characteristics Analyzing methods and determining parameters for starting electromechanical drives with DC motors with separate excitation; Analysis of methods and determination of parameters for adjusting the velocity of electromechanical actuations with DC motors with separate excitation; Determination of parameters for electric braking of electromechanical drives with separate excitation DC motors; Analysis of the dynamic regime of electromechanical actuations with separate excitation DC motors; Electromechanical drives with three-phase asynchronous motors: Static characteristics of asynchronous motor electromechanical drive; Determination of parameters of the natural mechanical characteristic; Determination of parameters for starting of electromechanical actuations with asynchronous motors; Determination of parameters for adjusting the speed of electromechanical actuations with asynchronous motors; Determining parameters for braking electromechanical actuations with three-phase asynchronous motors; Analysis of the dynamic regime. Laboratory: Laboratory methodology; Experimental determination of static parameters and characteristics at start of electromechanical actuations with m.c. with separate excitation; Experimental determination of static parameters and characteristics at start of electromechanical actuations with m.c. with excitement series; Experimental determination of parameters and static characteristics at start of electromechanical actuations with m.a; Experimental determination of static parameters and characteristics in controlling the speed of electromechanical actuations with m.c. with separate excitation; Experimental determination of static parameters and characteristics in controlling the speed of electromechanical actuations with m.c. with excitement series; Experimental determination of static parameters and characteristics in regulating the velocity of electromechanical actuations with m.a; Experimental determination of parameters and static characteristics at braking of electromechanical actuations with m.c. with separate excitation; Experimental determination of parameters and static characteristics at braking of electromechanical actuations with m.c. with excitement series; Experimental determination of parameters and static characteristics at braking of electromechanical actuators with m.a; Numerical simulation of the transient regime at starting and braking electromechanical actuators with m.c.c with separate excitation; Numerical simulation of the transient regime at starting and braking electromechanical actuators with m.c.c with series excitation; Numerical simulation of the transient regime when starting and braking electromechanical actuators with asynchronous motor.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER QUALITY AND ELECTROMAGNETIC COMPATIBILITY

COURSE OBJECTIVE(S): Acquiring basic knowledge on the disturbances in electrical networks, power quality indicators, increasing the efficiency of

electricity consumption, environmental effects and means of reducing the harmonic and electromagnetic pollution of the environment.
COURSE CONTENTS: Course: Disturbances in electrical networks and their impact on the environment; Power quality indicators; Characterization in terms of energy of the nonsinusoidal regime. Harmonics theory; ncreasing the efficiency of electricity consumption - means of mitigating the negative impact on the environment; DC power supply systems for industrial consumers. "Clean" systems; AC power supply systems for industrial consumers. "Clean" systems; Methods of increasing the efficiency of power transmission: network reactors, passive filters, active filters; Fundamentals of electromagnetic compatibility; Electromagnetic pollution of the environment: electromagnetic disturbances; biological effects; antiperturbative measures. Laboratory: Analysis of the harmonic pollution generated by the DC drive with single-phase controlled rectifier; Analysis of the harmonic pollution generated by the DC drive with single-phase half-controlled rectifier; Analysis of the harmonic pollution generated by the DC drive with three-phase controlled rectifier Analysis of the harmonic pollution generated by the AC drive with asynchronous motor and indirect frequency static converter with pulse width modulation; Analysis of the harmonic pollution generated by the AC drive with asynchronous motor and indirect frequency static converter with harmonics mitigation; *Model - based study on the influence of the DC-link circuit of an* indirect frequency static converter with single-phase rectifier on the harmonic pollution; *Model - based study on the influence of the DC-link circuit of an* indirect frequency static converter with three-phase rectifier on the harmonic pollution; Numerical analysis of the influence of the network inductance on the harmonic pollution in the AC drives with PWM indirect static converters; Analysis of the active power filtering in the harmonic pollution mitigation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HYDRAULIC AND RENEWABLE ENERGY

COURSE OBJECTIVE(S): Acquiring fundamental notions about energy resources and systems that use these resources.
COURSE CONTENTS: Course: Energy resources; Hydraulic energy conversion; Converting highmotor energy; Wave energy conversion. Conversion of marine current energy; Geothermal energy conversion; Biomass conversion. Laboratory 1: Labor protection and laboratory presentation; Turbidity of the attraction flow of a fish pass; Drinking water between two tanks; Hydroelectric power plant on medium water drop; Hydraulic low drop systems; Connect the CHE synchronous generators to the grid. The study of the synchronous generator operating in high-power hydraulic systems; Self-synchronous synchronous generator in low power hydraulic systems; Asynchronous generator study; Pelton Turbine (I); Pelton turbine test (II); Testing of the Francis turbine; Study of a mini hydropower plant (I); Study of a mini hydropower plant (II); Recovering outstanding work. Laboratory 2: Presentation of the topic to be addressed during the project hours. Establishing initial data for project topics; Presentation of general criteria for selection of hydraulic turbines; Choosing the type of hydraulic turbine and sizing it for hydropower; Presentation of the criteria for the selection and sizing of biogas plants. Case Study; Presentation by the students of the elaborated papers and their evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT

COURSE OBJECTIVE(S): To familiarize students with the main concepts and practices in the field of management. To develop organizational and decision-making skills.
COURSE CONTENTS: Course: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Management information system: concept, components, functions, principles, deficiencies. Seminar: Theoretical Foundations of Management: definition, short history, processes and managerial relationships; Management functions; Managerial decision: definition, importance, characteristics. Primary factors of managerial decision; Rationality requirements for managerial decisions. Types of managerial decisions. Stages of decision-making; Structural organization: definition and importance, components; Organizational structure: classification, representation and description. Principles of organizational structure; Management information system: concept, components, functions, principles, deficiencies.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENVIRONMENTAL QUALITY MONITORING SYSTEMS

COURSE OBJECTIVE(S): Obtaining basic knowledge on the classification, principles, performance and use of environmental quality monitoring systems.
COURSE CONTENTS: Course: Environmental monitoring and IT; Environment and pollution

issues. Air, water, soil pollution: general, pollution sources, direct effects; Environmental Quality Monitoring Systems (SMCM) -Generalities; classification; structure in terms of the activities carried out and the information system; Air quality monitoring systems: objectives; stages of designing an SMC for air; implementation methods; monitored areas, measurement points, monitored variables; Techniques for air quality monitoring: LIDAR system (definition, operating principle, applications); DOAS system (definition, operating principle, applications); Water quality monitoring systems: objectives; monitoring areas; sampling; monitored variables. Soil quality monitoring, analyzes performed; Geographic information systems (GIS) - general notions; the stages of designing and implementing a GIS system; the structure of a GIS system; types of data used; applications for environmental quality monitoring; Forecasting weather systems; evolution; the structure of a weather forecasting system. Data collection; realizing numerical models of the atmosphere; comparing data with numerical models; verification of results after modeling; presentation of the end-user prognosis; the importance and beneficiaries of the activity of forecasting systems. Laboratory: Labor protection training; presentation of the laboratory / works, organization of working groups; Multifunctional AMI 300STD environment monitoring system. Overview, measuring probes; Humidity measurement study. AMI300 used as a thermo-hygrometer; Air, pressure and air flow measurement study. AMI300 used as micro-manometer and anemometer; Temperature measurement and Data Logger function for AMI300; The gamma radiation measurement study using the Gamarad DL7; Introduction to GIS GeoMedia Intergraph technology. Concepts and Foundations. Creating a GeoWorkspace; Create an Access Warehouse; working with the database; Working with thematic maps and paper objects; Creating queries in GeoMedia Intergraph. Creating buffer zones around points; Geocoding and spatial analysis. Placing labels_RAWdoc; Displaying _RAWdoc results. Drafting reports using text editing and image placement. Final Map; Presentation of other Geographic Information System (GIS): ARC-INFO ESRI, Autodesk MapGuide, Google Earth; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNOLOGIES AND EQUIPMENT FOR ENVIRONMENTAL QUALITY ASSURANCE

COURSE OBJECTIVE(S): Students acquire basic knowledge of the principles, operation, performance and use of clean technologies and equipment to ensure environmental quality. To use correctly the theories and concepts with which the theory and methodology of the curriculum in the field of environmental protection operates. To form a global and relevant vision of understanding the importance and benefits of using technologies and equipment to ensure environmental quality to continually improve compliance with environmental quality requirements. Compliance with regulatory requirements applicable to the use of clean technologies and the development of high performance equipment to ensure environmental quality. To differentiate the concepts of specific compulsory curriculum, and to derive skills in the field of environmental protection.
COURSE CONTENTS: Course: Pollution and influence of environmental factors in the use of environmental quality assurance technologies: Technologies and equipment for waste treatment; Technologies and equipment for separation and filtration; Technologies and equipment for reducing acoustic, electrical and electromechanical phenomena; Technologies and equipment to reduce pollutant emissions. Laboratory: Hardware and software analysis of sorting stations in waste sorting facilities; Hardware and Software Analysis of Dosing Installations; Analysis of waste packaging and compaction facilities; Study on the use of mobile robots in environmental protection; Modeling and simulation of the operation of electrostatic filters; Study and modeling of combustion in an incinerator. Seminar: To design the technology and to dimension the components of the plant structure of: incineration, grinding, sludge treatment, combustion gases, for the presented plant characterized by the following characteristic sizes ...; Technologies for the specified installation; Analysis of the structure and components of the installation ...; Selection of component parts of the installation structure of ...; Determination of pollution indices and determination of the concentration of pollutants for ...; Dimensioning of elements in the structure of the ...; Command and automation schemes for ....
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRIC DRIVES II

COURSE OBJECTIVE(S): Formation of skills for reading and compiling a sequential automated control scheme and a structural scheme for a DC drive system and controlled rectifiers or continuous voltage changers and a structural scheme for an asynchronous motor drive system Static converters in the stator or rotor circuit.
COURSE CONTENTS: Course: Introduction . Fundamental elements of automated electromechanical drive systems; Choice of automatic electromechanical drive systems; Electromechanical drive systems with DC motors and continuous voltage variators: Equation of mechanical characteristic; Structure of milling systems and continuous voltage variators; Adaptive

command of electromechanical drive systems with m.c. and continuous voltage variators; Electromechanical drives with direct current motors and controlled rectifiers: Analysis of electromechanical drive systems with m.c. and rectifiers ordered according to the number of dials; Energy analysis of the drive system with m.c. and rectifier ordered; Structure and operation of electromechanical drive systems with m.c. and rectifiers ordered; Structure and operation of reversible electromechanical actuation systems; Structure of optimal positioning systems; Electromechanical drives with asynchronous motors and alternating voltage variators: The principle of the drive system; Structure of the drive system; Numerical control of drive systems with asynchronous motors and alternating voltage variators; Heating system equipped with single-phase asynchronous motors and alternating voltage variator; Asynchronous motors with rotor winding to adjust speed by changing the sliding energy: Speed-dissipating systems by dissipating the sliding energy; Speed control systems for the recovery of sliding energy; Electromechanical drive systems with asynchronous motors and static converters: The principle of speed regulation; Equation of mechanical characteristic; Structure of the power part of drive systems with asynchronous motors and static converters; Asynchronous motor drive systems and static converter with variable voltage DC intermediate circuit; Asynchronous motor drive system and static DC converter; Structure of drive systems ordered on the field orientation principle; Structure of drive systems for direct torque control; Electromechanical drive systems with linear motors. Seminar: Methodology of the implementation of classical (with contacts and control relays) control schemes used for sequential control of electric drives; Reversing start sequence control by direct coupling of electric drive with m.c. and with asynchronous motors; Sequential control of the rheostatic start-up of electric actuators with m.c. and with asynchronous motors; Sequential control of rheostatic start-up of electric actuators with m.c. and with asynchronous motors; Sequential control of rheostatic start-up depending on the speed of electric drives with m.c. and with asynchronous motors; Sequential command of star-delta starting of electric drives with asynchronous motors; Identification of abnormal operating modes in sequential control schemes. Laboratory: Laboratory methodology; Automatic sequential coinage of electromechanical shareholders; Drive system with m.a. and alternating voltage variator; Electromechanical drive with asynchronous motor and static converter; Asynchronous motor drives with winding rotor for speed adjustment by sliding energy recovery (cascade); Electromechanical drive with linear three-phase asynchronous motor; Star-delta automatic start command (simulation); Experimental analysis of the transient mode for asynchronous motor operation; Study of the programming cycles for the operation of electromechanical actuators with asynchronous motor and static converters; Final evaluation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL EQUIPMENT

COURSE OBJECTIVE(S): Learning the principles of construction and operation for typical numerical equipment; knowing the hardware/ software features for microcontrollers and developing applications; knowledge of structure, operation and programming of the main industrial numerical equipments: digital controllers, programmable logic controllers and computerized numerical controls for machine tools.
COURSE CONTENTS: Course: Microcontrollers. Hardware and software features. Specific functional modules, languages and programming tools; Applications with microcontrollers for controlling servosystems and temperature control; Digital control equipment. The structure of a digital controller. Z-Transform, sampling, extrapolation. Discrete models, choice of the sampling period; Processing of signals and information in digital controllers; Digital control algorithms. Auxiliary software modules; Programmable logic controllers. Structure, modules description, operational cycle. Related input/ output devices: transducers, actuators; Programming in LADDER and using state graphs. Applications; Numerical controls for machine tools. CNC. Structure and operation. Typical blocks; Programming CNC: ISO, APT - RCV, conversational programming. Seminar: Developing programs for a CISC microcontroller (80C552); Developing programs for PIC and AVR microcontrollers. I/ O operations, timing, acquisition of analog signals, arithmetic calculation, LCD display; Discretization of continuous models (first and second order systems); Designing a digital control loop for temperature; LADDER programs for TSX (Telemecanique) and Simatic (Siemens) PLCs. I/ O operations, logical operations, timing and other function blocks; Programs in GAFCET language for PLC. From the functional Grafcet steps to associating the physical elements and programming the LADDER networks for sequential and posterior areas; Development of milling and turning programs for CNC NUM 760. Analysis of trajectories, characteristic points and technological processing data. Writing programs in ISO code. Laboratory: Presentation of laboratory, equipment and hardware/ software tools; Digital controller with multiplexer PAL22V10 - PIC16F877; Programming and operation on temperature control equipment with MCU 80C552; Programming a MIDICOM equipment by LNTOOLS software; Design of control applications with an ARDUINO platform; Programming applications in

the FLOWCODE IDE for the Ebloks modular platform; Programming the TSX 17-20 in the LADDER language; Programming and operating with an equipment based on SIMATIC S7-200 PLC; Programming the TSX 17-20 in GRAFCET language; Programming and operating of a mobile microrobot (contour and labyrinth); Temperature control equipment with an industrial digital controller (TECO) and Eblocks system; Computer aided learning for turning and milling programs with NUM Keller 760 equipment; Programming the numerically controled lathe EMCO; Final examination and scoring. Project: Every student has to design his/ her own digital equipment from the a list: PLC for environment parameters (light, humidity, temperature) and for motion control; PIC, AVR, ARM, ARDUINO based platforms for control applications in motion, temperature, humidity etc; The project theme. Steps, personalized elements, theoretical support and tools necessay, way of completion, practical achievements. Project model; Block diagram and basic principle for the designed equipment; Hardware structure design; Software design: IDE, language, simulation; Program data computing; Modules for displaying, control, power supply, actuators; Presentation and scoring.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: WIND TECHNOLOGY AND SOLAR ENERGY

COURSE OBJECTIVE(S): Acquiring basic knowledge on the operating principles of the main wind and solar energy technologies.
COURSE CONTENTS: Course: Presentation of the context and the potential of renewable energies of wind and solar nature; VALUATION OF ELEVEN ENERGY; Brief history of wind conversion, current stage; Types of wind turbines; winding classification; Structure of a horizontal axis wind; Wind power technologies (fixed speed, variable speed, variable speed); Wind turbine sizing elements; the limit of Betz; Partial variable speed technology: dual asynchronous machine, energy balance; Analysis of the operation of a wind turbine with a dual-fed asynchronous machine; SOLAR ENERGY VALUATION; Presentation of the current state; Solar thermal converters for individual use: structure, components, types of collectors; Solar thermal conversion systems: types, structure; Solar thermal converters with concentrator: overview, achievements; Photovoltaic conversion: types of photovoltaic systems, structure, components; Photovoltaic conversion: cell types, photovoltaic cell characteristics. Laboratory: Presentation of laboratory contents, rules of conduct, presentation of laboratory work; Study of the structure of a wind generator with a horizontal shaft; Study of the structure and measuring equipment related to an isolated system based on a wind generator with horizontal axis (anemometer, girder); Individual questionnaire testing on knowledge of wind conversion; Study of the structure of an unpressurised solar-thermal conversion system and energy balance of a solar thermal collector; Study of the structure of a photovoltaic system and the influence of illumination and orientation of the panels on the efficiency of photovoltaic systems; Teaching assignments, examination, final evaluation and scoring. Project: Designing a power supply system for an isolated home using photovoltaic panels; Presentation of the project theme and the stages; Choosing a location and identifying the solar potential; Determining the energy requirement of the dwelling; Choosing the structure and components of the photovoltaic system; Technical and economic assessment, duration of depreciation; Supporting the project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENVIRONMENT MODELLING AND SIMULATION

COURSE OBJECTIVE(S): Understanding physical phenomena and applying general groundwater modeling methods, calculating concentrations and speeds of pollutant displacement, pollutant displacement in the atmosphere, and risk situations (accidents).
COURSE CONTENTS: Course: Importance of environmental modeling and simulation. Examples of applications. Modeling and simulation of frequency water land: physical principles, general quantitative aspects, Darcy's law, interstitial speed equation, hydrographic maps, flow direction determination, and hydraulic gradient based on data from three wells; Modulation of air quality: physical principles, general quantitative aspects, single-dimensional and bi-dimensional diffusion, Gaussian model of the evacuation cloud; Management of dangerous materials: physical principles, risk characterization of flammable vapors, characterization of toxicity risk, structure and use of modeling programs. Laboratory: Presentation of laboratory contents, rules of conduct, presentation of laboratory work; Identification of local water sources; Identification of cases of groundwater pollution; Calculation of flow and concentrations of pollutants in aquifers; Calculation of interstitial velocity and time in aquifers using hydrographic maps; Use of hydrographic maps and determination of flow direction in aquifers; Analyze a situation of your choice using local maps; Calculation of concentration in case of gas diffusion; Exhaust cloud modeling; Simulation of the risks of an accident involving dangerous substances; Teaching assignments, examination, final evaluation and scoring.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: ENERGY QUALITY AND ELECTROMAGNETIC COMPATIBILITY IN ELECTRICAL SYSTEMS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: NONLINEAR ELECTRIC CIRCUITS - ANALYSIS METHODS

COURSE OBJECTIVE(S): The students acquire knowledge on modern and effective techniques for analysis of nonlinear and time-variable analog circuits working in various operation modes, as well as skills in creating their own numerical applications for circuit analysis. The acquired competences aim the optimal design and effective maintenance of complex electric systems.

COURSE CONTENTS: Course: Introduction: symbolic/numerical/symbolic-numerical analysis of analog circuits; sources of errors and error control in numerical analysis; specific computer-aided tools; Functional modeling of nonlinear circuits: modeling of nonlinear elements, magnetically coupled inductors, switching elements; modeling errors; Numerical analysis of steady state modes; iterative algorithms; Small-signal analysis in nonlinear analog circuits; transfer functions used for small signal analysis; Numerical analysis of dynamic working regimes: equivalent resistive diagram; state and semistate equations; relaxation methods; Numerical algorithms specific to stiff systems, convergence control; Methods of analysis for periodic and multi-periodic working regimes; using of multiple time-scales; Sensitivity analysis and tolerance analysis. Laboratory: Topological description of circuits with magnetically coupled inductors and controlled sources – building a dedicated software application; Software implementation of a systematic algorithm for modeling of analog circuits in steady state mode by the modified nodal approach; Numerical computation of the operation point of a nonlinear analog circuit; Software implementation of an algorithm for analysis of nonlinear dynamic circuits, based on equivalent resistive diagrams; Implementation of an algorithm for analysis of nonlinear dynamic circuits, based on the state equation method, with convergence control; Systematic building of transfer functions for small-signal analysis; Direct sensitivity computation; Monte Carlo analysis of an electronic circuit.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ADVANCED METHODS OF MONITORING AND DIAGNOSIS FOR ELECTRICAL SYSTEMS

COURSE OBJECTIVE(S): Theoretical and practical foundation of the electrical equipment monitoring and diagnosis techniques.

COURSE CONTENTS: Course: Introduction. Basic concepts. Methods of monitoring and diagnostics of electrical systems. Theoretical foundation of online diagnostics; Controlled switching. Controlled switching techniques; Test conditions and procedures imposed on individual components and integrated systems; Diagnosis. Basic concepts in process diagnosis; Classification of methods for diagnosis; Elementary Functions and Performance Criteria of Diagnostic Systems; Diagnostic systems for drive systems; Principles of realization. Diagnostic systems for the power elements of a static converter; GIS geographic information systems; Artificial intelligence. Expert systems; Maintenance of electrical systems; Monitoring and diagnostic systems for electric transformers. Monitoring of parameters and insulation quality; internal temperature monitoring. Maintenance. Estimate lifetime. Specialized programs; Modern monitoring systems - power consumption management. Specialized hardware and software; Electrical circuit breaker monitoring and diagnosis systems. Structure. Functions. Algorithm and block diagram of the monitoring system; Systems for monitoring and on-line diagnosis of electrical and non-electric parameters in power plants; Off-line monitoring and dignoscopy of power plants using thermal imaging systems; Monitoring and control of centralized heating/cooling systems. Architecture. Monitoring a thermal point; Using software simulators in the process of monitoring/conducting energy installations - RESY PMC simulator. Laboratory: Design and build a user interface for short circuit current monitoring; Designing and realizing a user interface for monitoring and diagnosing the power elements of a static converter; Designing and realizing a user interface for monitoring the measured quantities of an electrical system.

LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: POWER QUALITY AND EMC FOR INDUSTRIAL AND HOUSEHOLD CONSUMERS

COURSE OBJECTIVE(S): Acquisition by master students of the knowledge and skills necessary to acquire professional skills in order to understand and manage the theoretical and computational bases relating to Power Quality and EMC for industrial and household consumers. Familiarize them with the main aspects related to the quality indicators of power supply and the main measures for ensuring the Power Quality considering the compliance with the admissible limits for the harmonics and the diminution of their content.

COURSE CONTENTS: Course: Introduction to Power Quality and EMC; Basic concepts regarding the Power Quality (Disturbances in electrical networks. Power Quality indicators); Factors that

determine the quality and disturbances for the quality of the power supply (Transient phenomena. Long/short duration variations of voltage. Non-symmetrical voltages); Non-sinusoidal electrical systems. Theoretical aspects (Harmonic analysis of non-sinusoidal functions. Non-sinusoidal analysis of industrial electrical networks (Harmonic model. Determination of harmonic voltage drops in the network. Harmonic currents in the capacitor battery. Resonance series. Reduction of the harmonic regime (Mounting of the anti-harmonic inductors. Mounting of adjusted filters); Harmonics (Harmonic generating equipment (Single-phase load. Three-phase loads). Problems caused by harmonics); Slow variations of the voltage (Indicators. Centralized/local adjustment of voltage); Periodic non-sinusoidal regime (Quality indicators; Effects (Increasing losses. Harmonic resonance. Increasing the neutral point potential. Long overload of capacitor batteries. Harmonic filters (passive/active/mixed); Non-symmetric regime (Unbalanced power. Prevention and limitation of the non-symmetrical regime). Laboratory: Harmonic analysis of the operation of a lighting network powered by a three-phase transformer. Study of non-sinusoidal and non-symmetric regimes produced by electric lamps; Study of POWER Q MI 2392. PC PowerQ Link Software; Analysis of Power Quality test reports for schemes with gases or metal vapours discharge lamps; Graphic representation in function of time (Mathcad) of non-sinusoidal waveforms. Calculation of the distorted regime characteristic sizes: active power; reactive power; apparent power; distorted power; reactive factor; distorted factor; power factor; Calculation of characteristic parameters for a nonlinear (distorted) consumer: the rms value of the harmonics of the current absorbed from the network; the phase difference between supply voltage and fundamental harmonic current; the reactive power transmitted on the fundamental; the distortion factor; Study of the practical harmonic model of an industrial electrical network in which there are linear consumers, a non-linear consumer and a capacitor battery; EMC (Electromagnetic Compatibility) tests: Semi-anechoic chamber; Immunity tests; Emission measurements; Analysis of the electrical parameters measurements needed for an electrical energy audit. Chauvin Arnoux CA8352 Power Analyzer; AR5L Network Analyzer. Software package dedicated to the analysis of acquired data; Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER QUALITY IN SYSTEMS WITH STATIC POWER CONVERTERS

COURSE OBJECTIVE(S): The discipline has the role to offer the students the theoretical and practical knowledge necessary to develop their activity inside industrial units which contain plants with actuating systems supplied through static converters. The discipline will allow the gruates to design, use and debug actuating systems based on static converters.
COURSE CONTENTS: Course: Aspects regarding the quality of electrical energy;Powers in periodical unsinusoidal regime; The calulation of electrical circuits under permanent unsinusoidal regime; The behavior of triphased circuits in permanent periodical unsinusoidal regime; Energetic aspects at the conversion of electrical energy of alternative current into electrical energy of continuous current; Energetic aspects at the conversion of electrical energy of continuous current into electrical energy of alternative current; Energetic aspects at the change of the parameters of alternative current electrical energy; Energetic aspects at the change of the parameters of continuous current electrical energy; The limitation of deforming regime. Laboratory: Labor protection, the presentation of the thematic and of the laboratory equipment; The study of harmonic regime of the alternative voltage changer; The study of the harmonic regime of the continuous voltage chopper; The study of harmonic regime of autonomous inverters; The study of harmonic regime of the inverter which follows a specific wave; The study of harmonic regime of the monophased rectifier with semi-drived brige; The study of the undrived half-wave rectifier using the EPE 10 – Lucas Nülle platform; The study of the drived half-wave rectifier using the EPE 10 – Lucas Nülle platform; The study of the monophased rectifier with undrived brige using the EPE 10 – Lucas Nülle platform; The study of the monophased rectifier with fully drived brige using the EPE 10 – Lucas Nülle platform; The study of the monophased rectifier with semi-drived brige using the EPE 10 – Lucas Nülle platform; The study of the triphased rectifier with undrived brige using the EPE 10 – Lucas Nülle platform; The study of the triphased rectifier with fully drived brige using the EPE 10 – Lucas Nülle platform; Final evaluation of the laboratory activities. Project: It will form sub-groups of 3-6 students depending on the total number of students. Each sub-group will receive a project theme. During the weekly meetings it will be presented the stages of the design and calculations, common and specific for each theme. It will be analyzed the stage in which each project is, and each blocking point in the design, will be solved. The last meeting is dedicated to the presentation of the final projects.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: THE ENERGETIC EFFICIENCY OF ELECTRICAL EQUIPMENT USED IN TRANSPORTATION SYSTEMS

COURSE OBJECTIVE(S): Learning outcomes of the course unit Students acquire the necessary knowledge and skills to acquire professional skills for understanding and managing the phenomena

that occur in the electric drive of the means of transport through: (a) the use of electrical machines and static converters in electric drive systems used in transport; (b) energy efficiency of transport electrical equipment; (c) designing an electrical drive system of a means of transport; (d) the use of specialized software dedicated to advanced design.
COURSE CONTENTS: Course: Introduction on energy efficiency of electric transportation systems based on electrical drives; DC Motors. Manufacturaring principles and operation; Characteristics of DC motors. Equations of dynamic regimes; Basic phenomena in the transient regimes of DC motors; The using of DC motors supplied by static converters; Basic phenomena from automation of electric drives with static converters in dynamic regimes; DC Chopper. Behavior of DC mptors supplied by DC choppers; Asynchronous motor as elements of electric drive. Dynamic regime of an asynchronous motor; Inverters used to increase energy efficiency in electric traction systems; Electric drives with asynchronous motors. Adjusting the speed of asynchronous motors; Behavior of asynchronous motors supplied by voltage inverters; The adjusting speed of asynchronous motors by static frequency converters. The applying of spatial phasors to the study of the AC motor-converter system; Numerical control of static converters used in electric transport systems. Project: Establishment of the project theme: operating system in dc for trams; drive system in ac for trolley/electric train; The designing of the electric motor used in the electric drive system; The designing the power circuit of the converter (dc or ac). Dimension of the brake choper; The designing of the control unit of the drive system; The designing and simulation of the entire drive system behavior using dedicated software (eg EMPT-RV, PSIM, dSPACE); Technicaland economical analysis of the designing system; Final verification of the project.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DIGITAL SIGNAL PROCESSING WITH SPECIFIC APPLICATIONS

COURSE OBJECTIVE(S): The discipline aims to make the students familiar to the main aspects of the direct and reversed transforms Fourier and Wavelet (in the most popular 3 forms) considering their modern approaches. There will be approached applications corresponding to the faults detection, spectral analysis and evaluation of power quality indices.
COURSE CONTENTS: Course: The main chapters of the course are: The discrete and short Fourier Transform. Tuning the parameters for FFT analysis. Wavelet filters and transforms. Wavelet Discrete Transform (DWT) , Wavelet Packet Transform (WPT) and Stationary Wavelet Transform (SWT). Special techniques for wavelet analysis. Tuning the parameters of wavelet analysis. Special aspects of reversed transforms. Signals compression and denoizing. Case studies of wavelet transform. Laboratory: Applications using FFT. Tuning the parameters of FFT analysis. Primary notions of working with DWT. Applying DWT for faults detection. Primary notions of working with WPT. Using WPT for the evaluation of power quality indices. Primary notions of working with SWT.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: MANAGEMENT OF RESEARCH PROJECTS

COURSE OBJECTIVE(S): Developing skills for: choosing the subject of an applied research; formulating an application for funding an applicative research (dissertation paper); documentation in order to finalize an applicative study; elaboration of a research report (dissertation paper); capitalizing on research results through; Scientific Communications, Patent, PhD thesis, Industrial Product, Technological Transfer
COURSE CONTENTS: Course: Formative elements; Management of research projects; The research project team; Reaping the results of research projects; Information from the patent literature; Protection of industrial property. Project: The theme of the research project: the chosen dissertation project. They will go through the specific stages of a research project to achieve formative goals: motivated choice of the theme for the dissertation thesis, considered "the theme of the research project", establishing the problem to be solved and the objectives to be achieved, elaboration of the plan for the realization of the research project, identifying the key research project theme and proposed activities, documentation from all sources of information based on keywords, drawing up the bibliographic record, proposing a solution and a method for verifying it, development of Dissertation Work considered the equivalent of a Research Report.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MODELING AND SIMULATION

COURSE OBJECTIVE(S): The students acquire knowledge on modern design methods for electric systems, based on mathematical modeling and numerical simulation algorithms of normal and fault operation, including switching-mode operation. There are considered models of common devices and electric machines, their interconnection and integration in simulators specific for electrical engineering.
COURSE CONTENTS: Course: Introduction: specific hardware and software tools in electrical engineering. Specific mathematical models: algebraic-differential equation systems; Modeling of

transients in lumped circuits and distributed circuits. Modeling of periodic switching. Model implementation in general-purpose and dedicated software; input-output data; Analysis of magnetic circuits, losses management, distorted operation modes; Electromagnetic systems with and without moving parts: particularities in mathematical modeling; Complex modeling by coupling electrical, magnetic, thermal and mechanical phenomena; Computer-aided processing of experimental data. Correction of design errors. Laboratory: Alternative methods for numerical analysis of lumped circuits in harmonic behavior and in dynamic operation modes; Alternative methods for numerical analysis of distributed circuits in harmonic behavior; Modeling of switching to study shortcut currents and switching overvoltages; Nonlinear models of three-phase transformers and comparison with linear models; Modeling and simulation of transients of electric drives with DC machines and various mechanical loads; Modeling and simulation of transients of electric drives with asynchronous motors; Numerical analysis of systems with synchronous generator, power network, and balanced/unbalanced load in harmonic behavior.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SPECIAL ISSUES OF ASSISTED DESIGN OF CIRCUITS WITH MICROCONTROLLERS

COURSE OBJECTIVE(S): The discipline has the role to offer the students the theoretical and practical knowledge necessary to develop their activitie inside some industrial plants which use complex electronic instalations based on microcontrollers. The discipline ensures the students the capacity to designe a complex system with microcontroller, for a specific application.
COURSE CONTENTS: Course: Microcontrollers. The Arduino board; The sketch; The communication between Arduino board and PC. The use of I/O pins; Overtaken and use the information from sensors; Visible display of the results (outputs); The control of movements. The use of a remote-controller for controling the actions; LCD display. SPI and I2C communications. Laboratory: Labor protection and the presentation of the thematics and the laboratory equipments; Digital display thermometer; Digital display luxmeter; Actuation of actuators and stepper motors; Tourometer with digital display; Electro-magnetic yala; Laboratory colloquy. Project: During the first meeting it will be established a certain number of project themes and it will be formed the working teams. During the weekly meetings it will be presented the working stages and the blocking points in the design. If some problems remein unclear, they will be rediscussed in the next meeting. The last meeting is dedicated to the presentation of the final projects and some practical achievements.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNIQUES AND EQUIPMENT FOR DYAGNOSIS AND MONITORING OF ELECTROMAGNETIC COMPATIBILITY

COURSE OBJECTIVE(S): Students acquire knowledge of the main issues that arise in the operation of equipment used for EMC measurement (emissions and immunity) and the use of IEC, CISPR, EN standards.
COURSE CONTENTS: Course: Introduction concerning the standardization in EMC domain; ACEC. Technical Committee TC 77. Scientific Committees SC 77A, SC 77B, SC 77C; CISPR/TC 77. CISPR Standards; Immunity Standards. Electrostatic discharge phenomenon; Immunity standards at radiated emissions; IEC 61000-4-6 Standard. IEC 61000-4-11. IEC 61000-4-12 Standard; General standards for immunity and emissions; Precompliance tests; Compliance tests; Test Environment for different applications. Open Area Test Side (OATS); TEM Cells. GTEM Cells; Reverberation chambers; Anechoic chambers. Semi-anechoic chambers. Laboratory: Antenna to radio waves. Antenna to transmission lines. The presentation concerning the dimensions and the manufacturing of a (bicconical/horn/log-periodic) antenna - used as transmitting or receiving antennas; The establishement of geometrical configuration of bicconical/horn/log-periodic antenna; The calculus of radiation patterns of the antenna; The determination of the efficiency of the antenna. The calculus of gain of the antenna; The determination of the radiation resistance and of the equivalent area; The reprezentation of the parameters of an antenna using specialized software (ex. CST, FEKO); The final verification of the designing project.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: APPLIED ELECTRICAL ENGINEERING IN ENVIRONMENTAL PROTECTION AND MANAGEMENT
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): It is a specialized discipline to present to students the modern methods of testing the electromechanical equipment, the importance of using computers in the testing and the management of information, the ultimate goal being to increase the quality of the tests.

COURSE CONTENTS: Course: Getting started. Quality assurance, management and control. Ensure quality in designing a product and tracking in-service behavior; RENAR general presentation, attributions, competences, international collaborations. Law on Product Conformity Assessment: Technical Regulations and Conformity Assessment. Accreditation and Infrastructure Law for Conformity Assessment; Essential health and safety requirements for the design and construction of electromechanical equipment and security components. Essential requirements for health and safety, principles of security integration, protection against mechanical and electrical hazards. Required features for protectors and protection devices. Requirements for certain categories of vehicles: agri-food, portable; Testing of Electromechanical Equipment, Technologies and Equipment: Classification of Tests, Test Methods, Equipment and Test Procedures. Elaboration of the test bulletin; Type tests for zero-cycle certification of an asynchronous motor: detailed test program overview. Laboratory: Work safety training. Confirmation of the conformity of the switching process to the DC machine; Certification of yield compliance determined by the DC machine; Certification of conformity of series tests to an asynchronous motor; Certificate of compliance of the operating characteristics of the asynchronous motor using a microprocessor-controlled multimeter; Certification of the compliance of the start-up characteristics of low-power DC motors; Certification of the compliance of the operating characteristics of the asynchronous motor to deforming operation; Final assessment of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: POWER MICRO SYSTEMS

COURSE OBJECTIVE(S): Introduce, understand and deepen the fundamental notions of intermittent generation from renewable sources and the effects of this type of generation.

COURSE CONTENTS: Course: The regional and regional solar and wind energy potential. Valuation principles; Technologies to convert renewable energy into electricity; Photovoltaic conversion: Principles, features, PV systems. Possible areas of use; Conversion of wind energy into mechanical and electrical energy, wind turbines, Cp performance rating, wind power technologies, insulating power supply utilization, high power wind power plants, storage systems to attenuate the random nature of power; Impact of intermittent generation on the distribution system; Technical impact: changing network voltage, increasing the importance of network failures, stability; The economic impact of intermittent generation on the distribution system; Protection of intermittent generators. Project: Presentation of the project theme, stages and deadlines; Choosing a location for determining the potential of renewable energies; Determining energy requirements; Choosing location-based technologies; Equipment dimensioning; Economic damping calculation; Project presentation.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: RADIATION PROTECTION AND DOSIMETRY

COURSE OBJECTIVE(S): It is a specialty discipline in the curriculum that aims to: analyze and know the main sources of radiation and their effects on man and the environment; training skills in exploiting sources according to prescriptions and norms; determination of radiation doses; calculating radiation protection and creating the basis for designing radiation protection equipment.

COURSE CONTENTS: Course: Notions of atomic nucleus physics; Radiation; Interaction between ionizing radiation and matter; Cosmic and Neutron Radiation: The Nature of Radiation; Protection against radiation and radiation shielding; Dosimetry; Professional irradiation; Irradiation in case of nuclear explosions and accidents; Pollution with high frequency electromagnetic radiation. Laboratory: L1. Use of electronic dosimetry with direct reading and alarm threshold to measure the dose equivalent and external irradiance flow rate; L2. Use of the photodimetric box for the determination of radiation doses; L3. Analysis of monitoring systems in individual dosimetry; L4. Determining the characteristics of radiation protection materials; L5. Use of dosimeters to measure ambient airflow rates; L6. Analysis of photometric, chemical and solid body dosimetry (transluminescence and scintillation); L7. Radiation detectors for dose-rate measurements; L8. Determining the levels of radiation mobile phones, hands-free kits, shields and attachments; L9. Determination of the radiation levels in the macrocellular, microcellular and picocellular emission stations; L10. Analysis of GSM antenna

conditions; L11. Spectral analysis of radiant emissions from the flame; L12. Study of techniques to reduce parasite coupling by radiation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: NON-POLLUTING TECHNOLOGIES

COURSE OBJECTIVE(S): Acquiring the knowledge and skills necessary for the environmental engineer to efficiently operate the technological systems, to properly analyze the noxes and to determine their impact on the environment; Acquiring practical skills and analysis and diagnosis skills.
COURSE CONTENTS: Course: Introduction. Objectives and discipline issues. Pollution and biological equilibrium, pollutant effects, environmental pollution, normative elements; Engineering and environmental protection. Balance of bio-ecological systems, ecological technologies. Engineering of non-polluting processes. Natural resources management, environmental protection strategies; Dust reduction technologies. Material balance of ashes. Installations for the removal of combustion gases. Functional principle, construction and calculation of electrofilters; Technology to reduce suspended particulate matter in the air. Ecological asphalt, performance filters for exhaust gases from cars; Non-polluting technologies, unconventional technologies, eco-technologies. Definitions, classification, general characteristics. Characteristics of clean, non-aggressive, clean and economical technologies; Non-polluting ultrasound and laser technologies. Classification, properties, characteristics, methods of generating ultrasound and laser radiation, applications. Laboratory: Presentation of laboratory work and protection measures to perform this work; Determination of pH and conductivity of the scalable, industrial and precipitated electrical conductivity; Determination of the purity and nature of the contaminants in industrial waste; Determining the consumption of electrostatic precipitators by simulating the functions; Determination of the height of the industrial chimneys and the height of the pollutants for the protection of the atmosphere; Analysis of electrostatic emissions, separation of theoretical variants, using the sizing algorithms; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SUSTAINABLE TRANSPORT

COURSE OBJECTIVE(S): Knowing the issues of sustainable transport. The main concepts of transport, types of vehicles, control and traffic safety systems, as well as their impact on the environment in the context of sustainable development
COURSE CONTENTS: Course: Concepts and directions of action of sustainable transport. The place of transport within sustainable development. The impact of transport systems on the environment. Specific environmental problems in the operation of transport systems; Equation of useful motion. Walking charts. Street and rail traffic; Conventional electric transport systems; Unconventional electric transport systems. Hybrid transport systems. Hybrid cars. Hybrid buses; New sources of electricity storage. Intelligent control strategies applied to hybrid vehicles; Safety of traffic. Vehicles and intelligent circulation arteries. Expert guidance systems for vehicles. Modern signaling systems; Sustainable transport management. Intermodal transport. Laboratory: Laboratory presentation. Performing NTS and PSI training. Study of mechanical parts of transport vehicles; Study of FERELEC equipment; Tracking the vehicle's charts; Optimize the useful movement of vehicles; Exergy analysis of vehicle start-up regimes; Study of modern vehicle speed control methods; Calculation of energy consumption of electric vehicles; Vehicle braking. Impact on the environment; Electric vehicle braking; Study of vehicle monitoring and diagnosis functions; Traffic control over Petri networks; Automatic ticketing and traffic safety (ETCS and ERTMS); Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ELECTROMAGNETIC COMPATIBILITY

COURSE OBJECTIVE(S): The discipline aims at defining and deepening the knowledge regarding the sources of electromagnetic waves, their effects, the damaging measures, the technique of electromagnetic emissions measurements etc.
COURSE CONTENTS: Course: General. Concepts on EMC and Harmonic Network Pollution; Sources of electromagnetic disturbance; Couplings; Earthing networks; Techniques to improve electromagnetic compatibility; Filters; Appliances - sources of harmonic pollution; Electrical machines as sources of disturbance; Technique of disruptive emission measurements; Elaboration of normative acts on the quality of electricity; Norms relating to harmonic disturbances. Laboratory: Labor protection. Asynchronous machines as sources of disturbance; CEM study of single-phase three-phase asynchronous motors; Study of disturbances due to CSTF - Fluke 41B Analyzer; Study of deformed regimes due to rectifiers; Using the DAS 1601 acquisition board for conducting perturbation; Study of filters; Verification and recovery
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENVIRONMENTAL MANAGEMENT. SUSTAINABLE DEVELOPMENT

COURSE OBJECTIVE(S): Familiarize students with the basic knowledge concerning on the application of SR EN ISO 14001 in an enterprise/organization, in order to achieve the objectives and understanding of the strategic and competitive issues, thereby contributing to sustainable development.

COURSE CONTENTS: Course: Environmental protection - a key priority for the European Union; Sustainable development - a new challenge for the European Union; From social responsibility of the enterprise to sustainable development of the European Union; Concerns of International Organization for Standardi-zation in environmental protection; Management systems generic standards. Compatibility between ISO 9000 and ISO 14001 families; ISO 14000 and EMAS standard families; Environmental Management – General Issues; Environmental Management Systems (EMS) - According to ISO 14001; Applying an environmental management system in SMEs; From environmental management to sustainable development of enterprises. Seminar: Application of SR EN ISO 14001 in the development of an EMS (Environmental Management System).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: METEOROLOGY AND CLIMATOLOGY

COURSE OBJECTIVE(S): It is one of the specialty disciplines in the curriculum, designed to present to students the laws governing atmospheric processes and phenomena, as well as their regime and their distribution. Students have to acquire the criteria for classification of climates and differentiation elements at planetary, regional and local level. The course also aims at developing the observation and geographic spirit by interpreting the phenomena in the atmosphere.

COURSE CONTENTS: Course: Introduction to meteorology; Atmosphere: atmospheric air composition, vertical atmospheric structure, air density, air mass; Atmospheric pressure: generalities, atmospheric pressure variations, isobar, atmospheric pressure measuring instruments; Air temperature: generalities, variations in air temperature, isotherms, temperature distribution in the free atmosphere, instruments for measuring air temperature; Water vapor in the atmosphere: atmospheric water forms, evaporation, air humidity, vertical and geographical distribution of moisture variations of air humidity, air humidity measurement instruments; Condensation of water vapor: condensation cores, condensation, fog and fog; Clouds: physical peculiarities, classification and types of clouds, cloudiness, cloud observation methods; Introduction to Climatology; Climate classifications; The main climate zones of the Earth; Climate variability. Laboratory: Presentation of the instruments used on the meteorological platform, ways of measuring the weather parameters, capturing the information, validating them and transmitting them to the forecasting service; Radar survey (operating principle). Analysis and interpretation of radar data; Receiving, validating and transmitting data from meteorological stations and hydrological stations in the national stream. Drawing up of bulletins, maps, charts; operational flow diagram; Study of mathematical programs and models used in meteorological forecasting; Analysis, plotting and interpretation of real maps (ground and altitude). Analysis of probable materials for meteorological forecasting; Study of the weather station and the program for monitoring the atmospheric parameters; Recovery session.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNIQUES OF FILTERING AND POWER FACTOR COMPENSATION

COURSE OBJECTIVE(S): Acquiring advanced knowledge in the field of filtering and power factor compensation in the electric power systems.

COURSE CONTENTS: Course: Power factor. Technical and economic benefits of the compensation; Parallel compensation. Thyristor-switched capacitor devices and thyristor-controlled reactor devices; Static synchronous compensator; Series compensation. Thyristor-controlled series capacitor; Harmonics and techniques of harmonic filtering. Standards and recommendations for the harmonic limits; Passive power filters; Active power filters. Project: Technical solution to achieve a minimal power factor for a distorted load with imposed structure and data; Analysis of the operation and identification of the critical regime; Calculation of the power quality indicators and characteristic quantities required for the design; Design of the filtering and compensation system; Matlab/Simulink modeling and performances determination.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ELECTRICAL TECHNIQUES AND EQUIPMENT TO DEPOLLUTION

COURSE OBJECTIVE(S): The discipline aims at defining and strengthening the knowledge regarding the electrical techniques and equipment used in the field of environmental stewardship within the framework of the Cleaner Production, with direct reference to electrochemical reactors based on electrical discharges.

COURSE CONTENTS: Course: The structure of an environmental reform. The location and role of electrical techniques and equipment for depollution in the framework of Cleaner Production; General presentation of electrical procedures for air depollution. General presentation of electrical

procedures for depollution of aqueous solutions. General presentation of electrical procedures for soil, sludge and waste depollution. Centralized table of depollution techniques according to NOVELECT publications. Advantages of electrical techniques for depollution; Electrical discharges. Definition, types of electric discharges. Experimental circuit for the study of electrical discharges; The voltage-current characteristic of an electrical discharge in a gas. Influence of thermodynamic and electrical parameters on the operation point on the discharge characteristic; Electrochemical reactors with electrical discharges of cold plasma type. The operating principle of cold plasma electrochemical reactors; Electric supply circuits for cold plasma single phase electrochemical reactors. Electric supply circuits for cold plasma three-phase electrochemical reactors; Cold plasma electrochemical reactors with radio and microwave discharges; Construction of electrochemical reactors with cold plasma electric discharges for gas depollution. Construction of electrochemical reactors with electric discharges of streamer and dielectric barrier types. Construction of electrochemical reactors with cold plasma electric discharges for aqueous solutions depollution. Construction of electrochemical reactors with cold plasma electric discharges for soil, sludge and waste depollution. Efficiency indicators of cold plasma electrochemical reactors; Electrochemical reactors with electrical discharges of thermal plasma type. Operating applications in the field of environmental stewardship. Laboratory: Presentation of the laboratory. Electric power sources. Presentation of laboratory works; Study of the stable electric arc as an electric depollution technique; Study of electromagnets as main element of solid waste segregation equipment; Study of electrical equipment for sterilization and neutralization of biomedical waste by cold plasma and ultraviolet radiation; Study of the control and protection equipment in the electrical schemes specific to depollution installations; Study of execution and measurement equipment in the electrical schemes specific to depollution installations; Recovery session. Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNIQUES AND SYSTEMS FOR ENVIRONMENTAL FACTORS MONITORING

COURSE OBJECTIVE(S): Presentation of the techniques and structure of the environmental factors monitoring systems realized with modern equipments and programs for acquisition and processing of experimental data
COURSE CONTENTS: Course: Environmental monitoring systems: General architecture, Air quality monitoring, Water quality monitoring, Soil quality monitoring; Data storage and recording techniques - data logging & recording: Virtual data logging techniques and tools in Data Logging mode in LabVIEW, Virtual I/O file operations with files; Geographic Information Systems - GIS: GIS Structure, Types of Data and Models Used in GIS, Acquisition, Analysis and Presentation of Environmental Information, Conclusions on Using a GIS; Satellite remote sensing - a modern instrument for monitoring environmental factors: Platforms and sensors, Space remote sensing satellites, Remote sensing role in monitoring environmental factors and applications. Project: Design a thematic map using ArcGIS: map of Dolj County; Introduction to the ArcGIS family of products; Studying ArcCatalog for organizing and managing information in a GIS; Studying ArcMap for charting, analyzing and editing maps; Using the ArcMap application for uploading and viewing data for Dolj county: Individual view of Dolj County, Viewing Dolj County Counties, Adding New Data to Dolj County, Making Printing Options in Dolj County; Creation of a buffer zone (flood potential area along the Danube) in Dolj county and introduction of a legend.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: VALUE ANALYSIS

COURSE OBJECTIVE(S): Presenting the elements underlying the analysis of processes and products, as recommended in the European Union, focusing on the importance of methods of analysis and efficiency of the information system. The modern way of approaching problems, as well as presenting case studies, contributes to the formation of future specialists.
COURSE CONTENTS: Course: History and definitions; Value Analysis - Presentation of the Method; Applying the seven steps of the value analysis method; Functional analysis: definitions and presentation of the method; Applying the seven steps of the functional analysis method; Analysis of defect modes, their effects and their criticality - AMDEC method. Seminar: Establishing the basics - Action orientation; Applying modern methods to search for information; Functional analysis - case study; Analyze solutions and choose the optimal solution; Validation of solutions; Establishing steps for tracking product achievement; Analysis of defect modes, their effects and their criticality - application of the AMDEC method; Final presentation of reports/final report
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INITIATION IN CREATING PRODUCTS

COURSE OBJECTIVE(S): Understanding and applying the creative and entrepreneurial thinking to develop a product.

COURSE CONTENTS: Course: The idea of the project; Innovative product; Market; The society; Production; Organization of production. Production capacity; Production costs. Laboratory: Human resources. Building the team; Genesis of the ideas; Market analysis; Society: generalities, location. Organization chart of society; Spatial and temporal organization of production; Production cost; Recovery of laboratory work.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: QUALITY MANAGEMENT

COURSE OBJECTIVE(S): Presenting the elements underlying the implementation of a quality management system, according to the standards in force in the European Union and Romania. The modern way of approaching problems, as well as presenting case studies, contributes to the formation of future specialists.
COURSE CONTENTS: Course: International Organization for Standardization (ISO) and Quality Management. Presentation of the ISO 9000 family of standards. Presentation of ISO 9001. Quality management system (SMC) - According to ISO 9001; The WV cycle - an approach to solving; Problem; Quality Management Tools; Audit and Internal Audit - Guidelines for Audit of the Management System. Seminar: Applications for QQOQCP; histogram; Cause-effect diagram; Pareto Diagram - case study (team work); Correlation chart; Control chart; Data stratification; Brainstorming - case study (team work); Diagram of relationships; Matrix Diagram - Case Study (Teamwork); Diagram of affinities; Tree Chart - Case Study (Teamwork); Arrow diagram (PERT); Diagram of the decision process program; Presentation in the table; Final presentation of reports/final report.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INNOVATION MANAGEMENT AND INDUSTRIAL PROPERTY

COURSE OBJECTIVE(S): Formative objectives/development: Skills training for: innovation of products at enterprise level; organization of an innovative enterprise; elaboration of a business plan; documentation from patent databases; how to describe an invention.
COURSE CONTENTS: Course: Defining the innovation process. Stages of the innovation process; Innovation at industrial enterprise level; Strategy of the innovation process; Organization of an innovative enterprise; Documentation from patent databases; Patent protection in Romania; Patent certification strategy in the market economy; Other components of industrial property. Project: Theme of the research project: design and organization of an innovative enterprise: Design of the business plan; Design of the strategic innovative plan; Organization of industrial property protection activity; Elaboration of documents for patent certification; Elaboration of documents for trademark certification.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT OF RESEARCH PROJECTS

COURSE OBJECTIVE(S): Developing skills for: choosing the subject of an applied research; formulating an application for funding an applicative research (dissertation paper); documentation in order to finalize an applicative study; elaboration of a research report (dissertation paper); capitalizing on research results through: scientific communications, patent, PhD thesis, industrial product, technological transfer.
COURSE CONTENTS: Course: Formative elements; Founding sources for research projects; Management of research projects; The research project team; Reaping the results of research projects Laboratory: The theme of the research project: the chosen dissertation project. They will go through the specific stages of a research project to achieve formative goals: motivated choice of the theme for the dissertation thesis, considered "the theme of the research project"; establishing the problem to be solved and the objectives to be achieved; elaboration of the plan for the realization of the research project; identifying the key research project theme and proposed activities; documentation from all sources of information based on words; drawing up the bibliographic record; proposing a solution and a method for verifying it; development of Dissertation Work considered the equivalent of a Research Report.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALYSIS TECHNIQUES OF DYNAMIC HYBRID SYSTEMS

COURSE OBJECTIVE(S): The students acquire knowledge on basic structural elements of dynamic hybrid systems, particular methods for modeling and analysis of structural and comportment properties, as well as the control strategies.
COURSE CONTENTS: Course: Introduction in general structure of hybrid dynamic systems; Specific elements intended for analysis of continuous dynamic systems; Systems with discrete events, modeling tools: Grafcet, Petri nets, Stateflow; Modeling of hybrid systems based on bond-graph techniques and on hybrid Petri nets; Mixed models: hybrid automatic systems, mixed Petri nets, differential Petri nets; Control of hybrid dynamic systems: sequence control, optimal control, control of interconnected systems. Laboratory: Stateflow models for hybrid dynamic systems; Analysis of hybrid systems with hybrid Petri nets; Techniques for automatic control of hybrid systems – automatic control of the liquid level in a

tank; Hybrid structure for transfer of manufacturing parts: analysis and control; Modeling of the traffic in crossing roads with traffic lights, based on Petri nets; Analysis of hybrid systems with adequate models, case study.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNOLOGIES AND EQUIPMENT FOR ENVIRONMENTAL QUALITY ASSURANCE

COURSE OBJECTIVE(S): Students acquire basic knowledge of the principles, operation, performance and use of clean technologies and equipment to ensure environmental quality. To use correctly the theories and concepts with which the theory and methodology of the curriculum in the field of environmental protection operates. To form a global and relevant vision of understanding the importance and benefits of using technologies and equipment to ensure environmental quality to continually improve compliance with environmental quality requirements. Compliance with regulatory requirements applicable to the use of clean technologies and the development of high performance equipment to ensure environmental quality. To differentiate the concepts of specific compulsory curriculum, and to derive skills in the field of environmental protection.
COURSE CONTENTS: Course: Pollution and influence of environmental factors in the use of environmental quality assurance technologies: Technologies and equipment for waste treatment; Technologies and equipment for separation and filtration; Technologies and equipment for reducing acoustic, electrical and electromechanical phenomena; Technologies and equipment to reduce pollutant emissions. Laboratory: Hardware and software analysis of sorting stations in waste sorting facilities; Hardware and Software Analysis of Dosing; Installations; Analysis of waste packaging and compaction facilities; Study on the use of mobile robots in environmental protection; Modeling and simulation of the operation of electrostatic filters; Study and modeling of combustion in an incinerator. Seminar: To design the technology and to dimension the components of the plant structure of: incineration, grinding, sludge treatment, combustion gases, for the presented plant characterized by the following characteristic sizes ...; Technologies for the specified installation; Analysis of the structure and components of the installation of ...; Selection of component parts of the installation structure of ...; Determination of pollution indices and determination of the concentration of pollutants of ...; Dimensioning of elements in the structure of the ....; Command and automation schemes for....
LANGUAGE OF INSTRUCTION: Romanian

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: COMPLEX ELECTROMECHANICAL SYSTEMS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: POWER QUALITY

COURSE OBJECTIVE(S): Acquiring advanced knowledge on the electrical network disturbances, influence of static converters on the power quality and methods of improving the power quality.

COURSE CONTENTS: Course: Disturbances in electrical networks. Primary power quality indicators; Secondary power quality indicators; Harmonic disturbances in electrical systems. Causes and effects. Quantification indicators for harmonic disturbance; Harmonics and power factor.; Limits and recommendations for current harmonics; Power quality in electrical drive systems with DC-motors and controlled rectifiers; Power quality in electrical drive systems with asynchronous motors and indirect frequency static converters; Harmonic distortion mitigation through line reactors and passive filers; Active power filters. Laboratory: Study of the power quality in the electrical drive system (EDS) with DC-motor and controlled rectifier; Study of the influence of the line reactor and filtering inductance on the power quality, in EDS with DC-motor and controlled rectifier; Study of the power quality in EDS with asynchronous motor and indirect frequency static converter (IFSC), with single-phase rectifier and inverter with frequency modulation; Study of the power quality in the EDS with asynchronous motor and IFSC, with three-phase rectifier and inverter with preset switching; Study of the energetic influence of the *DC-link circuit of an* IFSC with pulse width modulation; Study of the energetic influence of the line rector in EDS with IFSC and pulse width modulation; Study of an active power filter.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HIGH PERFORMANCE ELECTROMECHANICAL CONVERTERS

COURSE OBJECTIVE(S): Acquiring basic knowledge in the field of high-performance electromechanical converters: presents the new constructive solutions, the principles of operation and the characteristics of the performance electromechanical converters - traditional and non-traditional - used especially as elements of automatic systems.

COURSE CONTENTS: Course: Theoretical basis of electromechanical conversion. Powerful electromechanical converters as elements of automated systems; Powerful electromechanical DC converters; Powerful electromechanical asynchronous converters; Powerful electromechanical synchronous converters; Powerful electromechanical converters step-by-step; Powerful electromechanical transverse flux converters.; Piezoelectric micromotors and electrostatic motors. Laboratory: Labor protection measures and presentation of laboratory equipment; Characteristics of the d.c. servomotors with hybrid excitation; Characteristics of the two-phase asynchronous servomotors; Characteristics of a stepper motor; Stepper motor positioning system - components, commissioning and use; Stepper motor positioning system – programing elements; Recovery of laboratories. Laboratory test.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: OPTIMAL DESIGNING ELECTRIC MACHINES

COURSE OBJECTIVE(S): It is a specialized discipline designed to present to the students the fundamental elements necessary for the design of electrical machines, optimization methods and criteria and some notions of the use of the finished element in the design of electric machines. The objective of the course is to familiarize students with modern computing techniques and specalized software in design, parameter calculation, startup and function features.

COURSE CONTENTS: Course: Modern design solutions for electric machines. Client data analysis, electromagnetic stresses determination and basic calculation steps (ferromagnetic core, stator/rotor windings, parameters, characteristics). Calculation of losses in electric cars, ventilation and heating; The main stages in stationary optimization: defining the mathematical model, setting the objective function and restrictions, determining the optimal solution, stopping criteria. Classical analytical methods used in optimization (gradient methods, Newton, Lagrange method, and penalty functions). Direct multi-variable search methods (algorithms based on exploration hyperpolites): Complex algorithm and exhaustive exploration method; Optimal design of electrical machines. Mathematical formulation of the optimal problem, optimization criteria and their choice. The objective function, variables and restrictions. Minimum lens function calculation. Finite difference method: computational relations and boundary conditions for the first and second domains used in the study of the fields; The utility of the finite element method in the study of electrical machines. Method principle, MEF software and working procedures. Presentation of Finite Element Method Magnetic main menus. Magnetic Processor and Working Module: the preprocessor used to define the problem to be studied, and the postprocessor to solve and present the results; Laboratory: Presentation of the laboratory and numerical computing programs for: interpolation, derivation and numerical integration, solving the integral-equation equations; Optimization of winding construction of AC motors; Lens function in

designing electrical machines and calculating the optimum value using the spatial node method; Finite element method: defining the problem and drawing the geometry of the electric machine; Finite element method: defining material properties and boundary conditions; Magnetic field study of the asynchronous machine with the finite element method: the magnitude of the magnetic field, the magnitude of the induction, the magnitude of the magnetic field, etc., the magnetic induction distribution curve on different paths, etc., are visualized; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ADVANCED SYSTEMS AND CONTROL ALGORITHMS

COURSE OBJECTIVE(S): Complex systems in technics, nature and society; control structures with microcontrollers, digital signal processors, programmable digital arrays (CPLD, PFGA); numerical control algorithms specific to digital systems; servo applications and control of some environmental parameters; systems with artificial intelligence: fuzzy controllers, artificial neural networks, neuro-fuzzy systems, genetic algorithms;embedded systems.
COURSE CONTENTS: Course: Complex, advanced, high performance, hybrid systems. Characteristics and evaluation of algorithms. Numerical control algorithms specific to digital systems (Dead-Beat, Dahlin, Kalman, Lead-Lag). Synthesis of digital control algorithms; Designing a high performance control algorithm for the position in a servodrive. Models, multicriteria problem conditioning, hardware, timing, programming, performance evaluation; Processors: microcontrollers, DSP, programmable logic arrays. Hardware and software, comparisons; Artificial intelligence. Fuzzy logic and fuzzy controllers. Application for temperature control; Artificial neural networks. Neuro-fuzzy systems. Neuro-fuzzy control applications: for a DC positioning system, for an asynchronous motor drive with vector control, for a temperature loop; Genetic algorithms; Embedded systems. Development for automotive. Laboratory: Platform with Eblocks modules programmed in Flowcode to control a stepper motor in multi-mode; Temperature control in an enclosure. Platforms with CISC and RISC processors, quasi-continuous and fuzzy algorithms; Study of a vector control system with DSP TMS 320 for a brushless servodrive; Study of a 4-nodes CAN network for a car; Study of an asynchronous motor drive system with vector control by a dsPIC30 processor; Platform with four different motors controlled by a single processor operating in interruption mode; Fuzzy control applications in fuzzyTech and Inform Software programs for inverse pendulum, optimal displacement of containers, unmanned car.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SIMULATION OF ELECTRIC CIRCUITS

COURSE OBJECTIVE(S): Knowing the problems specific to intelligent transport systems and vehicles. Modern concepts and solutions implemented on state-of-the-art terrestrial vehicles are presented
COURSE CONTENTS: Course: Defining the concepts of Intelligent Transport Systems and Intelligent Transport Vehicles; The TCN vehicle communication network. Vehicle functions. Process data and messages; Intelligent high-speed transport systems and vehicles. Architectures of main power circuits. Traction and electric braking. The architecture of the computerized system. Signaling in the cabin; Computerized SIBAS and MICAS systems. Traction control. Brake control. Passenger Information. Vehicle tracking and diagnosis; Intelligent MAGLEV transport systems; Intelligent transport vehicles on the unmanaged path. Electric vehicles. Hybrid vehicles. Architectures and control strategies; Smart urban transport vehicles fast. Horizontal lift transport system; Intelligent techniques and solutions for traffic smoothing. Laboratory: Laboratory presentation. Performing NTS and PSI training; Analysis of vehicle start-up methods; Intelligent anti-knock control system; Intelligent control system for vehicle lighting system; Intelligent system for controlling the vehicle door drive system; Intelligent passenger information system; Architecture of the Communication Network (Train Communication Network); Intelligent traction and braking control with the SIBAS system; Intelligent traction and braking control with the MICAS system; Study of vehicle monitoring and diagnosis functions; Optimize the useful movement of vehicles; Traffic control over Petri networks; Study of automatic ticketing systems, ETCS and ERTMS; Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ADVANCED FLEXIBLE STRUCTURES

COURSE OBJECTIVE(S): The purpose of this course is to acquire the notions that are the object of defining, analyzing, modeling and simulation of flexible structures, especially of flexible production systems, in simple or hierarchical topologies, increasing performance and flexibility through automation and adaptability.
COURSE CONTENTS: Course: Automated Manufacturing Structures - Discrete Event Systems; Structures dedicated to assembly processes and its particularities; Hybrid flexible manufacturing structures; Design of the command – control strategies for discrete event drives manufacturing processes; Non-autonomous Petri Nets models used in flexible structures representation and analysis; Various modeling techniques of manufacturing structures and processes.

Laboratory: Presentation of the laboratory, of the equipment and programs used to carry out the works and the related themes; Techniques and modeling tools of discrete event driven events processes; Structure and modeling approach of the cycling manufacturing processes; Techniques of analysis and modeling used for high cadence manufacturing processes representation; Sequential command technique of an robotized flexible structure; Hybrid synthesis techniques of the Petri Nets models used in analysis of discrete event driven structures.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: VECTOR CONTROL OF ELECTRICAL DRIVES

COURSE OBJECTIVE(S): The introduction, understanding and deepening of the basic concepts of torque control developed by the c.
COURSE CONTENTS: Course: Asynchronous machine models in the concept of use in vector control systems; expressions of the electromagnetic torque developed by the asynchronous motor. Decoupling effects. Adjustable possibilities; Automated vector regulation systems of asynchronous motor electromechanical drive systems; Order with rotor flow orientation; Control with stator flux orientation; Direction by magnetization flux (resultant); Direct Torque Control (DTC) principle; Automatic vector control systems for synchronous motor drives; the model of the synchronous machine with permanent magnets in the concept of use in the vector control systems. Field-oriented command for the synchronous machine with permanent magnets. Laboratory: MATLAB-SIMULINK simulation environment; vector-specific blocking blocks (LV); Simulation of the driven motor drive system with rotor flow orientation; influence of variation of parameter values (LV); Real-time DSPACE DSPACE control system: hardware, software interface with MATLAB-SIMULINK (LP) environment; The study of the automatic speed/position control system of an asynchronous motor drive system controlled by rotor flow (LP); The study of the influence of asynchronous motor parameter variation on the dynamic performance of the automatic speed control system/position of the asynchronous motor driven control system with rotor flow (LP); The study of the automatic speed/position control system with asynchronous motor driven control with stator (LP); The study of the synchronous motor drive system with permanent magnets and voltage inverter (LP).
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPLEMENTS OF ELECTROMECHANICAL CONVERTERS DYNAMICS

COURSE OBJECTIVE(S): In accordance with the spectacular achievements in this field the methods of optimizing the behavior of electric machines in dynamic regimes are used, rapid calculation means are used so that it is possible to properly solve the mentioned regimes in order to obtain optimal solutions in terms of sizing or use electric machines considered separately or in complex drive systems.
COURSE CONTENTS: Course: Basic concepts. Inductivities of electric cars; Definitions and relations of calculus of electric machine inductances; Equations of electric machines in transient mode. Equations of AC electric machines without collector in instantaneous values in the phase coordinates. The representative phasor. Equations with representative phasors written in their own axle systems and in the common reference. Equations in the theory of the two axes; Transient processes in electric cars. Transient processes in the DC machine. Dynamic processes in the induction machine. Operational parameters of the induction machine. Sudden synchronous generator short-circuit. Asynchronous operation of the synchronous machine. The geometric location of the synchronous machine current; Improving the dynamic behavior of electric machines. Field Direction Method. Field Acceleration Method. Laboratory: Work safety training. The dynamic start-up mode of the short-circuit rotor asynchronous motor; The primary process of priming the c.c. with excitation bypass; Dedicated startup mode by docking the DC junction motor; The transient mode when the transformer is plugged into the mains; Transient mode for the synchronous synchronous three-phase short-circuit; Dynamic mode when synchronizing the synchronous motor; Final assessment of laboratory activity
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: PERFORMANT STATIC CONVERTERS

COURSE OBJECTIVE(S): Teaching the theoretical support for computer-aided analysis of linear analog circuits specific to electrical engineering applications as well as skills to use commercial software for circuit simulation.
COURSE CONTENTS: Course: Controlled rectifiers with superior energy performance: twelve-pulse rectifiers; phase-controlled rectifiers with unity power factor; phase-controlled rectifiers with capacitive power factor; PWM rectifiers with unity power factor; PWM inverters with harmonic cancellation; Soft switching static converters: basics on resonant circuits; zero-voltage switching DC/DC converters; zero-voltage switching inverters; zero-current switching inverters. Laboratory: Simulink modeling and analysis of the series twelve-pulse

rectifiers operation; Simulink modeling and analysis of the parallel twelve-pulse rectifiers operation; Study of the PWM trilogic control of rectifiers; Study of the voltage source inverter with sinusoidal modulation; Study of the three-phase voltage source inverter with harmonic elimination; Study of the three-phase voltage source inverter with space-phasor modulation.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ACTIVE POWER FILTERS

COURSE OBJECTIVE(S): Acquiring knowledge on using the power electronics to compensate the harmonic distortion, reactive power and unbalance by active power filtering.
COURSE CONTENTS: Course: Introduction to active power filtering. Operating principle of active power filters. Classification; Shunt active power filters: structure; reference current calculation; Interface filters: types, transfer function of the LCL filter; design; Design of the compensation capacitor and influence of the voltage across it; Closed loop control: principle; structural schemes and transfer functions; design of controllers; performances; Control implementation. Industrial applications. Laboratory: Model-based generation of the reference current by means of wave-multiplication method, using a PLL loop; Model-based generation of the reference current by means of the instantaneous complex power method; Study of a three-phase current source of reactive and distorted current; Experimental study of a shunt active power filter.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SMART MATERIALS

COURSE OBJECTIVE(S): Students acquire the basic notions needed to understand the properties and behavior of intelligent materials. Knowledge of calculation and sizing methods adapted to intelligent materials controlled and controlled systems, modern techniques with complex detection, command and control functions.
COURSE CONTENTS: Course Introduction: concept, achievements and development perspectives, illustrative examples; Form Memory Alliances: reversible martensitic transformation, memory effect, functional features, memory dimensioning problems, calculation examples, applications; Piezoelectric materials: piezoelectric effect, piezocomposites, piezostructures, piezoelectric actuators and sensors, ultrasonic piezoelectric motors; Electro- and magnetorheological fluids: introduction to electro- and magnetorheology, effect of electric or magnetic field intensity on particle displacement, properties, aspects of modeling of systems based on these fluids, intelligent fluid based driving systems; Electro-and magnetostrictive materials: electro-or magnetostrictive effect, field orientation problems, representative materials, applications; Nanomaterials: nanoparticles and nanomaterials, methods of operation in the nano world. Evolution and technological revolution, micro-electro-mechanical devices, applications in intelligent systems, research directions.Laboratory: Presentation of laboratory work and protective measures for carrying out these works; Testing of piezo-composite materials for determination of capacity, relative permittivity and the dielectric loss factor; Study of behavior of piezocomposite materials to traction and flexion; Study of the behavior of electrorheological fluids through simulations using the mathematical models that describe the; Measurement of the memory effect stroke to determine the dimensions of a shape memory alloy arc spring; The microscopic highlighting of the structures, from the mother phase and the martensitic phase, to a shape memory alloy; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTELLIGENT SENSORS AND ADVANCED EQUIPMENT

COURSE OBJECTIVE(S): Knowledge of the operating principles and areas of intelligent sensors, presentation of the architecture of modern intelligent instrumentation systems, standardization trends and instrumentation buses, acquisition and processing systems, communication and control of instrumentation over the Internet.
COURSE CONTENTS: Course: Intelligent Sensor Architecture: Intelligent Sensor Role and Functions, Intelligent Sensor Structure, Sensor Fusion; Wireless communication standards used for intelligent sensor networks: Wireless communication, Wireless Sensor Networks, Wireless Local Area Networks (WLAN), Wireless Personal Area Networks (WPAN); Acquisition and conveying data specific to intelligent sensors: structure, connection, configuration, communication; General aspects of Virtual Instrumentation: Virtual Instruments, Computer-Process Measurement or Control Interface, Virtual Instruments Software (LabVIEW Environment). Laboratory: Intelligent pressure transducer; Introduction to LabVIEW environment; Create, edit, and correct a virtual tool in LabVIEW; NI USB 6210 Acquisition Card: installation, configuration, applications; NI cDAQ9172: installation, configuration, applications; Implementing a virtual lab using LabVIEW environment.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: VALUE ANALYSIS

COURSE OBJECTIVE(S): Presenting the elements underlying the analysis of processes and products,

as recommended in the European Union, focusing on the importance of methods of analysis and efficiency of the information system. The modern way of approaching problems, as well as presenting case studies, contributes to the formation of future specialists.
COURSE CONTENTS: Course: History and definitions; Value Analysis - Presentation of the Method; Applying the seven steps of the value analysis method; Functional analysis: definitions and presentation of the method; Applying the seven steps of the functional analysis method; Analysis of defect modes, their effects and their criticality - AMDEC method. Seminar: Establishing the basics - Action orientation; Applying modern methods to search for information; Functional analysis - case study; Analyze solutions and choose the optimal solution; Validation of solutions; Establishing steps for tracking product achievement; Analysis of defect modes, their effects and their criticality - application of the AMDEC method; Final presentation of reports/final report. Seminar: Establishing the basics - Action orientation; Applying modern methods to search for information; Functional analysis - case study; Analyze solutions and choose the optimal solution; Validation of solutions; Establishing steps for tracking product achievement; Analysis of defect modes, their effects and their criticality - application of the AMDEC method; Final presentation of reports/final report
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INITIATION IN CREATING PRODUCTS

COURSE OBJECTIVE(S): Understanding and applying the creative and entrepreneurial thinking to develop a product.
COURSE CONTENTS: Course: The idea of the project; Innovative product; Market; The society; Production; Organization of production. Production capacity; Production costs. Laboratory: Human resources. Building the team; Genesis of the ideas; Market analysis; Society: generalities, location. Organization chart of society; Spatial and temporal organization of production; Production cost; Recovery of laboratory work.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: QUALITY MANAGEMENT

COURSE OBJECTIVE(S): Presenting the elements underlying the implementation of a quality management system, according to the standards in force in the European Union and Romania. The modern way of approaching problems, as well as presenting case studies, contributes to the formation of future specialists.
COURSE CONTENTS: Course: International Organization for Standardization (ISO) and Quality Management. Presentation of the ISO 9000 family of standards. Presentation of ISO 9001. Quality management system (SMC) - According to ISO 9001; The WV cycle - an approach to solving; Problem; Quality Management Tools; Audit and Internal Audit - Guidelines for Audit of the Management System. Seminar: Applications for QQOQCP; histogram; Cause-effect diagram; Pareto Diagram - case study (team work); Correlation chart; Control chart; Data stratification; Brainstorming - case study (team work); Diagram of relationships; Matrix Diagram - Case Study (Teamwork); Diagram of affinities; Tree Chart - Case Study (Teamwork); Arrow diagram (PERT); Diagram of the decision process program; Presentation in the table; Final presentation of reports/final report.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INNOVATION MANAGEMENT AND INDUSTRIAL PROPERTY

COURSE OBJECTIVE(S): Formative objectives/development: Skills training for: innovation of products at enterprise level; organization of an innovative enterprise; elaboration of a business plan; documentation from patent databases; how to describe an invention.
COURSE CONTENTS: Course: Defining the innovation process. Stages of the innovation process; Innovation at industrial enterprise level; Strategy of the innovation process; Organization of an innovative enterprise; Documentation from patent databases; Patent protection in Romania; Patent certification strategy in the market economy; Other components of industrial property. Project: Theme of the research project: design and organization of an innovative enterprise: Design of the business plan; Design of the strategic innovative plan; Organization of industrial property protection activity; Elaboration of documents for patent certification; Elaboration of documents for trademark certification.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT OF RESEARCH PROJECTS

COURSE OBJECTIVE(S): Developing skills for: choosing the subject of an applied research; formulating an application for funding an applicative research (dissertation paper); documentation in order to finalize an applicative study; elaboration of a research report (dissertation paper); capitalizing on research results through: scientific communications, patent, PhD thesis, industrial product, technological transfer.
COURSE CONTENTS: Course: Formative elements; Founding sources for research projects; Management of research projects; The research project team; Reaping the results of research projects Laboratory: The theme of the research project: the chosen dissertation project. They will go

through the specific stages of a research project to achieve formative goals: motivated choice of the theme for the dissertation thesis, considered "the theme of the research project"; establishing the problem to be solved and the objectives to be achieved; elaboration of the plan for the realization of the research project; identifying the key research project theme and proposed activities; documentation from all sources of information based on words; drawing up the bibliographic record; proposing a solution and a method for verifying it; development of Dissertation Work considered the equivalent of a Research Report.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ANALYSIS TECHNIQUES OF DYNAMIC HYBRID SYSTEMS

COURSE OBJECTIVE(S): The students acquire knowledge on basic structural elements of dynamic hybrid systems, particular methods for modeling and analysis of structural and comportment properties, as well as the control strategies.
COURSE CONTENTS: Course: Introduction in general structure of hybrid dynamic systems; Specific elements intended for analysis of continuous dynamic systems; Systems with discrete events, modeling tools: Grafcet, Petri nets, Stateflow; Modeling of hybrid systems based on bond-graph techniques and on hybrid Petri nets; Mixed models: hybrid automatic systems, mixed Petri nets, differential Petri nets; Control of hybrid dynamic systems: sequence control, optimal control, control of interconnected systems. Laboratory: Stateflow models for hybrid dynamic systems; Analysis of hybrid systems with hybrid Petri nets; Techniques for automatic control of hybrid systems – automatic control of the liquid level in a tank; Hybrid structure for transfer of manufacturing parts: analysis and control; Modeling of the traffic in crossing roads with traffic lights, based on Petri nets; Analysis of hybrid systems with adequate models, case study.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: ENERGY ENGINEERING
PROGRAMME TITLE: AUTOMATED ENERGY SYSTEMS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: THE INTEGRATION OF RENEWABLE ENERGY SOURCES IN ENERGY SYSTEMS

COURSE OBJECTIVE(S): Students will aquire basic knowledge regarding the integration of renewable energy sources. There are also persented CO_2 emissions reduction measures for conventional fossil fuel power plants.

COURSE CONTENTS: Course: Introduction; Wind turbines power plants. Plants operation and main effects over the electrical grids; Solar power plants. Main implications over the electrical grids; The role of hydro power plants in the compensation of other renewables; Tendencies in the design of conventional gas turbine power plants for the compensation of intermittent operation of power plants based on renewable energy; Steam turbine power plants operation with an increased quota of renewables in energy systems; Reducing the de CO_2 for conventional power plants. Carbon capture and storage. Laboratory: Laboratory presentation; Presentation of the software; Fuel type economical efficiency influence after the introduction of CO_2 tax; The operation of wind turbine insulated or connected to the grid; The operation of solar panels insulated or connected to the grid; Combined solar panels – wind turbine system connected to the grid; The use of internal combustion engine in parallel with renewable energy sources.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ADVANCED METHODS FOR MONITORING AND DIAGNOSIS OF POWER SYSTEMS

COURSE OBJECTIVE(S): The course forms the engineers of electro-energetic profile, familiarizing them with the main theoretical and practical aspects related to the composition and functioning of the main equipment and monitoring installations and diagnostics techniques for the energetic installations; Determine the knowledge of the performance criteria of the monitoring and diagnosis systems and present the most important dedicated systems / SCADA systems.

COURSE CONTENTS: Laboratory: Work safety rules. Presentation of the laboratory. Introduction to monitoring and diagnosis of energy installations; Calculation of relative aging for an oil power transformer. Application; Use of programmable equipment for the implementation of power transformer monitoring systems; Monitoring of electricity consumption. Application; Use of portable equipment for on-line monitoring of the parameters of an energy installation. Practical applications - electrical and compressed air installations; Off-line monitoring and dignoscopy of power installations using portable thermal imaging systems, pressure and temperature analysis; Use the RESY PMC Dynamic Simulator to study behavior and control power plants; Final evaluation of laboratory activity

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENERGETIC PROCESSES MODELLING AND SIMULATION

COURSE OBJECTIVE(S): Students acquire knowledge of theoretical support for modeling different elements of energy systems and understanding the use of these models to simulate power systems.

COURSE CONTENTS: Course: System, process, model, modeling, simulation. Definition. Types of models. Classification of models. Linearization of mathematical models; Power Transformers Modeling. The main phenomena to be represented in a transformer model. The model of a permanent transformer. Modeling transformers with voltage regulation windings. Transformer modeling in transient mode; Modeling power lines. Modeling of power lines in permanent mode through multiples with concentrated elements. Modeling of transient electrical lines by dividing into sections and their representation multipole equivalents; Modeling of heat exchange. Theoretical and practical modeling căldură basic transfer (conduction, convection, radiation). Modeling of heat exchangers. Laboratory: Solving mathematical models represented by differential equations in MATLAB; Modeling electrical circuits and developing a block diagram for a non-parametric model. Develop a block diagram for a memory model; Modeling of permanent power transformers in SIMULINK; Modeling of power transformers with voltage regulation windings in SIMULINK; Modeling power lines in SIMULINK; Modeling of permanent heat exchangers in SIMULINK; Final evaluation of laboratory activity.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENERGY MARKETS

COURSE OBJECTIVE(S): The discipline aims to familiarize students with the way of organizing the electricity markets. On this basis, the available solutions for electricity trading are investigated and the restrictions imposed by the technical limits of the networks on commercial transactions are analyzed. Also, the discipline initiates students in specific issues related to the service-specific markets (system technology services, transport service, distribution service, supply service).

COURSE CONTENTS: Course: Liberalization of the electricity sector; Pricing of power, energy and capacity; Characterization of consumption; Competition. Monopoly. Market Competitiveness

Indices; Dominant market positions. Game theory and coalitions theory; The marginal cost; Structure of markets; Market architecture; Market rules; Transmission capacity. Assessment of available capacity; Congestion. Treating congestion; Pricing of losses; Power reserves. Reserves for secondary, tertiary and tertiary slow regulation. Laboratory: Pricing of power, energy and capacity. Duration-power curves; Coalition theory; Testing market rules; ATC assessment; Treating congestion; Congestion pricing; Pricing of losses.
LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENERGY AND ECONOMICAL EFFICIENCY

COURSE OBJECTIVE(S): Students will aquire basic knowledge regarding the development of energy audits for domestic and industrial consumers. It's presented the selection of energy efficiency measurers and their economical analysis.
COURSE CONTENTS: Course: Students will aquire basic knowledge regarding the development of energy audits for domestic and industrial consumers. It's presented the selection of energy efficiency measurers and their economical analysis. Laboratory: Data graphical interpretation; Heat necessary calculation; Heat plants efficiency; CHP plants; Heat losses in pipe networks; The economical analysis.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTELLIGENT ELECTRICAL NETWORKS

COURSE OBJECTIVE(S): The discipline presents the concept of smart grids (SmartGrids) capable of hosting renewable energy sources, ensuring operational safety and adapting the quality of electricity to consumers' needs. For this purpose, new technologies (power electronics, telecommunications, computing, measurement systems, automation and protection, etc.) and algorithms and performance methods are used. It also shows how this evolution is in line with the sustainable development strategy.
COURSE CONTENTS: Course: The concept of smart power grids; Lasting development. Lisbon Strategy; Concepts: Galvin, Intelligrid; Experiences and pilot installations; Network structures of the future; Alternative voltage networks; Continuous voltage networks; Mixed networks (AC & DC); Loop distribution networks; Intelligent network technologies; Power electronics applications – FACTS; Advanced current paths (composite, superconductive) conductors; Storage systems (electrical, hydraulic, thermal inertia); Calculating power flows in intelligent networks; Limits of classical algorithms; Ascending-descending method in RE with renewable sources; Traceability of electricity; Significance of MW traceability; AC current model; The DC model; Destination of electricity produced; Origin MW consumed; Loop flows; The link between productions and line transits; The link between transit and consumption; Factors of network use by manufacturers; Factors of network use by consumers; Calculation of short-circuit currents in smart grids; Types of short circuits. Characteristics; Network models for calculating short-circuit currents; Matrix calculation of fault currents and short-circuit node voltages; Transit control in smart grids; Nodes-side distribution factors; Transit control through redispatching; Control of Transit Transformer Transits; Transit control using static compensators; Reactive power compensation and voltage control in intelligent electrical networks; Importance of voltage adjustment for transmission capacity; Line compensation. Changing natural power. Compensation for exploitation with equal stresses at the ends; Inductive and capacitive compensators, series and shunt; Virtual power plant. Guaranteeing production and managing uncertainty and risk associated with intermittent resources; Connect the renewable sources to intelligent electrical networks; Bidirectional power flow; Active consumers; Natural consumption elasticity; Artificial elasticity and elasticity induced by contract; Smart House; Participation of active consumers in the electricity markets; Active consumers on the balancing market; Piloting consumers; Uncertainties about electricity consumption; Risk management associated with variations in electricity consumption; Prognosis of consumption. Laboratory: Modeling active consumers; Modeling of renewable sources and aggravated sources; Calculation of Power Circuits in Intelligent Electrical Networks; Reactive power control and voltage regulation in intelligent electrical networks; Balancing portfolios in smart grids; Calculation of short circuit currents in intelligent electrical networks; Traceability of energy.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ENERGY PRODUCTION MODERN SOLUTIONS

COURSE OBJECTIVE(S): The discipline is designed to present learners, the main modern technologies for the production of electric and thermal energy both in autonomous systems and in cogeneration and trigeneration systems.
COURSE CONTENTS: Course: General problems in industrial energy; Cogeneration systems with steam turbines; Gas turbine cogeneration systems; Steam-gas combined cycle cogeneration systems; Low and medium power cogeneration; Trigenering systems; Calculation of the price of electricity and heat produced in cogeneration based on the distribution of fuel consumption. Project: Comparison of Energy Efficiency Indicators of High

Power Cogeneration Systems with Steam Turbine and High Power Cogeneration Systems with Gas Turbine; Calculation of the price of electricity produced from cogeneration by a steam turbine system.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SOURCES OF POLLUTION AND EQUIPMENT FOR ENVIRONMENTAL PROTECTION

COURSE OBJECTIVE(S): Acquisition by master students of knowledge and specialized skills on the theoretical and computational bases of the emission of pollutants produced in combustion plants of thermoelectric power plants, familiarizing them with the construction, operation and calculation of the main installations for the electrostatic dedusting of combustion gases and the development of skills on the use of specialized programming environments and software applications.
COURSE CONTENTS: Course: Environmental pollution. Conceptualization (Definition. Classification. Pollution sources. Pollutants); Methods to reduce dust emissions. Efficiency of filtration plants. Mechanical filters (based on mass forces) for dedusting; Electrostatic filters. Theoretical considerations. Dedusting efficiency; Operating principle and description of the electrical dedusting system for an energy boiler. Calculation of pre-dimensioning of the initial / modernized electrostatic precipitator; Total or porous filters (Bag filters installation. Numeric application). Wet hydraulic filters. Comparison of dust removal systems; Atmospheric pollution. Instant emission and continuous emission. Pollutant "Cloud". Turbulence intensity and atmospheric stability. Diffusion of pollutants. Calculation of pollutant emissions into the atmosphere. Duration of observation. Mediation period. Pollutant feather superelevation (Calculation relations of pollutant feather: Carey-Halton; Holland; Andreev). Estimation of pollutant concentration; Air quality control system in the thermoelectric power plant area. Description. Types of measurements of pollutants. Schemes of principle; Methods of reducing sulphur emissions. Secondary measures for desulphurisation of combustion gases. The wet process. Case study. Desulphurisation of combustion gases for an energy block. Laboratory: Methods for the measurement of emissions. Introductory concepts. Definitions. Principles of measurement of gaseous noxes. Emissions monitoring. Calculation of emissions of pollutants produced in combustion plants (solid particles, sulphur oxides, nitrogen oxides); Principles of measurement of gaseous noxes. Photometry. Overview. Operational methodology for assessing emissions; Principles of measurement of gaseous noxes. Photometry in IR and UV. Determination of the concentration of different gases based on phenomena of paramagnetism and thermal conductivity; Dust content analysis procedures. Predimensioning an electrostatic precipitator; Presentation and measurements with TESTO 350/454 (portable analyzer of emissions resulting from combustion processes). Numeric application. Homework; Final evaluation of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: ARTIFICIAL INTELLIGENCE TECHNIQUES

COURSE OBJECTIVE(S): It contributes to the formation of future graduates of the master electrical profile, familiarizing them with the main theoretical and practical aspects related to the design of fuzzy controllers.
COURSE CONTENTS: Course: Artificial Intelligence: Presentation, Features, Artificial Intelligence Techniques; Expert Systems: definition, structure, processing of knowledge; Applications of expert systems in the electrical field: diagnosis of electrical equipment condition, maintenance of protection systems, conduction of electrical networks, management of nuclear power plants; Artificial neural networks: presentation, formal neural patterns; Multilayer perceptron: structure, retropropagation algorithm for multilayer perceptron training, aspects of practical use; Hopfield Networks. Kohonen Networks; Applications of neural networks in the electrical field 8. Fuzzy sets: definition, characteristics, operations; Fuzzy relations: general properties, particular properties, relations of similarity, relations of order; Fuzzy properties: linguistic variables, linguistic modifiers, elementary fuzzy sentences, general fuzzy sentences, fuzzy logic characteristics; Fuzzy logic reasoning: fuzzy implications, general classes of implications, generalized pendulum modus, comparison of fuzzy implications; Applications of fuzzy logic in the technique: assessment of risk situations, determination of the optimum pressure-temperature conditions for the operation of a heat exchanger, adjusting the speed of a cc motor with separate excitation. Laboratory: Applications for the use of inference engines for expert systems. Static analysis of short circuits in electrical networks, using the PROLOG language; Applications for the use of multilayer perceptron neural networks; Using the MATLAB environment to implement the retropropagation method; Presentation of the Fuzzy Logic Toolbox from the MATLAB environment. Applications for performing fuzzy sets operations; Application of fuzzy relations in the technique. Applications for fuzzy sentences and reasoning in fuzzy logic; Applications for the use of fuzzy implications.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: POWER SYSTEM DYNAMICS

COURSE OBJECTIVE(S): The discipline proposes the analysis of the operation of the dynamic power and static power systems. Methods of assessing angular stability (synchronous generators) or voltage (of consumers) under various operating conditions are addressed. It presents the modeling of synchronous generators for small / large disturbances and the modeling of the electrical network for various stability problems. The course aims at connecting the graduates of the Electrical Engineering Engineering specialization to the concerns related to the safe operation of the power systems in order to ensure continuity in the electricity supply to the consumers.

COURSE CONTENTS: Course: General aspects of the stability of power systems; Theory and modeling of equipment from power plants; Modeling of dynamic regimes; Stability of the synchronous machine connected to an infinite power bar; Stability in complex power systems; Voltage stability; Frequency setting; Voltage adjustment. Laboratory: Modeling of lines and transformers, generators and consumers (EUROSTAG); Stability study for small and large disturbances of a power system; The study of the voltage stability of an electric power system; Primary frequency setting; Secondary frequency adjustment; Voltage adjustment. Determination of sensitivities. Calculation of electrical distances. Zoning. Choosing the pilot nodes; Coordinated voltage adjustment

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: FINANCING OF ENERGY INVESTMENTS

COURSE OBJECTIVE(S): The course is addressed to students of the 2nd year of Master SEI, and provides information on the financial and economic aspects of investment projects in the energy field. Through its content, the course supports the professional training of the learners involved or interested in the development activities of investment financing projects, strategic planning, mergers and acquisitions in the energy field.

COURSE CONTENTS: Course: The current situation and the strategic directions in the field of energy in Romania; Basic concepts of financing energy projects; Accounting and economic methods for evaluating projects in the energy field; Investment project; Opportunities to finance energy projects; Modern sources of financing of energy projects; Define projects and write project proposals; Accessing European funds to finance energy investments; Project control. Laboratory: Examples of calculation of the capital costs of energy projects; Examples of calculation of operating costs of energy projects; Examples of calculation of capital flows and depreciation; Examples of calculation of economic indicators: VNA, RIR; Writing proposals for the financing of investment projects in the energy field. Discussions on examples of bancable project proposals. Case studies: project description; the purpose of the project; project costs; the benefits of the project; financial evaluation; investment analysis; project financing; impact on the environment.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: APPLIED INFORMATICS IN ENERGY

COURSE OBJECTIVE(S): The acquisition by students of the stages of the implementation of computer systems and program products, modern means of communication used in control systems as well as developing skills in the use of specialized programming environments and software applications.

COURSE CONTENTS: Course: Computer applications. Terminology. Systemic system representation. Components of system analysis; Principles for the realization of IT products; Computer subsystems at the energy producer level. Computer subsystems for transmission and distribution of electricity. Computer subsystems for the energy consumer. Computer subsystem for the energy market; Methods of achieving program products; Primary processing of information. Establishing the information system architecture. Specialized equipments; Architecture of the control system, supervisor and data acquisition. Expert systems applicable to energy management; Current Issues of IMS Applications - Information Management Systems. Laboratory: Work safety rules. Presentation of papers; Tools for managing a power plant's management; Techniques and technologies for the development of integrated energy systems; Integration of the power generation, transport and billing system into the management system of the power plants; System analysis for the computerization of a power plant; The use of control, control and data acquisition systems in the management of power stations; Laboratory test - the final assessment of the laboratory activity

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: DECENTRALIZED POWER GENERATION SYSTEMS

COURSE OBJECTIVE(S): It aims at transmitting and assimilating the knowledge needed to understand the phenomena of energy generation by decentralized systems and the possibilities of their interconnection with the centralized system.

COURSE CONTENTS: Course: Comparison between distributed production and classical energy production; Local heating systems; Decentralized warming by low-temperature radiation;

Decentralized warming by low temperature radiant floor heating with hot water radiant panels; Decentralized heating systems with electric floor heating radiators; Decentralized heating systems with medium and high temperature radiation; Decentralized warm air heating of buildings; Thermal energy generation using solar energy; Generation of electricity using solar energy; Generation of electricity using wind power; Heat pumps; Distributed energy generation with fuel cells; Distributed generation with gas turbines. Laboratory: Dimensioning of local heating systems; Dimensioning of a heating system with hot water radiant floors. Dimensioning a floor heating system with radiant hot and electric panels; Dimensioning of hot air heating systems; Estimation of solar radiation using the EIS program developed in Visual Basic 6.0. Sizing a photovoltaic system. Analysis of the energy and economic efficiency of the photovoltaic system; Analysis of the energy and economic efficiency of a solar-thermal installation; Analysis of the energy and economic efficiency of a wind farm.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SCADA SYSTEMS

COURSE OBJECTIVE(S): Understanding the structure and functions of SCADA systems and the peculiarities of their use in intelligent electrical networks.
COURSE CONTENTS: Course: Architecture of SCADA systems. Components of hardware and software; RTU units. Types of orders and monitoring, functions; MTU Units. Functions; Particularities of SCADA systems used in electrical networks; Energy Management System functions – SCADA; DMS-SCADA systems. Applications for power distribution. Laboratory: Presentation of the SCADA type RESY PMC simulator; Study of airline behavior with RESY PMC; Identification of the test equipment (TCsiTT) with the RESY PMC simulator; Study of the connection between network topology and power losses using the RESY PMC simulator; Automatic voltage control using the; Simulation and analysis of the possibilities of parallel connection of the transformers; determining adjustment errors; Case study: SCADA system for the management of the electrical distribution networks and the railway dedicated to the railway transport; Final assessment of laboratory activity.
LANGUAGE OF INSTRUCTION: Romanian

FIELD: AEROSPACE ENGINEERING
PROGRAMME TITLE: COMPLEX SYSTEMS FOR AEROSPACE ENGINEERING
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: AUTOMATIC FLIGHT CONTROL OF AIRCRAFT LANDING

COURSE OBJECTIVE(S): It contributes to the improvement of aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the design and implementation of software for automatic landing control systems.

COURSE CONTENTS: Course: Procedures and characteristics of aircraft on landing; Mathematical models of aircraft movements and atmospheric disturbances; Landing trajectory calculation models; Landing radiotechnique systems; Automatic aircraft flight control based on dynamic inversion concept; Optimal flight control systems for landing aircraft; Adaptive aircraft flight control systems at landing. Seminara: Modeling of longitudinal and lateral aircraft movements on landing; Calculation of aircraft trajectories on landing in longitudinal and lateral plane; Design of radiotechnique landing systems for the longitudinal and lateral plane; Design of automatic aircraft control structures in longitudinal and side planes based on dynamic inversion concept; Designing optimal aircraft flight control systems using the H-inf criterion; Designing optimal aircraft flight control systems using the H2 criterion; Design of adaptive airborne control systems. Laboratory: Development and implementation of Matlab/Simulink models for longitudinal and lateral aircraft movement at landing; Development and implementation of Matlab/Simulink models for trajectory calculation; Development and implementation of Matlab/Simulink models for atmospheric disturbances; Development and implementation of Matlab/Simulink models for landing radio systems; Development and implementation of Matlab/Simulink models for dynamic inversion concepts; Elaboration and implementation of Matlab/Simulink models for optimal flight control systems for landing aircraft; Development and implementation of Matlab/Simulink models for landing aircraft adaptive control systems.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: 3D ENGINEERING GRAPHICS

COURSE OBJECTIVE(S): It is one of the disciplines of general engineering training, having the character of deepening and having the role of preparing the students in the use of computers and specific peripheral equipment for the preparation and editing of the sketches, execution drawings, aggregate drawings in axonometric (three dimensional) projection and, as a rule, representation of independent graphical materials (charts, schemes etc.) or embeddable into other formats.

COURSE CONTENTS: Course: Axonometric representations. Types of representations. Calculation of reduction coefficients. Practical examples; Working with coordinate axis systems and User Coordinate System (UCS). Changing UCS position in space. Practical examples; Generate and represent surfaces in space. Surface types. Getting 3D surfaces; Wireframe models. Getting spatial wireframes models; Specific commands for obtaining revolution bodies and polyhedral space bodies; Graphical operations to obtain spatial solids. Determination of two-dimensional projections (views, sections) starting from three-dimensional solids models. Laboratory: Representing items in bi- or three-projectional system after model; Representation of axis-symmetric (revolving) items; determining of generation contours; Specific operations for the determination of three-dimensional solids; Determination of three-dimensional surfaces with special properties; Drawing of polyhedral items; Three-dimensional design drawings for parts of an assembly, by model (on-board apparatus, or other instrument/equipment for aircraft). Transformation into plane representations; Representation of the assembly (aggregate drawing). Drawing and completing the component table; Processing of imported graphic objects (drawings).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MINIATURISED SENSORS AND TRANSDUCERS FOR AEROSPACE ENGINEERING

COURSE OBJECTIVE(S): Students are expected to acquire special chapters related to architectures and calculation elements related to miniaturized sensors and transducers used in aerospace applications

COURSE CONTENTS: Course: Parameters and errors of acceleration sensors and angular speed; Optical fiber accelerometer transducers with Bragg network; Analog capacitive microaccelerometers; Accelerometers with electron tunneling; Electromagnetic microaccelerometers; Vibration gyrometers; Fiber optic interferometric grommet; Laser gyrometer. Seminar: Case studies on the influences of inertial sensor errors in the positioning of air vehicles; Optical fiber accelerometer optimization calculations with Bragg network; Study of miniaturized accelerometers: capacitive, with electron tunneling and electromagnetic; Study of vibration gyrometers; Study of optical gyrometers.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPLEX POWER CONVERSION SYSTEMS ON BOARD AIRCRAFT

COURSE OBJECTIVE(S): It has the role of transmitting to the students information about the electrical energy conversion systems on subsonic and supersonic aircraft, mathematical models, elements of design and calculation of these systems, analysis of dynamic processes, their construction and operation.

COURSE CONTENTS: Course: Air power systems on board aircraft; Electricity conversion systems on board aircraft. power converters d.c.-d.c; Modeling and control of high power inverters; Modeling of multi-pulse transformer-rectifier units used in power distribution systems; Modeling and control of the synchronous generator provided with electronic loads; Specifications of on-board impedances for stable power distribution systems. Laboratory: Modeling the converters d.c.- d.c. Buck and Boost in the closed loop using the Matlab/Simulink program; Dynamic study of the synchronous generator provided with electronic tasks using the Matlab/Simulink program; Study of negative impedance stability in aircraft power systems "More Electric Aircarft"; Modeling and analysis of a d.c. of a "More Electric Aircraft" using the Matlab/Simulink program; Supply and commissioning of turbo-jet engines of IAR-93 type subsonic aircraft; An electrical power supply with c.c. on board the MIG-21 aircraft type; Electric power supply, startup and distribution electrical installation on board subsonic aircraft (IAR 93).

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: INTEGRATED AEROSPACE NAVIGATION SYSTEMS

COURSE OBJECTIVE(S): It is intended that the master students acquire special chapters on integrated navigation systems architectures, GPS/INS based on the Kalman filter, respectively on fuzzy techniques. It also aims at acquiring knowledge about inertial and satellite navigation systems.

COURSE CONTENTS: Course: Fundamental elements of inertial and satellite navigation; Characteristics of the signals and extraction of the information from them; GPS data errors; Inertial navigation; The basics of the Kalman filter; Integrated GPS/INS navigation systems based on the Kalman filter; Integrated GPS/INS navigation systems based on fuzzy techniques. Laboratory: Determination of flight attitude using a strap-down inertial navigation system and a dedicated algorithm and error study; Matlab/Simulink implementation of the inertial straw-down navigator error model and its validation by numerical simulation; Study of Inertial Sensor Inertial Sensor Influence on Navigation Solution for a Straight-Inertial Navigator; Positioning a user with a GPS system coupled to the serial entry of a laptop and tracking its trajectory on an integrated map; Numerical simulation of positioning and errors affecting fixed and dead-reckoning systems by integrating three navigation systems; Kalman-Bucy filtering of navigation errors; Fuzzy corrections in a GPS/INS hybrid inertial navigation system. Project: Determining the inertial two-dimensional horizontal plane inertial navigational error pattern from a horizontal plane starting from inertial sensor errors and estimating the navigator errors for a MEMS sensor system; Determination of the inertial two-dimensional horizontal plane inertial navigational model in horizontal plane starting from inertial sensor errors and estimation of navigator errors for a MOEMS sensor system; Determining the inertial two-dimensional horizontal plane inertial navigational error pattern from inertial sensor errors and estimating navigator errors for a MEMS sensor system; Determination of the inertial two-dimensional vertical plane inertial navigational error model from the inertial sensor errors and estimation of the navigator errors for a MOEMS sensor system; Determining the error pattern of a three-dimensional strap-down inertial navigator starting from inertial sensor errors and estimating the navigator errors for a MEMS sensor system; Determining the error pattern of a three-dimensional strap-down inertial navigator starting from inertial sensor errors and estimating the navigator errors for a MOEMS sensor system; Estimation of the position and errors that affect it for fixed systems by integrating three navigation systems; Estimation of the position and errors that affect it for dead-reckoning systems by integrating three navigation systems; Integration of two-dimensional GPS/INS strap-down horizontal plane with the Kalman/Bucy filter; GPS/INS two-dimensional strap-down integration with Kalman/Bucy filter; Integration of the GPS/INS strap-down with the Kalman/Bucy filter

LANGUAGE OF INSTRUCTION: Romanian

1ST YEAR, 2ND SEMESTER

COURSE TITLE: INTEGRATED AVIONICS

COURSE OBJECTIVE(S): Mastering the mastering of the specific problems that arise in the implementation of the avionics systems in general and the integrated avionics systems in particular. The course represents a continuation of the Bachelor's Degree course within the license cycle and aims at presenting and mastering the latest trends and technologies in avionics.

COURSE CONTENTS: Course: Aircraft systems architectures; Real-time operation of Avionics; Ensure fault tolerance; Certification requirements for digital avionics systems. Laboratory: Integrated avionics systems architectures; Advantages and disadvantages of implementing the integrated avionics concept; Specific issues related to the real-time operation of avionics systems; Time division in integrated avionics systems; Partitioning of hardware resources within integrated avionics systems; System data buses on board aircraft - AFDX data bus; System data buses on board aircraft - ARINC 629 data bus; System data buses onboard aircraft - STANAG 3910 data bus; Other data buses used in the aerospace and transport industries - CAN, TTP buses; Instrument data buses used in the aerospace and transport industry - SPI,

I2C; Information display in integrated avionics systems; Requirements for the certification of integrated avionics systems
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SPECIAL FLIGHT DYNAMICS CHAPTERS

COURSE OBJECTIVE(S): Introductory questions on rocket flight; Equations of general motion; Decoupled forms of ordered motion equations; Flight helicopter introductory issues; Helicopter Aerodynamics; Performance and stability of the helicopter; The helicopter command response.
COURSE CONTENTS: Course: Introductory questions on rocket flight; Equations of general motion; Decoupled forms of ordered motion equations; Flight helicopter introductory issues; Helicopter Aerodynamics; Performance and stability of the helicopter; The helicopter command response. Laboratory: Aerodynamic features of the rocket. Polar, aerodynamic coefficients; Rocket motion equations. Numerical simulation of rocket movement; Response to command of the missile; The performance of the helicopter's main rotor; Static stability and dynamic stability of the helicopter; Helicopter stability study by linearizing motion equations; Numerical helicopter flight simulation using nonlinear equations.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: AUTOMANTIC COMAND OF AEROSPACE PROPULSION SYSTEMS

COURSE OBJECTIVE(S): It is one of the deepening disciplines of the Master's cycle of studies, with the aim of presenting to the students the equipments and the automation systems that assist the propulsion systems, from the point of view of construction, operation, mathematical model, dynamic behavior etc. It examines the operation of the various automatic control systems for aircraft engines, their role and their performances, as well as the way of their embedding into the aircraft (flight vehicle).
COURSE CONTENTS: Course Propulsion systems as controlled objects (single-jet turbo-engine with fixed and variable nozzle geometry, with engine shaft driven fuel pump). Equations of mathematical models. Time and frequency characteristics; Multi-spool jet engines (single jet two-spool, single-jet or twin-jets turbofans). Jet engines with afterburning; Equipment in the automatic control systems for air-breathing engines (trensducers for rotational speed, for pressure, for compression ratio, actuators with/without rigid or elastic feedback, dosage elements); Automatic control of supersonic inlets (centerbodies and/or anti-stall flaps positionning systems, intake`s cross-section area control systems); Automatic control of axial compressors; Automatic engine rotational speed control systems (based on fuel flow rate control), automatic acceleration/deceleration control systems; Automatic control of turbo-jet engine propulsion systems with afterburning (afterburning control based on fuel flow rate control). Flight optimization system based on minimum fuel consumption. Seminar: Determination of coefficients of equations of the mathematical model of single-jet single-spool turbo-engine; Determination of coefficients of equations of the mathematical model of single-jet single-spool turbo-engine with variable exhaust nozzle and afterburning; Calculation and plotting of normal time and frequency characteristics; Determining the coefficients of the equations of the mathematical model of a single-spool jet-engine rotational speed control system; Comparative study of the quality of an automatic speed control system of a single-jet single-spool engine, assisted and unassisted by an automatic acceleration control system; Determining the coefficients of equations of the mathematical model of an automatic control system for the position of the exhaust nozzle flaps and the quality study; Determining the coefficients of the equations of the mathematical model of an automatic control system for the supersonic axial-symmetric inlet's cone position and the quality study. Laboratory: Study of the VK-1F-type turbo-engine starting system; R11-F300-type turbo-engine regimes automatic control system; Study of the TG-16M auxiliary power unit automatic starting system; Electromechanical automatic control system for gas temperature in engine`s combustor; Automatic hydromechanical system for controlling the position of the blades of the compressor with respect to the position of engine throttle; Automatic hydromechanical system for positioning the centerbody of the exhaust nozzle with respect to the position of engine throttle.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MICRO AERIAL VEHICLES DYNAMICS AND FLIGHT CONTROL

COURSE OBJECTIVE(S): It contributes to the improvement of aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the dynamics of MAVs, as well as the design and implementation of software for their automated control systems.
COURSE CONTENTS: Course: MAV flight aerodynamics elements; MAV movement modeling and stability analysis. Unfortunate models of MAV dynamics; MAV movement modeling and stability analysis. Linear models and stability analysis of longitudinal motion of MAV MAV; MAV movement modeling and stability analysis. Linear models and stability analysis of lateral movement of MAV MAV; Modeling and design of MAVs; Automatic MAV Flight Control. Laboratory: Linear alignment of longitudinal longitudinal patterns; Linearisation of lateral models; Study of the stability of the longitudinal movement of some MAV-insect line models; Stability study of lateral movement of some MAV-insect line models; Choosing and calculating the dimensional dimensions of the chest; Design of MAV chest control laws; Designing an adaptive control system for the attitude and position of MAV. Project: Analysis of the stability of longitudinal and

lateral movements of some MAV-insect variants; Designing and simulating a servomotor to drive the insect-type MAV wing; Designing an optimal control system for the planned MAV movement; Designing and simulating an adaptive control system of MAV's insect-type attitude
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: MANAGEMENT OF POWER QUALITY

COURSE OBJECTIVE(S): The course supports the professional training of the future or current specialists coming from energy-consuming businesses, energy managers, and equipment manufacturers. The discipline is intended to assist students in deepening the energy quality aspects associated with energy management solutions.
COURSE CONTENTS: Course: General aspects of power quality; Energy quality in liberalized markets; Processed signals measured in power systems; Sources of electromagnetic disturbance; Slow variations of frequency and voltage; Evaluation of harmonic distortions in power systems; Evaluation of asymmetries in power systems; Power quality monitoring; Technical and economic implications of power quality. Laboratory: Study of the harmonics propagation in the electrical networks - software application Paladin DesignBase; Harmonics filters - model in Matlab/Simulink environment; Three-phase models of network components - Matlab/Simulink environment; Power quality monitoring with portable analyzers; Equipments for foads symmetrization in three-phase electrical networks.
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: COMPLEX GYROSCOPIC SYSTEMS FOR ORIENTATION, STABILIZATION AND CONTROL

COURSE OBJECTIVE(S): It contributes to the improvement of the aerospace engineers, familiarizing them with the mathematical modeling of the monoaxial, biaxial and triaxial force gyrostabilizers, the guiding gyroscopic heads, as well as the frequency synthesis of the various gyro system structures for orientation and stabilization.
COURSE CONTENTS: Course: Mathematical modeling of monoaxial, biaxial and triaxial force gyro-stabilizers with different types of mono and office gyroscopes, integrator-correction networks, integral-differentiator and phase-rotor. Differential and matrix forms, linear and nonlinear. Stability analysis; Gyroscopic guidance heads. The mathematical description of the movement of the various variants of the guiding heads: with a gyroscope in the inner and outer cardan suspension; with two gyroscopes with orthogonal or collinear precession axes and with differential gyroscopes; with three gyroscopes. Differential and matrix forms, linear and nonlinear. Stability study; Dynamics of linear gyroscopic systems: nonlinear models of dissipative, elastic, elastic-dissipative and luft couplings; the operative description of the movement; the study of non-linear nonlinear gyro-systems with linear non-linear part, harmonic linearization; gyrosistemes auto oscillating regimes study of the inner and outer couplings dissipative non-linear, stability analysis, calculating the periodic arrangements parameters; auto-shrinking relay-slip modes, stability of dry friction gyrosystems; gyrosystems auto oscillating modes of the rebate and the elastic coupling-dissipative nonlinear stability analysis, calculation of the autooscilations parameters; the influence of orthogonal couplings; methods of damping periodic regimes; Synthesis of gyroscopic systems for stabilization, navigation and routing: frequency synthesis of different gyro system structures for orientation and stabilization, monoaxial, biaxial and triaxial; optimal synthesis gyrostabilisators of force and gyroscopic steering heads criterion minimum time under complete information or incomplete; synthesis of gyrosystems according to the patrician quality criterion; statistical synthesis of force gyrostabilizers; optimal synthesis of gyroscopic systems in random disturbance conditions; using the Kalman-Bucy filter as a state estimator; Design of structural elements, components of gyroscopic systems: gyromotors; cardanic, floating, gas-dynamic, magnetic and electrostatic suspensions; torque-type construction equipment, stabilizer motor with and without mechanical reducer etc ; information acquisition devices, measurement and distance transmitting systems of proportional signals with angular dimensions; damping and locking devices; automatic temperature control systems in gyroscopic enclosures. Laboratory: Testing SFIM type gyroplast; Testing gyroscopic guiding heads with gyroscopes in internal cardanic suspension; Study of a Strap-Down gyroscopic platform; Design of monoaxial gyro-stabilizers assisted by computer, using frequency methods; Design of monoaxial gyrosystems for orientation and stabilization using algorithms based on qualitative quadratic criteria; Girostabilizers of force with deterministic state estimators; Filter for stabilization errors of gyro systems using the Kalman-Bucy filter.
LANGUAGE OF INSTRUCTION: Romanian

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ADAPTIVE SYSTEMS WITH NEURAL NETWORKS FOR FLIGHT COMMAND

COURSE OBJECTIVE(S): It contributes to the improvement of aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the design and implementation of software for adaptive aircraft flight control systems
COURSE CONTENTS: Course: Adaptive driving structures; Hierarchical structures of neuro -

adaptive control; Algorithms for estimating linear and nonlinear systems; Identifying dynamic flight models using neural networks; Dynamic inversion of nonlinear systems; Nonlinear adaptive controllers with linear dynamic compensators and neural networks; Adaptive command systems for longitudinal flight movements using neural networks; Adaptive command systems for attitude and flight speeds with neural networks; Automatic Flight Control using Adaptive Status Observers. Laboratory: Adaptive driving structures; Hierarchical structures of neuro - adaptive control; Algorithms for estimating linear and nonlinear systems; Identifying dynamic flight models using neural networks; Dynamic inversion of nonlinear systems; Nonlinear adaptive controllers with linear dynamic compensators and neural networks; Adaptive command systems for longitudinal flight movements using neural networks; Adaptive command systems for attitude and flight speeds with neural networks; Automatic Flight Control using Adaptive Status Observers.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: SYSTEMS FOR FLYING OBJECTS' STATE ESTIMATION

COURSE OBJECTIVE(S): The discipline contributes to the improvement of the aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the design and implementation of the state estimators software.

COURSE CONTENTS: Course: Estimating state with the least squares method; Optimal status observers; The Kalman filter - Bucy and the design of Bass-; Gura observers; Low-order observers: Low order observers - algorithm 1, Low order observers - algorithm 2, Low order observers - algorithm 3, Low order observers - algorithm 4, Low order observers - the algorithm 5, Low order observers - algorithm 6; Low order observers - algorithm 7 (algorithm ALGLOOR). Laboratory: Observer of the optimal state for the longitudinal movement of the deformable or non-deformable elastic aircraft; Observer of optimum state for lateral movement of the non-deformable elastic aircraft; Estimator Kalman - Bucy for the longitudinal movement of the deformable or non-deformable elastic aircraft; Low order Observer - Algorithm 1 for longitudinal movement of the non-deformable elastic aircraft; Low order Observer - Algorithm 2 for longitudinal movement of the non-deformable elastic aircraft; Low order Observer - Algorithm 3 for longitudinal movement of the non-deformable elastic aircraft; Low order Observer - Algorithm 4 for longitudinal movement of the non-deformable elastic aircraft; Low order Observer - Algorithm 7 for longitudinal movement of the non-deformable elastic aircraft.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: HYBRID POWER SYSTEMS ON BOARD AIRCRAFT AND ROCKETS

COURSE OBJECTIVE(S): It sends students to the Master information on hybrid energy systems on aircraft and missiles, mathematical models, computational elements and design of these systems, analysis of dynamic processes, their construction and operation.

COURSE CONTENTS: Course: General considerations regarding the energy systems of aircraft and rockets; Fuel cells: thermodynamic bases, calculation, types, use; Applications of fuel cells in the aerospace industry; Combustion engine power system for commercial aviation; Types of revolutionary fuel; Requirements and Definitions; State of technology; Unmanned aerial vehicles; PEMFC - for UAV applications; SOFCs for UAV applications; Examples of Fuel Cells Applications on UAVs; The concept of "More Electric Aircraft (MEA)"; Electric action on board aircraft; The concept of "All-Electric Aircraft (AEA)". Laboratory: Mathematical modeling of energy systems on board aircraft based on fuel cells; Mathematical modeling of energy systems on rockets based on fuel cells; Mathematical modeling of a PEM-FC type pile; Mathematical modeling of a SOFC type cell; Mathematical modeling of a power distribution system; Examples of Fuel Cells Applications on UAVs.

LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: OPTIMAL FLIGHT CONTROL SYSTEMS

COURSE OBJECTIVE(S): The discipline contributes to the improvement of aerospace engineers, familiarizing them with the main theoretical and practical aspects related to the design and implementation of optimal control software.

COURSE CONTENTS: Course: Optimal control of linear systems; Optimal Flight Control by Status Vector; The optimal command of flight machines after the output vector; Parametric on-line estimation and discreet optimal command of flight instrument movemen. Seminar: Computer-aided study of the longitudinal movement of an aircraft using the ALGLX algorithm; Computer-aided study of the lateral movement of an aircraft using the ALGLX algorithm; Computer-aided study of the longitudinal movement of an aircraft using the ALGLP algorithm; Computer-aided study of the lateral movement of an aircraft using the ALGLP algorithm; Computer-aided study of the longitudinal movement of an aircraft using the ALGLY algorithm; Computer-aided study of the lateral movement of an aircraft using the ALGLY algorithm; Computer-aided study of the longitudinal movement of an aircraft using the ALGLDR algorithm; Computer-assisted study of the lateral movement of an aircraft using the ALGLDR algorithm.

LANGUAGE OF INSTRUCTION: Romanian

FIELD: ELECTRICAL ENGINEERING
PROGRAMME TITLE: ADVANCED ELECTRICAL SYSTEMS (ENGLISH-TAUGHT PROGRAMME)
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MONITORING AND DIAGNOSIS OF ELECTRICAL SYSTEMS

CODE: D25AES101
ECTS CREDITS: 9
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Knowledge and application of the modern monitoring and diagnosis methods in the field of electrical systems.
COURSE CONTENTS: Introduction. Basic notions. Monitoring and diagnosis methods for electrical systems. Theoretic fundamentals of the on-line and off-line monitoring and diagnosis methods. Hierarchy industrial monitoring systems. Monitoring and diagnosis modules integration; SCADA systems, hardware and firmware. SCADA system. Distributed control system (DCS). Programmable logic controller (PLC). PLCs used as RTUs. Smart instrument. Considerations and benefits of SCADA system. Remote terminal units. The master station; SCADA systems software and protocols. Specialized SCADA protocols. New technologies in SCADA systems; SCADA systems. Modems. Modulation techniques. Radio modems. System reliability and availability. Troubleshooting and maintenance; Diagnosis. Basic concepts. Classification of the diagnosis methods; Elementary functions and performance criteria of the diagnosis systems; Basic principles of shape recognition. Shape recognition techniques applied in diagnosis. Fundamental principles of statistic shape recognition. Specific rules of shape recognition applied in diagnosis; Basic principles of diagnosis based on processes state estimation; Diagnosis methods and techniques: signal based methods, models based methods and knowledge based methods; Diagnosis based on unmeasurable processes parameters. Models based methods. Problem definition. Relations between process parameters and model parameters.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ELECTRICAL SYSTEMS CONTROL WITH PLC THODS

CODE: D25AES103
ECTS CREDITS: 6
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Acquiring basic knowledge about the structure and functioning of the electrical systems control with PLC.
COURSE CONTENTS: An overview of automated electrical systems: definition, classical structure, automatic control in industrial applications (open-loop and closed-loop); advantages of PLCs over relay cabinets; Basic components of automation: concept of relays, switches and different types of sensors: optical, capacitive, inductive, ultrasonic, Hall effect, angular displacement (potentiometer, encoder, tachometer), linear position (LVDT), temperature (RTD, thermocouple, thermistor) and light (LDR); Programmable Logic Controller (PLC): the general architecture of PLC, working principle of PLC, modular construction of PLCs, the central processing unit (CPU), the programming unit, the I/O modules, memory types, digital I/O, analog I/O. Example for S7-200 CPU – Hardware; Programming the PLC with principal languages: the ladder diagram, the Boolean logic, the Sequential Flow Chart (SFC) or the European equivalent (Grafcet). Basic elements of a program: main program, subroutines, interrupt routines, system block, data block. Instructions processing: concept of cycle (synchronous, asynchronous and priority cycles). Execution times, cycle and reaction. Addressing. The operations developed with PLC: logic functions (combinatory and sequential), arithmetic operations (sum, subtraction, multiplication, division), counting and timings, PID process regulations, sequential process controls. Timers; Communications Protocol for Network: Point-to-Point Interface (PPI), Multi-Point Interface (MPI), PROFIBUS.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: OPTIMAL DESIGN OF ELECTRICAL SYSTEMS

CODE: D25AES104-105
ECTS CREDITS: 9
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Students will be able to manage the basic concepts of optimization techniques based on experimental design coupled with finite element method and on genetic algorithms for optimal design of electrical systems.
COURSE CONTENTS: Optimization in electrical systems. Kinds of problems and of optimization methods. Optimization of electrical systems modeled by finite element method; Basic concepts in design of experiments: Strategy of experimentation. Guidelines for designing experiments. Statistical techniques in experimentation; Experiments with a single factor. The analysis of variance. Factorial design. Two factor factorial design. General factorial design. Fitting response curves and surfaces. 2k factorial design; Two- and three- level fractional design; Fitting regression models: Estimation of the parameters. Hypothesis testing. Confidence intervals. Prediction of new response observations; Response surface methodology and optimization. Analysis of second order response surface. Experimental design for fitting response surfaces. Robust design. Adjustments coefficients; Sensitivity analyses: Local sensitivity. Global sensitivity. Technique of screening and optimization;

Optimization by design of experiments: Methods by sliding of designs of first and second order. Sliding without computation of models; Optimization by design of experiments: Methods by zooms. Zooms – Rotations – Translations. Zooms without computation of models; Optimization by design of experiments: Exhaustive methods using factorial design. Exhaustive methods using response surface methodology; Comparison of different optimization methods; Genetic algorithms (GA) – Basic principles – Problem modeling, function optimization, population, coding as binary strings, chromosomes. Evolution steps - initialization, evaluation, selection, recombination, mutation, replacement, parents, offsprings, encoding methods; Genetic operators - Selection methods, fitness, Crossover, Mutations, k-point crossover, uniform/order based/partially matches/cycle crossover; Simple class of genetic algorithms, Two bar pendulum, Traveling salesman problem, Knapsack Problem; GA Variants for Real valued Optimization problems – Messy GA, alternative selection schemes, adaptive GA, hybrid GA, self-organizing GA; Building Blocks; Tuning of Fuzzy systems using genetic algorithms. Genetic programming.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ARTIFICIAL INTELLIGENCE TECHNIQUES FOR ENGINEERING APPLICATIONS

CODE: D25AES106
ECTS CREDITS: 6
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Contribute to future graduates of master-profile electric, familiarizing them with the main theoretical and practical aspects related to design fuzzy controllers. Knowledge and application of the modern diagnosis methods in the field of electrical systems.
COURSE CONTENTS: Fuzzy sets and membership functions; Operations with fuzzy sets; Fuzzy relationships; Linguistic variables and fuzzy sentences; Reasoning in fuzzy logic; Defuzzification method; Application of fuzzy logic in control; Diagnosis. Basic concepts. Classification of the diagnosis methods; Elementary functions and performance criteria of the diagnosis systems; Basic principles of shape recognition. Shape recognition techniques applied in diagnosis; Fundamental principles of statistic shape recognition. Specific rules of shape recognition applied in diagnosis; Basic principles of diagnosis based on processes state estimation; Diagnosis methods and techniques: signal based methods, models based methods and knowledge based methods; Diagnosis based on unmeasurable processes parameters. Models based methods. Problem definition; Relations between process parameters and model parameters.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ADVANCED CONTROL OF AC MACHINES

CODE: D25AES209-210
ECTS CREDITS: 9
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): The overall objective of the discipline is to make the students understanding the principles of the vector control and direct torque control of the AC motors.
COURSE CONTENTS: Models of the induction motor for vector control applications: Phase variables model. Orthogonal bi-phased models. Phasor model in own frames. Phasor model in general frame. Electromagnetic torque expressions. Effects decoupling. Controlling facilities; Vector control of the induction machine; Rotor flux oriented control: Specific torque expression. Rotor voltage equation in rotor flux frame. Vector control diagrams for preset currents voltage fed inverters. Flux models. Stator voltage equation in rotor flux frame. Decoupling circuits. Vector control diagrams for voltage inverters; Stator flux oriented control: Specific torque expression. Stator voltage equation in stator flux frame Decoupling circuits. Rotor voltage equation in stator flux frame. Flux models. Vector control diagrams for voltage inverters. Vector control diagrams for preset currents voltage fed inverters; Magnetizing (resultant) flux oriented control: Specific torque expression. Stator voltage equation in magnetizing flux frame Decoupling circuits. Rotor voltage equation in magnetizing flux frame. Flux models. Vector control diagrams for voltage inverters. Vector control diagrams for preset currents voltage fed inverters; Direct torque control (DTC) of the induction motor: Principle. Implementation and limits of the classic DTC. Continuous DTC; Vector control of the synchronous machine: Models of the permanent magnets synchronous motor (PMSM) for vector control applications. Field oriented control of the PMSM. Vector control diagrams for preset currents voltage fed inverters. Vector control diagrams for voltage inverters. Field oriented control for electric excited synchronous machine.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: ADVANCED CONTROL IN POWER ELECTRONIC APPLICATIONS THODS

CODE: D25AES211-212
ECTS CREDITS: 8
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Knowledge of the construction, operation and control of static converters using DSPs for industrial research and development.
COURSE CONTENTS: Industrial Static Converters: PWM rectifiers. Working principle, topologies, control strategies; PWM inverters for electric drives.

Working principle, topologies, control strategies; PWM inverters for induction heating applications. Working principle, topologies, control strategies; PWM inverters for active filtering applications. Working principle, topologies, control strategies; Closed Loop Control Using Dsp Systems: General terms; DSP systems structure; DSP programming; Closed Loop Control Using DSPACE Control Boards: DS1103 architecture and specifications; DS1104 architecture and specifications); Control Algorithm Implementation for Typical Industrial Static Converters: Control algorithm implementation for PWM rectifiers; Control algorithm implementation for PWM inverters for electric drives; Control algorithm implementation for PWM inverters for induction heating applications; Control algorithm implementation for PWM inverters for active filtering applications.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: MEASUREMENT TECHNIQUES AND STANDARDS IN ELECTROMAGNETIC COMPATIBILITY FOR SMART ELECTRICAL SYSTEMS

CODE: D25AES213
ECTS CREDITS: 5
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): The students will get knowledge on the main aspects related to: (a) the using of the advanced electromagnetic field and electrical circuits methods for electromagnetic waves propagation; (b) the designing of antenna and antenna patterns; (c) the using of specialized software dedicated to advanced EMC.
COURSE CONTENTS: Introduction concerning the standardization in EMC domain. International Electrotechnical Committee (IEC). The Advisory Committee (ACEC) - EMC at IEC level. IEC 107 guide. The limits of emissions in EMC area. Generic standards in EMC. Products standards/family products standards; ACEC. Technical Committee TC 77. Scientific Committees SC 77A, SC 77B, SC 77C. The basic standards developed by Scientific Committees; CISPR/TC 77. CISPR Standards; Immunity Standards. Electrostatic discharge phenomenon. IEC 61000-4-2 Standard; Immunity standards at radiated emissions. IEC 61000-4-3 Standard. Immunity tests over switching voltages; IEC 61000-4-6 Standards: Conducted perturbances due to High Frequency EM fields. IEC 61000-4-11 Standard: voltage drops and voltage interruption. IEC 61000-4-12 Standard; IEC 61000-4-18 Standard; General standards for immunity and emissions; Precompliance tests. Testing environment for precompliance tests. Conducted emissions tests. Radiated emissions tests. Immunity precompliance tests; Compliance tests. Testing environment. Conducted emissions tests. Radiated emissions tests. Immunity compliance tests; Test Environment for different applications. Open Area Test Side (OATS); TEM Cells. GTEM Cells: structure of a GTEM cell; testing volume; appex; radio-frequency absorbers. The propagation of EM fields inside a GTEM cell. The measurement of conducted emissions, radiated emissions and electromagnetic susceptibility in a GTEM cell; Reverberation chambers. The measurement of conducted emissions, radiated emissions and electromagnetic susceptibility in reverberation chambers. VIRC (Virtual Intrinsec Reverberation chambers); Anechoic chambers. Semi-anechoic chambers. The measurement of conducted emissions, radiated emissions and electromagnetic susceptibility in anechoic/semi-anechoic chambers.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: COMPUTER-AIDED ANALYSIS OF NONLINEAR ELECTRICAL SYSTEMS

CODE: D25AES215-216
ECTS CREDITS: 8
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Understanding of basic knowledge on nonlinear systems used in electrical engineering. Developing of skills to handle the mathematical algorithms implemented in software tools for system analysis.
COURSE CONTENTS: General considerations: linear/nonlinear/inertial electrical systems – main particularities; operation regimes; analysis/synthesis of systems; stages of analysis and validation of results; Modeling of nonlinear and non-inertial elements with certain accuracy: global/local models; piecewise/local linear approximation and equivalent diagrams; spline approximation; Modeling of time varying elements, modeling of inertial elements. Examples; General model of stationary behavior of nonlinear electrical systems. Iterative algorithms for analysis: principles, convergence issues, rate of convergence, accuracy of solutions; common related software tools for engineering. Examples; Models of dynamic behavior of nonlinear electrical systems; nonlinear state equations; initial conditions; stiff/non-stiff equations; natural response/forced response. Specific algorithms for numerical integration: principles, convergence issues, accuracy. Witness simulations, common related software tools for engineering. Examples. Small-signal analysis in nonlinear dynamics; Negative-slope elements and chaos phenomena. Example.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

2ND YEAR, 1ST SEMESTER

COURSE TITLE: PROJECT MANAGEMENT IN ELECTRICAL ENGINEERING

CODE: D25AES318
ECTS CREDITS: 7
TYPE OF COURSE: Compulsory

COURSE OBJECTIVE(S): Introduction, understanding and deepening of the fundamental project management principles and apply them to Electrical Engineering real-world projects.
COURSE CONTENTS: General principles of Project Management; Project Management process and tools; Team Culture and project communications; Strategic issues in Project Management, risk and crisis management; Practical considerations in implementing Project Management in the Industry; Case studies in Electrical Engineering; Application of Project Management to Electrical and Engineering Projects; Project Documentation and reporting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: INTEGRATED RENEWABLES IN ADVANCED ENERGY SYSTEMS
CODE: D25AES319
ECTS CREDITS: 6
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Presenting the operation of energy systems with a large quota of renewables.
COURSE CONTENTS: Introduction; Wind farms. Wind turbines. Long term behavior. Operation and perturbations for the electrical grid; Solar power plants. Main types. Long term operation effects; The role hydro power plants when compensating renewables. Main types of hydropower plants; Tendencies in the development of Gas Turbine power plants. Rapid cycle CGTs. Mixed power gas turbine - solar power plants; The operation of conventional steam power plants in parallel with renewable energy sources. Limitations of conventional steam power plants. Methods to decrease the lower operation limit and to increase the speed of conventional power plants; Centralised trigeneration systems operation in parallel with renewable energy sources; Decreasing CO2 emissions for conventional power plants – Carbon Capture and Storage (CCS). CCS as a method to increase the flexibility of conventional power plants.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: SMART PRODUCTS DEVELOPMENT
CODE: D25AES320
ECTS CREDITS: 6
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Understand and apply the creative thinking to develop a smart product.
COURSE CONTENTS: Comparison between creative thinking and design thinking; Review on smart materials; Smart products. Product life cycle; Smart manufacturing ecosystems; Manufacturing standards; User centred design; Smart production and integration of the engineering process; Developing market driven production strategies; Designing the manufacturing and assembly process. Digital factory. Process planning; Strategy of reusing of existing production facilities; Human factor: training and planning; Cost of engineering system; Case study.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

COURSE TITLE: THERMAL AND ELECTROMAGNETIC ANALYSIS OF ELECTRICAL SYSTEMS
CODE: D25AES321
ECTS CREDITS: 9
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): Introducing to the master students in electrical engineering field some issues and techniques related to the analysis of electrical systems using numerical modeling.
COURSE CONTENTS: Basics of electromagnetic field theory: quantities, laws, theorems; equations for static, stationary and time-varying cases; Maxwell's equations, material properties; Computational methods for estimation of the electromagnetic field in electrical systems' components: finite difference method, finite volume method, finite element method. Scalar and vector potentials, boundary conditions, geometry simplifications - planar and axial symmetry, mesh, discretization, theorem of unicity; Concepts of heat transfer: conduction, convection, radiation; thermal conduction, convection and radiation equations. Numerical modeling of heat transfer: computational methods for the estimation of the thermal field. Boundary conditions; One-dimensional heat conduction problems in steady state and time-varying regime. Two-dimensional heat conduction problems in steady state and time-varying regime. Convection-diffusion problems in steady state and time-varying regime; Specialized software for the electromagnetic field and thermal field estimation. Coupled problems issues; DC and AC conduction/thermal field coupled problems. Principles, equations, boundary conditions, mesh, initial state. Applications; AC magnetic/thermal field coupled problems (including eddy currents). Principles, equations, boundary conditions, mesh, initial state. Applications; Transient magnetic/thermal field coupled problems (including eddy currents). Principles, equations, boundary conditions, initial conditions, mesh, initial state. Applications.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam

Faculty of Mechanical Engineering

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Faculty of Mechanical Engineering

Bachelor's Degree

Duration: 4 years
No. of credit points: 240

Field: *Industrial Engineering*
Programme title: Automotive Technology

Field: *Automotive Engineering*
Programme title: Motor cars

Field: *Transport Engineering*
Programme title: Transport and Traffic Engineering

Field: *Maritime and Navigation Engineering*
Programme title: Navigation and Maritime and River Transport (Centre of Dr.-Tr. Severin)

Field: *Environment Engineering*
Programme title: Engineering and Environment Protection in Industry (Centre of Dr.-Tr. Severin)

Field: *Civil Engineering*
Programme title: Civil, Industrial and Agricultural Constructions

Field: *Engineering and Management*
Programme title: Industrial Economic Engineering (Centre of Drobeta-Turnu Severin)

Master's Degree

Duration: 2 years
No. of credit points: 120

Field: *Automotive Engineering*
Programme title:
Concept and Design of Modern Automotives
Optimisation of Road Transport Systems
Automotive Engineering – Design, Manufacturing and Development (English-taught programme)

Field: *Industrial Engineering*
Programme title: Optimisation of Technological Processes and Equipment

Field: *Engineering and Management*
Programme title:
Production and Logistics Management
Logistics Systems Management (Centre of Drobeta-Turnu Severin)
Engineering and Quality Management (Centre of Dr.-Turnu Severin)

Field: *Environment Engineering*
Programme title: Environmental Management and Sustainable Energy (Centre of Drobeta-Turnu Severin)

FIELD: AUTOMOTIVE ENGINEERING
PROGRAMME TITLE: MOTOR CARS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS

CODE: D22ARL101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of Mathematical Analysis.
COURSE CONTENTS: Convergence: Sequences and series of real numbers, Power series, Fourier series; Continuity and Differentiability: Functions of several real variables, Implicit functions, The extreme values of a real function of several variables; Integral calculus: Definite integrals with parameters, Improper integrals, Line integrals of the first type, Multiple integrals, First type surface integrals; Elements of field theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY

CODE: D22ARL102
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts from descriptive geometry, to develop the creative skills to see „deep in space" and to prepare project designs. Terms used are under current standards and international standards.
COURSE CONTENTS: Projection systems; Line; A line of positions in relation to the planes of projection; The relative positions of two lines; The Plan; Line of a plan; The relative positions of the two planes; The position of a line in a plane; The intersection of plane figures; The projection transformation methods: the method of changing the projection planes, crop rotation method and rotation method of projection planes; Representation of geometric bodies; Sections in geometrical bodies; Development of geometric surfaces; Intersection of geometric bodies; The general method for the determination of the line of intersection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL CHEMISTRY

CODE: D22ARL103
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STUDY OF MATERIALS

CODE: D22ARL104
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students basic knowledge about the internal structure and properties of ferrous and nonferrous alloys materials. It is an essential technical discipline needed to further understanding the technology of materials and thermal treatment.
COURSE CONTENTS: Crystal structures and properties of metals; Solidification and plastic deformation of metals; Binary alloy systems; Structures and properties of ferrous alloys plain carbon steels; ron-carbon phase diagram; Plain carbon steels ; Cast iron; Basic concepts of thermal treatment of carbon steels; Carbon steels transformation under heating and cooling; Austenite transformation under cooling; Martensite transformation; Isothermal and continuous-cooling transformation diagrams of carbon steels; Thermal treatments: annealings, normalizing, quenching, tempering; Aluminium alloys and copper alloys.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS I

CODE: D22ITTL103
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents to students the fundamental notions of analytical mechanics and specific notions of kinematics; kinematical analysis of rigid body in particular motions and, generally, in general motion.
COURSE CONTENTS: Reduction of the sliding vectors; Mass, the centre of mass (definitions, properties, Guldin-Pappus Theorems); Moments of inertia; Kinematics of material point; Kinematics of rigid body; Kinematics of relative motion for material point; Kinematics of relative motion for solid body.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION I

CODE: D22ARL107
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) I

CODE: D22ARL108
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES I

CODE: D22ARL106
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop at students basic skills in the use of Windows operating systems, to familiarize students with development of fundamental algorithms and programming theory; learn students with programming in "C" language and development of Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications, Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MECHANICS II

CODE: D22ITTL211
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents to students the fundamental notions of analytical mechanics and specific notions of kinematics; kinematical analysis of rigid body in particular motions and, generally, in general motion.
COURSE CONTENTS: Reduction of the sliding vectors; Mass, the centre of mass (definitions, properties, Guldin-Pappus Theorems); Moments of inertia; Kinematics of material point; Kinematics of rigid body; Kinematics of relative motion for material point; Kinematics of relative motion for solid body.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES II

CODE: D22ARL210
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop at students basic skills in the use of Windows operating systems, to familiarize students with development of fundamental algorithms and programming theory; learn students with programming in "C" language and development of Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications, Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ALGEBRA, ANALYTIC AND DIFFERENTIAL GEOMETRY

CODE: D22ARL211
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING AND INFO-GRAPHICS

CODE: D22ARL212
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts about the drawing of the technical documentation for manufacturing, assembling and repairing operations. Also, the course offers the basics for the graphical representation and correct reading of the technical ideas necessary for each engineer.
COURSE CONTENTS: The course focuses on projecting and drawing systems; The general rules for the correct drawing of the views and sections; The dimension operation in Technical drawing, dimension rules representation, dimension systems, scaled drawing; The drawing, notation and dimension operations for the threads; The material code: notation; The roughness of the surfaces notation; Assembly drawing, the drawing rules, the bill of materials; The gears drawing operation; General aspects about Computer Graphics; The

evolution of Computer Graphics; A short history of the CAD (Computer Aided Design) concept; The classification of the CAD systems; The location of the CAD concept in the industrial company; New concepts in CAD; The concepts and software adjacent to the CAD concept; The CAM (Computer Aided Machining) concept; The FEA (Finite Element Analysis) concept; The dynamic and kinematic simulation software; Parameterization and bidirectionality; Modeling software modules; 2D sketches; Base and additional shapes; Reference geometrical elements; Complex shapes; Curves, surfaces; Assembly software module; Conections, geometrical constraints, equations, mechanical constraints; Software modules for the technical documentation; The 2D drawings; Elements of virtual testing; Animation and realist views.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NUMERICAL APPLICATIONS IN ENGINEERING (MATLAB, SIMULINK, MATHCAD)

CODE: D22ARL213
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION II

CODE: D22ARL214
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: HISTORY OF TECHNICS

CODE: D22ARL215
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I

CODE: D22ARL218
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: TECHNICAL DRAWING AND INFO-GRAPHICS

CODE: D22ARL322
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts about the drawing of the technical documentation for manufacturing, assembling and repairing operations. Also, the course offers the basics for the graphical representation and correct reading of the technical ideas necessary for each engineer.
COURSE CONTENTS: The cours focuses on projecting and drawing systems; The general rules for the correct drawing of the views and sections; The dimension operation in Technical drawing, dimension rules representation, dimension systems, scaled drawing; The drawing, notation and dimension operations for the threads; The material code: notation; The roughness of the surfaces notation; Assembly drawing, the drawing rules, the bill of materials; The gears drawing operation; General aspects about Computer Graphics; The evolution of Computer Graphics; A short history of the CAD (Computer Aided Design) concept; The classification of the CAD systems; The location of the CAD concept in the industrial company; New concepts in CAD; The concepts and software adjacent to the CAD concept; The CAM (Computer Aided Machining) concept; The FEA (Finite Element Analysis) concept; The dynamic and kinematic simulation software; Parameterization and bidirectionality; Modeling software modules; 2D sketches; Base and additional shapes; Reference geometrical elements; Complex shapes; Curves, surfaces; Assembly software module; Conections, geometrical constraints, equations, mechanical constraints; Software modules for the technical documentation; The 2D drawings; Elements of virtual testing; Animation and realist views.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D22ARL321
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICAL VIBRATIONS

CODE: D22ARL323
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts

regarding the modelling process of vibrating mechanical systems , both discrete and continuous as well as different methods both analytical and numerical for solving these models.
COURSE CONTENTS: General considerations; Elements for modeling the mechanical systems with one degree of freedom (1DOF) – (un)damping; Elements for modeling the mechanical systems 2DOF – (un)damping; Elements for modeling mechanical systems xDOF and numerical methods for solving them; Mechanical vibrations of continuous systems (longitudinal, rotational and bending); Special problems of vibrational systems (biological systems, coupled problems, etc.).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY
CODE: D22ARL324
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding the main technology of production and processing technical materials.
COURSE CONTENTS: Classification of material properties; metal materials; obtaining metallic materials; metal casting; powder metallurgy; plastic deformation of metals; welding of metallic materials; technologies unconventional; NDT materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINING AND MACHINE-TOOLS
CODE: D22ARL325
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course teaches the students theoretical and practical knowledge regarding the machines manufacturing.
COURSE CONTENTS: Concepts regarding the chipping and the cutting tools theory; Elements of the machines kinematical chains theory; Products manufacturing on lathes; Products manufacturing on the drillers and the boring machines; Products manufacturing on the milling machines; Products manufacturing on the planing machines, slotters and die-slotting machines; Products manufacturing on the grinding machines; Gears tooths manufacturing on the gear cutting machines; Products manufacturing on machines with program command; Products manufacturing on aggregates and automatic lines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANISMS I
CODE: D22ARL326
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course provides general concepts about the structure, kinematics and dynamics of bar, cam and gear mechanisms and how these concepts may be applied in other disciplines and specialized fields.
COURSE CONTENTS: Structural analysis and synthesis of mechanisms; Kinematic analysis of mechanisms; Kinetostatic analysis of mechanisms; Dynamic analysis of mechanisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION I
CODE: D22ARL328
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I
CODE: D22ARL329
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF ECONOMY
CODE: D22ARL436
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRENGTH OF MATERIALS I
CODE: D22ARL327
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Achieve of computing skills in order to design mechanical constructions; Assimilation of knowledge on simple and complex demands of the various pieces of machinery, aggregates and machinery.
COURSE CONTENTS: Sectional charts efforts; Axial efforts; Surface geometric features; Torsion stress; Bending of straight beams stress; Elements of elasticity theory; Compound stress; Calculation of deformations; Statically indeterminate systems, Dynamic stress; Fatigue stress.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: MECHANISMS II

CODE: D22ARL430
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course provides general concepts about the structure, kinematics and dynamics of bar, cam and gear mechanisms and how these concepts may be applied in other disciplines and specialized fields.
COURSE CONTENTS: Cam and intermittent motion mechanisms; Gear mechanisms; Synthesis of articulated mechanisms; Optimization of mechanisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STRENGTH OF MATERIALS II

CODE: D22ARL431
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Achieve of computing skills in order to design mechanical constructions; Assimilation of knowledge on simple and complex demands of the various pieces of machinery, aggregates and machinery.
COURSE CONTENTS: Sectional charts efforts; Axial efforts; Surface geometric features; Torsion stress; Bending of straight beams stress; Elements of elasticity theory; Compound stress; Calculation of deformations; Statically indeterminate systems, Dynamic stress; Fatigue stress.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL PHYSICS

CODE: D22ARL432
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER AIDED DESIGN-BASIS

CODE: D22ARL433
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop at students skills to generate a three-dimensional geometry with wireframe, solid modelling and surfaces techniques; to combine these models in virtual assemblies, and to automatically extract the plane documentation from 3D models.
COURSE CONTENTS: The role of CAD system in a production cycle; components of a CAD system and its evaluation criteria, analytical representation of curves and surfaces; 3D surface modelling techniques: the primitive, by generation – revolution, extrusion, tubular, swept, rulers – rule, planar, loft, derived surfaces – blend, offset, fillet, corner); parametric solid modelling based on the sketch, geometric constraints and dimensional parametric solid modelling based on feature; Features for tree modelling crankshafts; Special modelling for crankcase; modelling features for cylinder heads; Use of standardized libraries, documentation extraction of virtual models, virtual assemblies, assembly constraints, exploded representations; A-class surfaces; specific modelling elements Body auto.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination, practical test

COURSE TITLE: FLUIDS MECHANICS

CODE: D22ARL434
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers to the students the theoretical and practical concepts about the fluids flow with application in the mechanical engineering.
COURSE CONTENTS: The main properties of fluids; The general methods of study used in the mechanics of fluids; The fundamental equations of the mechanics fluids; The kinematics of the fluid; The dynamics of the ideal fluids; The statics of fluids; The dynamics of the viscous fluids under the laminar and turbulent flow; The applied of the mechanics of fluids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TOLERANCES AND DIMENSIONAL CONTROL

CODE: D22ARL435
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with specific notions for dimensional and geometric accuracy of mechanical engineering parts, correct prescription of economic tolerances when designing assembly fits of main types: cylindrical and conical, with bearings, thread, feathers and grooves gear. Laboratory work skills training needed to perform control operations aimed in manufacturing processes of parts and assembly listed above, by performing measurements with different methods and measuring devices.
COURSE CONTENTS: Dimensional and geometric tolerances; Surface roughness; Tolerances, fits and control of smooth cylindrical assemblies; Chains of dimensions; Tolerances, fits and control of conical parts and assemblies; Bearing assembly tolerances and fits; Tolerances, fits and control threaded

fasteners; Tolerances, fits and control parts and assemblies with wedges and grooves; Tolerances, fits and control gear wheels and gear cylinders; 3D measurement with TESA MultiGage articulated arm.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION II
CODE: D22ARL437
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I
CODE: D22ARL439
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SPECIAL MATERIALS FOR CARS
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: optional (specialised, domain)
COURSE OBJECTIVE(S): Constituent materials of automotive knowledge and technical materials used in the operation of the car; Establishing the operating conditions, operating requirements and criteria for choice of materials.
COURSE CONTENTS: Basics vehicles; Getting technical tribology automotive applications; Oils, greases, solid lubricants and special pasta; Gear oils; Transmission fluids and hydraulic dampers; Fluids and technical materials: Liquids for engine cooling, brake fluid, electrolytes for electric accumulators; Plastics in automotive construction; Elastomers and their use in automobiles; Corrosion protection; Materials with acoustic features; Adhesives; Textiles in automotive interior; Activated carbon; For friction materials; Ceramic materials; Glass and its use in automobiles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written colloquium

COURSE TITLE: PRACTICAL STAGE
CODE: D22ARL438
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: THE HYDRAULIC AND PNEUMATIC DRIVES
CODE: D22ARL544
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S) The course offers to the students the theoretical and practical concepts used for design calculation of the hydraulic and pneumatic components and choosing these for the hydraulic and pneumatic systems.
COURSE CONTENTS: The internal problems in hydraulic systems (SAH); Flow balance equations in SAH; Fundamentals of he hydraulic resistances in SAH; The applications concerning the calculation of the hydraulic schemes in steady and unsteady regime of SAH; The apparatus used in the hydraulic and pneumatic systems; The hydraulic volume machines; The general theory of the hydraulic volume generators (GHV); Particular types of the rotary volume generators GVR; The volume rotary engines (MVR); The general theory of the stationary MVR; The stationary characteristics of the MVR; The linear volume engines (MVL); The general theory of the MVL; The stationary characteristics of the MVL; The practical problems in SAH concerning the installation of the hydraulic volume machines; The hydrodynamic machines; Fans.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELECTROTEHNICS AND ELECTRICAL MACHINES
CODE: D22ARL545
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELECTRONICS AND BASICS OF AUTOMATION SYSTEMS
CODE: D22ARL546
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELEMENTS OF MECHATRONICS
CODE: D22ARL562
ECTS CREDITS: 3
TYPE OF COURSE mandatory
COURSE OBJECTIVE(S): The course provides students familiar with the main mechatronic systems (sensors and actuators) that equip existing vehicles

and applications processors mechatronic systems (intelligent auto).

COURSE CONTENTS: The car as mechatronic products; Basic components and their functions; Sensors and actuators in automotive technology; Sensors for automotive applications; priority requirements; Mechatronic systems for monitoring and adjusting the position; Transmission management systems; Mechatronic systems for monitoring stability; Acceleration and vibration sensors; Superficial film sensors; Hall type acceleration sensors; Piezoelectric sensors; Pressure sensors; Mechatronic systems for engine management; Detonation sensors; Flow measurement systems; Mass and volume flow sensors; Temperature sensors; Mechatronic systems for monitoring and controlling the movement and braking; Mechatronic systems for safety and comfort; Electromagnetic actuators and electro-mechanical systems used in safety and comfort we manage to drive actuators seats, mirrors, roof and central locking; Actuators for control of automated navigation and piloting; Fluid mechanical actuators; Hydraulic and pneumatic actuators.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MACHINE ELEMENTS I

CODE: D22ARL548

ECTS CREDITS: 5

TYPE OF COURSE: technical culture of specialty

COURSE OBJECTIVE(S): Promoting and developing of some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming the students' creativity skills by elaborating original solutions and modern design through facilities brought by CAD/ CAM/ CAE. This course addresses to students which follows the 4 years undergraduate studies at Faculty of Mechanics from Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT), Engineering and Management (IEM).

COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear transmissions; Chain drives; Friction wheels transmissions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profiles assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS AND THERMAL MACHINES I

CODE: D22ARL549

ECTS CREDITS: 5

TYPE OF COURSE: mandatory

COURSE OBJECTIVE(S): The course present students the notions necessary for understanding thermal phenomena, utilisation of heat and to obtaion mechanical work from heat. Also presents the basic principles of design and operation of thermal installation.

COURSE CONTENTS: General notions about the laws of perfect gas and simple transformations; The perfect gas mixtures and the thermodynamic principles; There are presented the methods for thermodynamics analyses; For the analyses of real processes of thermal machines are presented the real gases showing the differences of the properties are used in some technical applications; Are analyzed the theoretical principles of thermal machines through the presentation of the methods for the study and evaluations of their performances.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TRIBOLOGY

CODE: D22ARL550

ECTS CREDITS: 3

TYPE OF COURSE: optional

COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts for the study of physical, mechanical, metallurgical and chemical interactions of elements in relative motion and lubrication issues.

COURSE CONTENTS: Definition and importance of tribology; Friction in joints; Tribotechnical systems; The deformable elastic body; Hertzian elastic contact; Elastic contact with friction; Lubricants; Friction regimes; State of lubrication and wear; Recommendations for friction joints materials selection.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELECTRICAL AND ELECTRONICS EQUIPMENT FOR AUTOMOMOBILES

CODE: D22ARL552

ECTS CREDITS: 3

TYPE OF COURSE: optional

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: MACHINE ELEMENTS II

CODE: D22ARL654
ECTS CREDITS: 3
TYPE OF COURSE: technical culture of specialty
COURSE OBJECTIVE(S): Promoting and developing of some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming the students' creativity skills by elaborating original solutions and modern design through facilities brought by CAD/ CAM/ CAE. This course addresses to students which follows the 4 years undergraduate studies at Faculty of Mechanics from Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT), Engineering and Management (IEM).
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear transmissions; Chain drives; Friction wheels transmissions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profiles assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS AND THERMAL MACHINES II

CODE: D22ARL656
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course present students the notions necessary for understanding thermal phenomena, utilisation of heat and to obtaion mechanical work from heat. Also presents the basic principles of design and operation of thermal installation.
COURSE CONTENTS: General notions about the laws of perfect gas and simple transformations; The perfect gas mixtures and the thermodynamic principles; There are presented the methods for thermodynamics analyses; For the analyses of real processes of thermal machines are presented the real gases showing the differences of the properties are used in some technical applications; Are analyzed the theoretical principles of thermal machines through the presentation of the methods for the study and evaluations of their performances.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROCESSES AND CHARACTERISTICS OF INTERNAL COMBUSTION ENGINES

CODE: D22ARL657
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Assimilation by learners of: notions specific to components and internal combustion engines operation; notions specific to the thermal processes and internal combustion engines characteristics; Formation of the aptitudes necessary to determinate parameters and indices which characterize thermal processes and interpretation of engines characteristics; Formation of skills concerning engines design in terms of thermal processes and characteristics.
COURSE CONTENTS: Genral consideration; Engines systematics; Internal combustion engines operation principle; Principal parameters and vehicles and tractors internal combustion engines operation principle; Thermodynamic cycles of piston engines; Operating regimes; Engine load; Change gas processes (normal filling four-stroke engines, filling two-stroke engines, filling forced the evacuation process); Compression process; Combustion process; Physico-chemical bases of the combustion process; Elements of thermodynamics and combustion kinetics; Elements of the ignition theory and spread of fire; Combustion in m.a.s.; Combustion in m.a.c.; Relaxation process; Engine's thermic calculation; Internal combustion engines characteristics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROCESSES AND CHARACTERISTICS OF INTERNAL COMBUSTION ENGINES – PROJECT

CODE: D22ARL658
ECTS CREDITS: 2
TYPE OF Project: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICAL SYSTEMS MODELLING BASICS

CODE: D22ARL659
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course forms and guide the students assimilation capacity for modelling and simulating, through modern methods, of the behavior in static and dynamic mode structures and mobile mechanical systems, based on multi body systems theory and finite element method. Another aim is the one that it can be develop and form, students' ability through

applications by using important modelling and analysis software (ADAMS, ANSYS, etc.).
COURSE CONTENTS: Elements of matrices and vectorial algebra; Computer kinematic and dynamic modelling through computational methods of mechanical mobile systems; Kinematic modelling and simulations with ADAMS software; Linear elasticity elements; Finite element modelling basics; Finite element modelling in static and dynamic mode of mechanical structures (theory and applications); Modelling and simulations by using finite element method with ANSYS and COSMOS software.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: AUTOVEHICLE DYNAMICS I

CODE: D22ARL660
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides the students the appropriate knowledge and use of specific fundamental concepts of the discipline, allowing also the interpretation of this discipline specific notions regarding their application in the vehicle's structural components design, explain at the same time kinematics and dynamic theories that define vehicle's motion.
COURSE CONTENTS: Organization and the main parameters of wheeled vehicles; The vehicles' self-propulsion; Vehicles' wind drag; Reactions of the tread upon the vehicle's wheels; Vehicles' traction and braking dynamics; Fuel consumption; Vehicle stability; Vehicles' manipulation; Vehicles oscillation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: AUTOVEHICLE DYNAMICS – PROJECT

CODE: D22ARL661
ECTS CREDITS: 2
TYPE OF PROJECT: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FUELS AND LUBRICANTS

CODE: D22ARL647
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: HEAT AND MASS TRANSFER

CODE: D22ARL664
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): It is presented the necessary background for understanding of the phenomenons that occurs in the thermal plants and machines. The fundamentals for the study of heat and mass transfer processes for steady and transient are further discussed.
COURSE CONTENTS: General information about the heat transfer by conduction, convectionand radiation for steady and transient conditions. The the calculation methods for the global heat transfer are presented, together with examples about the characteristics of the thermal insulation for different surfaces. For the mass transfer there are analyzed Fick's laws which describe the difussion phenomenon as process regarding the amount of substance that is being transported. As an exemple for technical applications there are studied the methods for thermal design of a heat changer.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): written examination

COURSE TITLE: PRACTICAL STAGE

CODE: D22ARL663
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: AUTOVEHICLE DYNAMICS II

CODE: D22ARL770
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides the students the appropriate knowledge and use of specific fundamental concepts of the discipline, allowing also the interpretation of this discipline specific notions regarding their application in the vehicle's structural components design, explain at the same time kinematics and dynamic theories that define vehicle's motion.
COURSE CONTENTS: Organization and the main parameters of wheeled vehicles; The vehicles' self-propulsion;; Vehicles' wind drag; Reactions of the tread upon the vehicle's wheels; Vehicles' traction and braking dynamics; Fuel consumption; Vehicle stability; Vehicles' manipulation; Vehicles oscillation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CALCULATION AND CONSTRUCTION OF INTERNAL COMBUSTION ENGINES

CODE: D22ARL771
ECTS CREDITS: 3
TYPE OF COURSE: mandatory

COURSE OBJECTIVE(S): The main objectives are represented by the study of notions of calculus and construction of internal combustion engines.
COURSE CONTENTS: Introduction to internal combustion engines; Kinematics of motor mechanism; Equilibration of engines; Piston Segments; Engine bolt; Connecting rod; Crank-shaft; Distribution mechanism; Supply system; Lubrication system; Cooling system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: CALCULATION AND CONSTRUCTION OF INTERNAL COMBUSTION ENGINES – PROJECT

CODE: D22ARL772
ECTS CREDITS: 3
TYPE OF Project: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TESTING AND APPROVAL OF VEHICLES

CODE: D22ARL773
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course provides students with theoretical and practical concepts concerning the approval and testing their vehicle to placement rules imposed by their current standards.
COURSE CONTENTS: Identifying possibilities for testing and approval of the concept vehicle systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SPECIAL INSTALLATIONS FOR AUTOVEHICLES

CODE: D22ARL774
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents students general concepts regarding the construction and operation of special equipment for motor vehicles and facilitates command and control knowledge elements managed by the Central Unit Calculator.
COURSE CONTENTS: Mixture preparation systems at MAS: Electronic equipment for low pressure gas injection; Electronics gasoline direct injection; Mixture ignition engines Otto engine Power Plant classical MAC; Injection systems m.a.c. with electronic control of fuel injection; Overeating engines; Control of motor vehicle emissions; Engine cooling control with variable speed fans special equipment electronic stability control; Special equipment electronic traction control, steering and suspension; Safety features and comfort.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CALCULATION AND CONSTRUCTION OF AUTOVEHICLES I

CODE: D22ARL775
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Discipline aims to make students acquire the basic concepts of calculation and construction of the autovehicles, organological analysis skills development, skills development of design and creativity in the field of autovehicles.
COURSE CONTENTS: General concepts about autovehicles, construction and calculation elements for: clutches, gearboxes, longitudinal transmissions, front and rear axles, steering systems, braking systems, suspension systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CALCULATION AND CONSTRUCTION OF AUTOVEHICLES – PROJECT

CODE: D22ARL883
ECTS CREDITS: 2
TYPE OF Project: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ROAD VEHICLE MANUFACTURING TECHNOLOGIES I

CODE: D22ARL776
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts conceptual and technological principles of vehicle manufacture.
COURSE CONTENTS: General notions about processes; Determine the necessary elements for preparation processes; Automotive moldings; The calculation precision machining; Surface quality automotive parts, bases, dimensions and devices; Working methods and reconditioning of vehicle parts; Manufacturing technologies tree parts; Manufacturing technology type parts bush; Technology manufacturing pistons; Rings and connecting rod; Manufacturing technology type casing parts; Painting and additional protection vehicles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SPECIAL TRANSMISSIONS FOR AUTOVEHICLES

CODE: D22ARL785
ECTS CREDITS: 2
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Student acquaintances with different formalisms used in mechanical transmissions modelling; thoroughgoing study, previously acquired, regarding mechanical transmissions; student acquaintances with numerical computations specific aspects, applicable on kinematic and dynamic studies of mechanical transmissions with variable structure.
This course addresses to 4th year students which follows the 4 years undergraduate studies at Faculty of Mechanics from Automotive Engineering (AR).
COURSE CONTENTS: Knowledge regarding the mechanical transmissions structure and topology; mechanical transmissions classification; mechanical transmissions with invariable structure; mechanical transmissions with variable structure; transfer functions; algorithms for mechanical transmissions kinematic analysis; mechanical transmissions kinematic optimization; error sources in mechanical transmissions kinematic analysis; algorithms for optimizing the mechanical transmissions kinematic synthesis; mechanical transmissions efficiency evaluations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TECHNICAL EXPERTISE OF THE TRAFFIC CRASH

CODE: D22ARL787
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Assimilation of the scientific concepts specific to technical expertise and traffic crash.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: ROAD VEHICLE MANUFACTURING TECHNOLOGIES II

CODE: D22ARL881
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts conceptual and technological principles of vehicle manufacture.
COURSE CONTENTS: General notions about processes; Determine the necessary elements for preparation processes; Automotive moldings; The calculation precision machining; Surface quality automotive parts, bases, dimensions and devices; Working methods and reconditioning of vehicle parts; Manufacturing technologies tree parts; Manufacturing technology type parts bush; Technology manufacturing pistons; Rings and connecting rod; Manufacturing technology type casing parts; Painting and additional protection vehicles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CALCULATION AND CONSTRUCTION OF AUTOVEHICLES II

CODE: D22ARL882
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objectives are represented by the study of notions of calculus and construction of internal combustion engines.
COURSE CONTENTS: Introduction to internal combustion engines; Kinematics of motor mechanism; Equilibration of engines; Piston Segments; Engine bolt; Connecting rod; Crank-shaft; Distribution mechanism; Supply system; Lubrication system; Cooling system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: EQUIPMENT AND AUTOMOTIVE DIAGNOSTIC TECHNIQUES

CODE: D22ARL877
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course provides students with knowledge regarding vehicles' specific elements of diagnosis equipment and techniques, and training skills in automotive diagnosis and understanding, explaining and interpreting theoretical and practical content of the discipline.
COURSE CONTENTS: General principles of diagnosis; General diagnosis of the vehicle; Diagnosing the technical condition of the engine; Diagnosing the ignition system; Diagnosing the technical condition of the transmission; Steering Diagnosis; Brake System Diagnosis; Suspension Diagnosis; General diagnostics using electronic tester.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CAR BODIES AND STRUCTURES

CODE: D22ARL878
ECTS CREDITS: 3
TYPE OF COURSE: fundamental (specialised, domain)
COURSE OBJECTIVE(S): Learning general concepts of body building, knowledge of computing elements and aspects of the design for vehicle bodies and structures, Knowledge of technological achievement and test phases of vehicle bodies and structures; Primary security; Cockpit ergonomics.

COURSE CONTENTS: General considerations on the construction of bodies; Technical design of the body shape and the bearing structure; Items for car body design; Body design elements for buses and trucks; Body as a security feature; Constructive measures and methods for conditions regarding: information security, security primary (active) and secondary safety (passive protection); Tests of passive safety body; Calculation of body elements; Solutions and building blocks bearing structures; Materials used in car body construction; Corrosion and corrosion protection of metal parts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RELIABILITY OF VEHICLES

CODE: D22ARL879
ECTS CREDITS: 4
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Learning by students of the relationship of reliability, maintainability and terotehnics vehicles.
COURSE CONTENTS: Reliability: reliable vehicles; Study of reliability, object definitions; Random variables; Theoretical aspects of reliability, the basic parameters; Primary processing of experimental data; Theoretical laws of distribution used in reliability; Confidence intervals; Parameters of reliability for repairable items and unrecoverable; Reliability of systems; Reliability tests.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MANAGEMENT

CODE: D22ARL888
ECTS CREDITS: 2
TYPE OF Project: optional
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: TRANSPORT ENGINEERING
PROGRAMME TITLE: TRANSPORT AND TRAFFIC ENGINEERING
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS

CODE: D22ITTL101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of Mathematical Analysis.
COURSE CONTENTS: Convergence: Sequences and series of real numbers, Power series, Fourier series; Continuity and Differentiability: Functions of several real variables, Implicit functions, The extreme values of a real function of several variables; Integral calculus: Definite integrals with parameters, Improper integrals, Line integrals of the first type, Multiple integrals, First type surface integrals; Elements of field theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL CHEMISTRY

CODE: D22ITTL102
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS I

CODE: D22ITTL103
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents to students the fundamental notions of analytical mechanics and specific notions of kinematics; kinematical analysis of rigid body in particular motions and, generally, in general motion.
COURSE CONTENTS: Reduction of the sliding vectors; Mass, the centre of mass (definitions, properties, Guldin-Pappus Theorems); Moments of inertia; Kinematics of material point; Kinematics of rigid body; Kinematics of relative motion for material point; Kinematics of relative motion for solid body.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF ECONOMY

CODE: D22ITTL104
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES I

CODE: D22ITTL105
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop at students basic skills in the use of Windows operating systems, to familiarize students with development of fundamental algorithms and programming theory; learn students with programming in "C" language and development of Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications, Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STUDY OF MATERIALS

CODE: D22ITTL106
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical concepts of the correlation between microstructure, properties and processing of the metallic materials.
COURSE CONTENTS: Crystal structures of metallic materials; Crystalline lattices and imperfections in crystalline solids; Plastic deformation of metallic materials (plastic deformation of single crystals and polycrystalline materials); Properties of metallic materials; Crystallization principles of metallic materials; Theory of binary alloy systems; Crystallization of iron-carbon alloys; Heat treatments and thermo-chemical treatments of ferrous materials; Non-ferrous metals and alloys; Advanced materials developments.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION I

CODE: D22ITTL107
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I

CODE: D22ITTL108
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES II

CODE: D22ITTL213
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop at students basic skills in the use of Windows operating systems, to familiarize students with development of fundamental algorithms and programming theory; learn students with programming in "C" language and development of Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications, Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MECHANICS II

CODE: D22ITTL211
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents to students the fundamental notions of analytical mechanics and specific notions of kinematics; kinematical analysis of rigid body in particular motions and, generally, in general motion.
COURSE CONTENTS: Reduction of the sliding vectors; Mass, the centre of mass (definitions, properties, Guldin-Pappus Theorems); Moments of inertia; Kinematics of material point; Kinematics of rigid body; Kinematics of relative motion for material point; Kinematics of relative motion for solid body.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D22ITTL209
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course gives the possibility to analyse the physical and mechanical phenomena using the vector notion and its properties. Many mathematical models that describe the behaviour of mechanical components, in static or dynamic regime, are obtained using geometric notions like curves and surfaces.
COURSE CONTENTS: Vectorial spaces, examples, properties; Mathematical connections among vectorial spaces; Bilinear forms and quadratic forms, applications; Euclidean spaces – the notion of length of a vector and unoriented angle between two vectors; Orthogonality, orthogonal base; Tensors, properties; Free vectors, applications; Line and plane in space; Quadrics and Conics; Curves; Surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: NUMERICAL APPLICATIONS IN ENGINEERING (MATLAB, SIMULINK, MATHCAD)

CODE: D22ITTLL210
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS

CODE: D22ITTL212
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Representations used in technical drawing; Representation in ortho-gonal projection; Representation of views, sections and breakage; Representation of views in technical drawing; Dimensioning in technical drawing: classification of dimensions; rules of listing; Registration quotas on the drawing; Methods of dimensioning and special cases for dimensioning; Representation of the threads; Tolerances; Dimensional accuracy; Linear and angular dimensions tolerances; Accuracy of shape and position of geometrical elements; Surface condition; Specific and conventional representations; Representation and cylindrical and tapered holes dimensions; Drawing overviews; Rules of representation, positioning of the components and dimensioning design overall; From snap-on;

Threaded assembly; Elastic assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION II

CODE: D22ARL214
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN II

CODE: D22ITTL218
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: HISTORY OF TECHNICS

CODE: D22ITTLL216
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS

CODE: D22ITTL323
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Representations used in technical drawing; Representation in ortho-gonal projection; Representation of views, sections and breakage; Representation of views in technical drawing; Dimensioning in technical drawing: classification of dimensions; rules of listing; Registration quotas on the drawing; Methods of dimensioning and special cases for dimensioning; Representation of the threads; Tolerances; Dimensional accuracy; Linear and angular dimensions tolerances; Accuracy of shape and position of geometrical elements; Surface condition; Specific and conventional representations; Representation and cylindrical and tapered holes dimensions; Drawing overviews; Rules of representation, positioning of the components and dimensioning design overall; From snap-on; Threaded assembly; Elastic assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D22ITTL322
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY

CODE: D22ITTL324
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts regarding the main technology of production and processing technical materials.
COURSE CONTENTS: Classification of material properties; Metal materials; Obtaining metallic materials; Metal casting; Powder metallurgy; Plastic deformation of metals; Welding of metallic materials; Unconventional technologies; NDT materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANISMS

CODE: D22ITTL325
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at familiarizing students with the fundamental notions regarding mechanisms and machine elements, as well as structural calculus methods, kinematics, kinetostatics and dynamics of mechanisms. The basic skills to conceive and design mechanisms are also covered.
COURSE CONTENTS: Structural analysis of mechanisms; Kinematical analysis of planar mechanisms; Kinetostatical analysis of planar mechanisms; Dynamic analysis of planar mechanisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: GRAPH THEORY IN TRANSPORTATIONS

CODE: D22ITTL326
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE OBJECTIVE(S): Presentation of theoretical concepts and practical applications on graph theory, their proper use in professional communication, learning algorithms to determine the optimal path in the graph.
COURSE CONTENTS: Getting Started; Graph Representation targeted; Untargeted Graphs; Operations on graphs; Graphs valued; Route, circuit and chains in graph; Related components and associated hard; Trees; Bipartite graphs; Transport networks; Algorithms for graphs: matrix algorithm, method Boolean composition; Determination of related components; Determination of Eulerian circuits; Hamiltonian paths and circuits (Kaufmann algorithm, Foulkes, Chen); Routs optimal value (Ford's algorithm, Bellman-Kalaba, Dijkstra, Floyd-Warshall algorithms); Kruskal's Algorithm; Prim Algorithm; Problem damage (Little's algorithm, Hungarian algorithm).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STRENGTH OF MATERIALS
CODE: D22ITTL327
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Achieve of computing skills in order to design mechanical constructions; Assimilation of knowledge on simple and complex demands of the various pieces of machinery, aggregates and machinery.
COURSE CONTENTS: Sectional charts efforts; Axial efforts; Surface geometric features; Torsion stress; Bending of straight beams stress; Elements of elasticity theory; Compound stress; Calculation of deformations; Statically indeterminate systems, Dynamic stress; Fatigue stress.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION I
CODE: D22ITTIL328
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I
CODE: D22ITTL331
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF ELECTRICAL ENGINEERING
CODE: D22ITTL329
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELEMENTS OF AUTOMATION
CODE: D22ITTL330
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: TECHNICAL PHYSICS
CODE: D22ITTL432
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER AIDED DESIGN-BASIS
CODE: D22ITTL433
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): To develop at students skills to generate a three-dimensional geometry with wireframe, solid modelling and surfaces techniques; to combine these models in virtual assemblies, and to automatically extract the plane documentation from 3D models.
COURSE CONTENTS: The role of CAD system in a production cycle; components of a CAD system and its evaluation criteria, analytical representation of curves and surfaces; 3D surface modelling techniques: the primitive, by generation – revolution, extrusion, tubular, swept, rulers – rule, planar, loft, derived surfaces – blend, offset, fillet, corner); parametric solid modelling based on the sketch, geometric constraints and dimensional parametric solid modelling based on feature; Features for tree modelling crankshafts; Special modelling for crankcase; modelling features for cylinder heads; Use of standardized libraries, documentation extraction of virtual models, virtual assemblies, assembly constraints, exploded representations; A-class surfaces; specific modelling elements Body auto.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination, practical test

COURSE TITLE: STRENGTH OF MATERIALS II
CODE: D22ITTL434
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Achieve of computing skills in order to design mechanical constructions; Assimilation of knowledge on simple and complex demands of the various pieces of machinery, aggregates and machinery.
COURSE CONTENTS: Sectional charts efforts; Axial efforts; Surface geometric features; Torsion stress; Bending of straight beams stress; Elements of elasticity theory; Compound stress; Calculation of deformations; Statically indeterminate systems, Dynamic stress; Fatigue stress.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FLUIDS MECHANICS AND HYDRAULIC MACHINES
CODE: D22ITTL435
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers to the students the theoretical and practical concepts about the fluids flow with application in the mechanical engineering.
COURSE CONTENTS: The main properties of fluids; The general methods of study used in the mechanics of fluids; The fundamental equations of the mechanics fluids; The kinematics of the fluid; The dynamics of the ideal fluids; The statics of fluids; The dynamics of the viscous fluids under the laminar and turbulent flow; The applied of the mechanics of fluids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TOPOGRAPHY AND TRANSPORT INFRASTRUCTURE
CODE: D22ITTL437
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION I
CODE: D22ITTLL438
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: PRACTICAL STAGE
CODE: D22ITTL439
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN II
CODE: D22ITTIL439
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TOLERANCES AND DIMENSIONAL CONTROL
CODE: D22ITTL440
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with specific notions for dimensional and geometric accuracy of mechanical engineering parts, correct prescription of economic tolerances when designing assembly fits of main types: cylindrical and conical, with bearings, thread, feathers and grooves gear. Laboratory work skills training needed to perform control operations aimed in manufacturing processes of parts and assembly listed above, by performing measurements with different methods and measuring devices.
COURSE CONTENTS: Dimensional and geometric tolerances; Surface roughness; Tolerances, fits and control of smooth cylindrical assemblies; Chains of dimensions; Tolerances, fits and control of conical parts and assemblies; Bearing assembly tolerances and fits; Tolerances, fits and control threaded fasteners; Tolerances, fits and control parts and assemblies with wedges and grooves; Tolerances, fits and control gear wheels and gear cylinders; 3D measurement with TESA MultiGage articulated arm.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: THERMOTHECNICS
CODE: D22ITTL544
ECTS CREDITS: 4
Type of Course: mandatory
COURSE OBJECTIVE(S): The course focuses on the notions that are necessary in order to understand thermal phenomena, use of heat and getting mechanical work from heat, the fundamental principles of design and operation of thermal machines and installation.
COURSE CONTENTS: Transmission of knowledge in the production, transmission and use of heat; Thermodynamic analysis methods; Using diagrams

and tables in calculations of thermal drying installations; Real gases and water vapour as thermal agent in energy installations of high power; The moist air as an agent in drying and cooling installations; Gas dynamic.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ELEMENTS I
CODE: D22ITTL545
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing of some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming the students' creativity skills by elaborating original solutions and modern design through facilities brought by CAD/ CAM/ CAE. This course addresses to students which follows the 4 years undergraduate studies at Faculty of Mechanics from Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT), Engineering and Management (IEM).
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear transmissions; Chain drives; Friction wheels transmissions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profiles assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TRAFFIC
CODE: D22ITTL546
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Assimilation of the scientific concepts specific to road traffic, creating premises necessary to the interdisciplinary process with other complementary sciences; forming skills corresponding to logical application of international systems specific to road traffic in affected road areas in terms of congestion and noise and chemical pollution.
COURSE CONTENTS: Road traffic technique; Microscopic traffic variables; Macroscopic traffic variables; Circulation accident; Human factor; Road path; Road capacity; Elements concerning application of probability theory and mathematical statistics in road traffic; Concepts concerning circulation regulation in road intersections; Considerations for coordinating movement of vehicles with pre-timed signals; Formation of traffic flows or circulation currents; Mathematical instruments for traffic flows analysis; Forecasting models of traffic flow; Elements of traffic flow theory; Elements of admissibility intervals theory; Urban traffic regulations by traffic lights; Utilization of AIMSUN software in road traffic.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TRANSPORTATION SYSTEMS
CODE: D22ITTL547
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Provides students with the elements and concepts of specific transportation systems. Students are familiarized with specific elements of transport activity. The course also focuses on developing students' vocational skills in solving specific situations of road transport systems.
COURSE CONTENTS: Transport and socio-economic context; Transport demand; The influence of transport infrastructure networks on the road transport system; The importance of traffic flow in road transport systems; The transportation and cargo facilities; Considerations about the road policy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENGINES FOR VEHICLES
CODE: D22ITTL548
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Assimilation of concepts and notions specific to thermal processes, to characteristics of internal combustion engines, to elements and conceptual-constructive solutions, as well to environmental impact in terms of pollutant products and technical solutions characteristic tot their reduction; Formation of skills necessary to determinate the parameters which characterize thermal processes and the interpretation of an engine's characteristics; Skills development concerning engines design in terms of energy, economic and pollution requirements; Creating premises necessary to the interdisciplinary process with other complementary sciences.
COURSE CONTENTS: Engines systematic; Main parameters and operating conditions of motor vehicles and tractors engines; Internal combustion engines operational principle; Thermodynamic cycles of piston engines; Gas changing processes; Compression process; Combustion process; Relaxation process; Engines energy performance; Operating conditions and engines characteristics; Motor mechanism's kinematics; Forces and

moments acting on motor mechanism; Considerations on the design of automotive and tractors engines; Principal dimensions computation and internal combustion engines similarity; Piston group; Rod; Crankshaft; Engine's fixed components; Gas distribution system; Fuel injection engines supply; Lubrication system; Cooling system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ECONOMICAL ANALYSIS IN TRANSPORTATION
CODE: D22ITTL549
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: MACHINE ELEMENTS II
CODE: D22ITTL651
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing of some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming the students' creativity skills by elaborating original solutions and modern design through facilities brought by CAD/ CAM/ CAE. This course addresses to students which follows the 4 years undergraduate studies at Faculty of Mechanics from Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT), Engineering and Management (IEM).
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear transmissions; Chain drives; Friction wheels transmissions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profiles assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MECHANICAL SYSTEMS MODELLING BASICS
CODE: D22ITTL652
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course is for undergraduate students of the Faculty of Mechanical Engineering who are studying Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT) or Engineering and Management (IEM). This course forms and guide the students assimilation capacity for modelling and simulating, through modern methods, of the behaviour in static and dynamic mode structures and mobile mechanical systems, based on multi body systems theory and finite element method. Another aim is the one that it can be develop and form, students' ability through applications by using important modelling and analysis software (ADAMS, ANSYS, etc.).
COURSE CONTENTS: Elements of matrices and vectorial algebra; Computer kinematic and dynamic modelling through computational methods of mechanical mobile systems; Kinematic modelling and simulations with ADAMS software; Linear elasticity elements; Finite element modelling basics; Finite element modelling in static and dynamic mode of mechanical structures (theory and applications); Modelling and simulations by using finite element method with ANSYS and COSMOS software.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: DESIGN AND MODELLING OF TRAFFIC FLOWS
CODE: D22ITTL653
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: POLLUTION IN TRANSPORTS
CODE: D22ITTL654
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objectives are represented by the knowledge of the pollutants emitted by internal combustion engines and how they affect the environment, establishment of the modality to reduce the engine emissions, presenting the link between engine operating conditions and pollution, presentation of alternative propulsion systems. The research results in recent years undertaken by representative study centres and large corporations of engine manufacturing and legislative requirements in this area are presented in this course.
COURSE CONTENTS: Overview regarding the fuel economy and limiting the emissions on automotive engines; Turbocharging of engines for vehicles; Alternative propulsion systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELEMENTS OF DYNAMICS OF VEHICLES

CODE: D22ITTL655
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of theoretical concepts and practical concepts of kinematic and dynamic theories that define vehicle motion, assimilation of methodology and study design of the vehicle dynamic.
COURSE CONTENTS: Transmission arrangement and main dimensional and mass parameters of vehicles; The self-propulsion process of vehicles; Drag forces vehicle; Reaction forces of tread on car wheels; Vehicle traction and braking dynamics; Fuel consumption; Vehicle stability; Handling vehicles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TRAFFIC MANAGEMENT

CODE: D22ITTL657
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Assimilation of notions specific to road traffic monitoring and control installations; Developing skills concerning traffic parameters determination and choice of equipment necessary to traffic management.
COURSE CONTENTS: Road traffic management's importance, structures, systems, examples; Road traffic signalling and control systems; Traffic management at intersection level; Traffic management at city level; Databases: acquisition, storage, utilization; Traffic management-traffic participants inter-correlation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE

CODE: D22ITTlL656
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MULTIMODAL TRANSPORT

CODE: D22ITTL659
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: INFORMATICS IN TRANSPORT

CODE: D22ITTL765
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge and appropriate use of system theory concepts relating to freight transportation; Software applications which can be utilized to solve transportation problems; Applications dedicated to transport modelling and simulation problems.
COURSE CONTENTS: Transport systems theory; Freight transportation system; The essence of transportation processes; Transport's base functions; Freight flow; Motor vehicle's productivity; Strengthening senders after recipients; Cargo transport routing table; Vehicle choice and determining necessary resources; Software applications which can be utilized to solve transportation problems; Applications dedicated to transport modelling and simulation problems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MEANS OF CONVEYANCES

CODE: D22ITTL766
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at teaching students the basic concepts of road vehicles construction, skills development of organological analysis of conveyances, concept and design skills development.
COURSE CONTENTS: General concepts about conveyances, constructive solution on the overall composition of the conveyances, construction and calculation elements for: clutch, gearbox, longitudinal transmission, front and rear axle, steering system, braking system, suspension system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: REPAIRS TECHNOLOGIES FOR VEHICLE I

CODE: D22ITTL767
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts of vehicle repair principles.
COURSE CONTENTS: Vehicle system structure; Wear parts car; Methods for determining the wear parts and reconditioning their technological processes parts reconditioning vehicles; Technological processes reconditioning vehicle parts; Vehicle parts repair technologies and component assemblies; Repair framework; Body

and cab cars corrosion protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELEMENTS OF VEHICLES DYNAMICS

CODE: D22ITTL768
ECTS CREDITS: 4
TYPE OF COURSE: vehicles domain
COURSE OBJECTIVE(S): Presentation of theoretical concepts and practical concepts of kinematic and dynamic theories that define vehicle motion, assimilation of methodology and study design of the vehicle dynamic.
COURSE CONTENTS: Vehicle traction and braking dynamics; Fuel consumption of vehicles; Vehicle stability; Handling vehicles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: VEHICLES TEROTECHNICS

CODE: D22ITTL769
ECTS CREDITS: 3
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The course provides students with the necessary concepts in the field of technology maintenance for vehicles, defects that can occur in operation, of the technologies of remedy defects and repair of vehicles.
COURSE CONTENTS: Introduction; Concepts of tribology; Dynamics wear of machine parts; Durability and resource; System maintenance and repairs; Exploitation technology vehicles; In-specialised automotive repair.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CONTROL AND AUTOMATIC TRAFFIC MANAGEMENT

CODE: D22ITTL770
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TELEMATICS IN TRANSPORT

CODE: D22ITTL772
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: REPAIRS TECHNOLOGIES FOR VEHICLE II

CODE: D22ITTL874
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts of vehicle repair principles.
COURSE CONTENTS: Vehicle system structure; Wear parts car; Methods for determining the wear parts and reconditioning their technological processes parts reconditioning vehicles; Technological processes reconditioning vehicle parts; Vehicle parts repair technologies and component assemblies; Repair framework; Body and cab cars corrosion protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RELIABILITATION OF VEHICLES

CODE: D22ITTL873
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course teaches students about the relationship between vehicle reliability, maintainability and terotechnics.
COURSE CONTENTS: Reliability: reliable vehicles; Study of reliability, object definitions; Random variables; Theoretical aspects of reliability, the basic parameters; Primary processing of experimental data; Theoretical laws of distribution used in reliability; Confidence intervals; Parameters of reliability for repairable items and unrecoverable; Reliability of systems; Reliability tests.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TECHNICAL EXPERTISE OF TRAFFIC ACCIDENTS

CODE: D22ITTL875
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FUELS AND LUBRICANTS

CODE: D22ITTL876
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: EQUIPMENT AND AUTOMOTIVE DIAGNOSTIC TECHNIQUES

CODE: D22ITTL877
ECTS CREDITS: 3

TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with knowledge regarding vehicles' specific elements of diagnosis equipment and techniques, and training skills in automotive diagnosis and understanding, explaining and interpreting theoretical and practical content of the discipline.
COURSE CONTENTS: General principles of diagnosis; General diagnosis of the vehicle; Diagnosing the technical condition of the engine; Diagnosing the ignition system; Diagnosing the technical condition of the transmission; Steering Diagnosis; Brake System Diagnosis; Suspension Diagnosis; General diagnostics using electronic tester.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NOISE AND VIBRATION CONTROL IN VEHICLES

CODE: D22ITTL879
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course aims at familiarizing students with the basic concepts related to the noises and vibrations occurring during operating motor vehicles, general skills for the use of the information provided by the noises in order to establish the technical faults.
COURSE CONTENTS: General notions on the vibratory patterns of cars, the effects of vibration and noise comfort and safety in traffic.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TRACTORS AND TRAILERS

CODE: D22ITTL882
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Students are familiarized with the construction and operation of tractors and trailers, acquiring theoretical knowledge and calculation of dynamic systems tractors and tractor trailer.
COURSE CONTENTS: Introduction; Principal parameters of tractors; Tractors parts of the general conditions imposed on them; Driving force (propulsion) of the tractor; Gear ratio and transmission efficiency; General dynamics of tractors; Traction and dynamic qualities of tractors; Determination of transmission ratio, gears and propulsion forces of tractors; Traction characteristics of wheeled; Economic and dynamic characteristic and transport the tractor to work; Starting tractors; Consideration about on tractors transmissions; Clutch; Role; Classification; Construction; Calculation clutches; Gearbox for tractor; Role; Classification; Mechanical gearboxes; Rear axle; Central transmission; Differential; Shaft; Final drive; Role; Component, construction; Steering and braking system of tractors; Role; Construction and characteristics; Road tractors dynamic elements; Trucks and tractors used to develop road trains; Trailers and semi-trailers for trucks and tractors; Agricultural trailers and semi-trailers; Light trailers and semi-trailers (for cars).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: INDUSTRIAL ENGINEERING
PROGRAMME TITLE: AUTOMOTIVE TECHNOLOGY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS

CODE: D22TCML101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of Mathematical Analysis.
COURSE CONTENTS: Convergence: Sequences and series of real numbers, Power series, Fourier series; Continuity and Differentiability: Functions of several real variables, Implicit functions, The extreme values of a real function of several variables; Integral calculus: Definite integrals with parameters, Improper integrals, Line integrals of the first type, Multiple integrals, First type surface integrals; Elements of field theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL CHEMISTRY

CODE: D22TCML102
ECTS CREDITS: 4
TYPE OF COURSE mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS I

CODE: D22TCML103
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The discipline aims to get students familiarized with its specific basics in order to enable them in approaching Mechanics System Design and to facilitate them a good understanding of any simple mechanical process that might occur while exploiting a machine of any kind.
COURSE CONTENTS: Basics of vectorial algebra and operational calculus are introduced first. Then, in a modern but natural way, basics of mass geometry, kinematics and dynamics are presented. Statics is regarded as a special case of the dynamics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY

CODE: D22TCML104
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main aim of the course is to prepare students to acquire the basic theoretical and practical concepts for descriptive geometry, to develop their creative skills and to be able to see „deep in space" and to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Projection systems; Line; A line of positions in relation to the planes of projection; The relative positions of two lines; The Plan; Line of a plan; The relative positions of the two planes; The position of a line in a plane; The intersection of plane figures; The projection transformation methods: the method of changing the projection planes, crop rotation method and rotation method of projection planes; Representation of geometric bodies; Sections in geometrical bodies; Development of geometric surfaces; Intersection of geometric bodies; The general method for the determination of the line of intersection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES I

CODE: D22TCML105
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): To develop at students basic skills in the use of Windows operating systems, to familiarize students with development of fundamental algorithms and programming theory; learn students with programming in "C" language and development of Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications, Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STUDY OF MATERIALS

CODE: D22TCML106
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students the theoretical concepts of the correlation between

microstructure, properties and processing of the metallic materials.
COURSE CONTENTS: Crystal structures of metallic materials; Crystalline lattices and imperfections in crystalline solids; Plastic deformation of metallic materials (plastic deformation of single crystals and polycrystalline materials); Properties of metallic materials; Crystallization principles of metallic materials; Theory of binary alloy systems; Crystallization of iron-carbon alloys; Heat treatments and thermo-chemical treatments of ferrous materials; Non-ferrous metals and alloys; Advanced materials developments.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION I
CODE: D22TCML107
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) I
CODE: D22TCML108
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INDUSTRIAL SOCIOLOGY
CODE: D22TCML118
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MECHANICS II
CODE: D22TCML211
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The discipline aims to get students familiarized with its specific basics in order to enable them in approaching Mechanics System Design and to facilitate them a good understanding of any simple mechanical process that might occur while exploiting a machine of any kind.
COURSE CONTENTS: Basics of vectorial algebra and operational calculus are introduced first. Then, in a modern but natural way, basics of mass geometry, kinematics and dynamics are presented. Statics is regarded as a special case of the dynamics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE: D22TCML209
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course gives the possibility to analyse the physical and mechanical phenomena using the vector notion and his properties; Many mathematical models that describe the behaviour of mechanical components, in static or dynamic regime, are obtained using geometric notions like curves and surfaces.
COURSE CONTENTS: Vectorial spaces, examples, properties; Mathematical connections among vectorial spaces; Bilinear forms and quadratic forms, applications; Euclidean spaces - the notion of length of a vector and unoriented angle between two vectors; Orthogonality, orthogonal base; Tensors, properties; Free vectors, applications; Line and plane in space; Quadrics and Conics; Curves; Surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: NUMERICAL APPLICATIONS IN ENGINEERING (MATLAB, SIMULINK, MATHCAD)
CODE: D22TCML210
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS I
CODE: D22TCML212
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Representations used in technical drawing; Representation in ortho-gonal projection; Representation of views, sections and breakage; Representation of views in technical drawing; Dimensioning in technical drawing: classification of dimensions; rules of listing; Registration quotas on the drawing; Methods of dimensioning and special cases for dimensioning; Representation of the threads; Tolerances; Dimensional accuracy; Linear and angular dimensions tolerances; Accuracy of shape and

position of geometrical elements; Surface condition; Specific and conventional representations; Representation and cylindrical and tapered holes dimensions; Drawing overviews; Rules of representation, positioning of the components and dimensioning design overall; From snap-on; Threaded assembly; Elastic assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION II
CODE: D22TCML215
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) II
CODE: D22TCML219
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: HISTORY OF TECHNICS
CODE: D22TCML215
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS
CODE: D22TCML323
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. Terms used comply with current standards and international standards.
COURSE CONTENTS: Representing permanent joints; Riveted joints; Representing welded or soldered joints; Preparation of technical drawings for a welded components of an assembly; Technical representation for gears; Representing feathered joints and straight dovetail joints; Technical representation for shafts; Project theme: preparation of technical drawings for two cylindrical gears fixed on shafts; Representation of bearings and sealing gland; Preparation of project design for gearbox assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING AND INFO-GRAPHICS II
CODE: D22TCML324
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts related to drafting technical documentation for manufacturing, assembling and repairing operations. Also, the course offers the basics for the graphical representation and correct reading of the technical ideas necessary for each engineer.
COURSE CONTENTS: Course objectives, projecting and drawing systems; The general rules for the correct drawing of the views and sections; The dimension operation in Technical drawing, dimension rules representation, dimension systems, scaled drawing; The drawing, notation and dimension operations for the threads; The material code notation; The roughness of the surfaces notation; Assembly drawing, the drawing rules, the bill of materials; The gears drawing operation; General aspects about Computer Graphics; The evolution of Computer Graphics; A short history of the CAD (Computer Aided Design) concept; The classification of the CAD systems; The location of the CAD concept in the industrial company; New concepts in CAD; The concepts and software adjacent to the CAD concept; The CAM (Computer Aided Machining) concept; The FEA (Finite Element Analysis) concept; The dynamic and kinematic simulation software; Parameterization and bi-directionality; Modelling software modules; 2D sketches; Base and additional shapes; Reference geometrical elements; Complex shapes; Curves, surfaces; Assembly software module; Connections, geometrical constraints, equations, mechanical constraints; Software modules for the technical documentation; The 2D drawings; Elements of virtual testing; Animation and realist views.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THE BASIS OF COMPUTER AIDED DESIGN

CODE: D22TCML325
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with general information and concepts of Computer Aided Design, and develops their capacity to operate with AutoCad and their capacity to perform design calculus using adequate programs.
COURSE CONTENTS: AutoCad: 2D drawing and editing; 3D solids modelling and editing; Design applications programming using AutoLisp; Design elements using AutoCad Mechanical; Design calculus basis with MathCad program.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY I

CODE: D22TCML326
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts of the main technology of production and processing technical materials.
COURSE CONTENTS: Classification of material properties; Metal materials; Obtaining metallic materials; Metal casting; Powder metallurgy; Plastic deformation of metals; Welding of metallic materials; Unconventional technologies; NDT materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANISMS I

CODE: D22TCML327
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course provides students with specific notions for dimensional and geometric accuracy of mechanical engineering parts, correct prescription of economic tolerances when designing assembly fits of main types: cylindrical and conical, with bearings, thread, feathers and grooves gear. Laboratory work skills training needed to perform control operations aimed in manufacturing processes of parts and assembly listed above, by performing measurements with different methods and measuring devices.
COURSE CONTENTS: Structural analysis and synthesis of mechanisms; Kinematics of flat mechanisms; Force analysis of mechanisms; Cam mechanisms (analysis and synthesis); Gearings (kinematics, geometry, efficiency); Dynamics of machines; Balancing of rotating masses.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICAL VIBRATIONS

CODE: D22TCML328
ECTS CREDITS: 3
TYPE OF COURSE: fundamental, speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding the modelling process of vibrating mechanical systems, both discrete and continuous as well as different methods, both analytical and numerical, for solving these models.
COURSE CONTENTS: General considerations; Elements for modelling the mechanical systems with one degree of freedom (1DOF) – (un)damping; Elements for modelling the mechanical systems 2DOF – (un)damping; Elements for modelling mechanical systems xDOF and numerical methods for solving them; Mechanical vibrations of continuous systems (longitudinal, rotational and bending); Special problems of vibrational systems (biological systems, coupled problems, etc.).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRENGTH OF MATERIALS I

CODE: D22TCML329
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding the strength analysis of structures (machine parts, constructions, strength structures and so on).
COURSE CONTENTS: Mechanical structures schematization; Mechanical structures analysis (loadings, reaction forces, stresses, displacements and so on); Interpretation of mechanical loadings states for a construction; The design of mechanical structures; Strength and stiffness calculus, structure strength check.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TOLERANCES AND DIMENSIONAL CONTROL I

CODE: D22TCML330
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course provides students with specific notions for dimensional and geometric accuracy of mechanical engineering parts, correct prescription of economic tolerances when designing assembly fits of main types: cylindrical and conical, with bearings, thread, feathers and grooves gear. Laboratory work skills training needed to perform control operations

aimed in manufacturing processes of parts and assembly listed above, by performing measurements with different methods and measuring devices.
COURSE CONTENTS: Dimensional and geometric tolerances; Surface roughness; Tolerances, fits and control of smooth cylindrical assemblies; Chains of dimensions; Tolerances, fits and control of conical parts and assemblies; Bearing assembly tolerances and fits; Tolerances, fits and control threaded fasteners; Tolerances, fits and control parts and assemblies with wedges and grooves; Tolerances, fits and control gear wheels and gear cylinders; 3D measurement with TESA MultiGage articulated arm.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION III
CODE: D22TCML331
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) III
CODE: D22TCML332
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF ECONOMY
CODE: D22TCML333
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: MATERIALS TECHNOLOGY II
CODE: D22TCML438
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts of the main technology of production and processing technical materials.
COURSE CONTENTS: Classification of material properties; Metal materials; Obtaining metallic materials; Metal casting; Powder metallurgy; Plastic deformation of metals; Welding of metallic materials; Unconventional technologies; NDT materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANISMS II
CODE: D22TCML437
ECTS CREDITS: 4
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course provides students with specific notions for dimensional and geometric accuracy of mechanical engineering parts, correct prescription of economic tolerances when designing assembly fits of main types: cylindrical and conical, with bearings, thread, feathers and grooves gear. Laboratory work skills training needed to perform control operations aimed in manufacturing processes of parts and assembly listed above, by performing measurements with different methods and measuring devices.
COURSE CONTENTS: Structural analysis and synthesis of mechanisms; Kinematics of flat mechanisms; Force analysis of mechanisms; Cam mechanisms (analysis and synthesis); Gearings (kinematics, geometry, efficiency); Dynamics of machines; Balancing of rotating masses.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL PHYSICS
CODE: D22TCML435
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FLUIDS MECHANICS AND HYDRAULIC MACHINES
CODE: D22TCML439
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical concepts about the fluids flow with application in the mechanical engineering.
COURSE CONTENTS: The main properties of fluids; The general methods of study used in the mechanics of fluids; The fundamental equations of the mechanics fluids; The kinematics of the fluid; The dynamics of the ideal fluids; The statics of fluids; The dynamics of the viscous fluids under the laminar and turbulent flow; The applied of the mechanics of fluids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRENGTH OF MATERIALS II
CODE: D22TCML438
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding the strength analysis of structures (machine parts, constructions, strength structures and so on).
COURSE CONTENTS: Mechanical structures schematization; Mechanical structures analysis (loadings, reaction forces, stresses, displacements and so on); Interpretation of mechanical loadings states for a construction; The design of mechanical structures; Strength and stiffness calculus, structure strength check.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TOLERANCES AND DIMENSIONAL CONTROL II
CODE: D22TCML441
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course provides students with specific notions for dimensional and geometric accuracy of mechanical engineering parts, correct prescription of economic tolerances when designing assembly fits of main types: cylindrical and conical, with bearings, thread, feathers and grooves gear. Laboratory work skills training needed to perform control operations aimed in manufacturing processes of parts and assembly listed above, by performing measurements with different methods and measuring devices.
COURSE CONTENTS: Dimensional and geometric tolerances; Surface roughness; Tolerances, fits and control of smooth cylindrical assemblies; Chains of dimensions; Tolerances, fits and control of conical parts and assemblies; Bearing assembly tolerances and fits; Tolerances, fits and control threaded fasteners; Tolerances, fits and control parts and assemblies with wedges and grooves; Tolerances, fits and control gear wheels and gear cylinders; 3D measurement with TESA MultiGage articulated arm.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: CUTTING THEORY
CODE: D22TCML440
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts of the surfaces generation, physical principles of the cutting process. It also provides them with knowledge regarding the characteristics phenomena of the cutting processes.
COURSE CONTENTS: Kinematics of cutting process; Physical principles of cutting process (chip formation and types of chips, the importance of chip shape, built-up-edges, etc.); Plastic deformations of work-piece material; Forces and power in cutting processes, thermal phenomena in cutting processes; Cutting fluids; Tool wear and tool life; Vibration in cutting process; The quality of machined surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION IV
CODE: D22TCML442
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) IV
CODE: D22TCML444
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE
CODE: D22TCML443
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: THERMOTECHNICS AND THERMAL EQUIPMENT I
CODE: D22TCML550
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents the necessary notions for students to understand the thermal phenomena, the use of heat and mechanical work obtained from heat, the fundamental principles of design and operation of thermal machines and installations.
COURSE CONTENTS: The course refers to general notions about the laws of perfect gas, simple transformations and the perfect gas mixtures, the thermodynamic principles. It also discusses the methods for thermodynamics analysis, real gases with a focus on the deviations from perfect gas properties used in technical applications. The theoretical principles of thermal machines through

the presentation of the methods for the study are also presented.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ELEMENTS I

CODE: D22TCML551
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming students' creative skills by elaborating original solutions and modern design by means of the facilities offered by CAD/ CAM/ CAE. The course is addressed to undergraduate students of the Faculty of Mechanical Engineering enrolled at Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT) or Engineering and Management (IEM).
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear trans-missions; Chain drives; Friction wheels trans-missions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profile assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MECHANICAL SYSTEMS MODELLING BASICS

CODE: D22TCML552
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course forms and guide the students' assimilation capacity for modelling and simulating, through modern methods, of their behaviour in static and dynamic mode structures and mobile mechanical systems, based on multi body systems theory and finite element method. Another aim is that it can develop and shape students' ability by means of specific applications, using important modelling and analysis software (ADAMS, ANSYS, etc.).
COURSE CONTENTS: Elements of matrices and vectorial algebra; Computer kinematic and dynamic modelling through computational methods of mechanical mobile systems; Kinematic modelling and simulations with ADAMS software; Linear elasticity elements; Finite element modelling basics; Finite element modelling in static and dynamic mode of mechanical structures (theory and applications); Modelling and simulations by using finite element method with ANSYS and COSMOS software.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SURFACES GENERATION PROCESSES ON MACHINE-TOOLS – BASICS

CODE: D22TCML553
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts of the surfaces generation using classical operations: turning, planning, shaping, broaching, drilling, milling, grinding.
COURSE CONTENTS: Surface generation by planning and shaping; Surface generation by broaching; Surface generation by turning; Surface generation by drilling, counter-boring and reaming; Surface generation by milling; Surface generation of gears with gear form cutting tools, gear cutting hob, gear shaper tools; Surface generation by grinding.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROTEHNICS AND ELECTRICAL MACHINES

CODE: D22TCML554
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ELECTRONICS AND BASICS OF AUTOMATION SYSTEMS

CODE: D22TCML555
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TRIBOLOGY

CODE: D22TCML556
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts for the study of physical, mechanical, metallurgical and chemical interactions of elements in relative motion and lubrication issues.
COURSE CONTENTS: Definition and importance of tribology; Friction in joints; Tribotechnical systems; The deformable elastic body; Hertzian elastic contact; Elastic contact with friction; Lubricants;

Friction regimes; State of lubrication and wear; Recommendations for friction joints materials selection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER AIDED DESIGN
CODE: D22TCML557
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides general information and concepts of Advanced Computer Aided Design, and develops students' capacity to operate with the Pro/Engineer – Creo programme.
COURSE CONTENTS: Pro/Engineer (Creo): 3D modelling and editing of parametric models; Drawing module – Graphical documentation used for fabrication of the designed models; Assembly module – virtual assembly of the designed 3D models.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and practical examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: MACHINE ELEMENTS II
CODE: D22TCML661
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming students' creative skills by elaborating original solutions and modern design by means of the facilities offered by CAD/ CAM/ CAE. The course is addressed to undergraduate students of the Faculty of Mechanical Engineering enrolled at Automotive Engineering (AR), Industrial Engineering (TCM), Transport Engineering (ITT) or Engineering and Management (IEM).
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear trans-missions; Chain drives; Friction wheels trans-missions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profile assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS AND THERMAL EQUIPMENT II
CODE: D22TCML660
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents the necessary notions for students to understand the thermal phenomena, the use of heat and mechanical work obtained from heat, the fundamental principles of design and operation of thermal machines and installations.
COURSE CONTENTS: The course refers to general notions about the laws of perfect gas, simple transformations and the perfect gas mixtures, the thermodynamic principles. It also discusses the methods for thermodynamics analysis, real gases with a focus on the deviations from perfect gas properties used in technical applications. The theoretical principles of thermal machines through the presentation of the methods for the study are also presented.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THERMAL TREATMENT
CODE: D22TCML658
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at building knowledge on practical technology to improve strength properties for mechanical parts submitted to high stress in use. The students will learn the physical processes which determine these transformations, types of treatment, specific technologies for steel and non-iron parts, for machine parts, tools, welded parts, sintered parts.
COURSE CONTENTS: Thermal treatment process definition, technological parameters; Preliminary thermal treatments (annealing); Final thermal treatments (quenching and tempering); Thermo-chemical treatments; Thermal treatments of nonferrous alloys, welding semi-finished product, sintered materials product; Thermal and thermo-chemical treatments of semi-finished product made from cast iron; Thermal and thermochemical treatments applied to machine parts and cutting tools.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ELEMENTS PROJECT
CODE: D22TCML662
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing specific concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and

forming students' creativity skills by elaborating original solutions and modern design through facilities brought by CAD/ CAM/ CAE. This course is for undergraduate students enrolled in the Industrial Engineering (TCM) programme of the Faculty of Mechanical Engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MACHINE-TOOLS
CODE: D22TCML663
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The course presents to students the actuator and command mechanisms for machine-tools, the specific component elements, symbols used in representing the skeleton, hydraulic and electrical diagram and the kinetics, construction, work adjusting and the possibilities of machinability for the most important types of machine-tools.
COURSE CONTENTS: The linkages of machine-tools; Representing linkages; The principal linkages for obtaining linear movement; Specific mechanisms used for principal linkages; Lead linkages, classification, structure; Specific mechanisms used for lead linkages; Principal hydraulic system for machine-tools; Kinetic for usual machine-tools.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CUTTING TOOLS
CODE: D22TCML664
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical basis regarding the cutting tools design, and in the same time, both the knowledge of the dimensional and geometrical elements of the cutting tools. The course presentation is graduated, starting from the single point tool geometry and finishing with the very complex tools from point of view of geometry and dimensional elements.
COURSE CONTENTS: Tools classification; Tool-in-hand system; Position system; Kinematic system; Tool geometry in tool-in-hand system (shape of tool faces, rake angle, relief angle, the wedge angle, tool cutting edge angle, the cutting edge inclination angle); Optimum values of geometric elements of tools; Tool materials; Fixing devices for tools; Tool strength and rigidity calculations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PRODUCTS MANUFACTURING TECHNOLOGY I
CODE: D22TCML665
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The students' assimilation of: the concepts specific to products fabrication technology, the design methodology of technological fabrication processes in classical systems production and with CNC and the typical technology for different groups of products. The forming of necessary aptitudes to determine the influence of different factors on the manufacturing precision and the surfaces quality made in the technological systems, but also their programming and setting.
COURSE CONTENTS: The manufacturing precision; The basis of technological processes design for metal cutting; The technology for different types of surfaces machining; The fabrication technology of main products groups; General problems concerning the technologies development for manufacturing on semi-automatic and automatic machine; The basis of CNC products systems programming; Elements of the assembly technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER AIDED MANUFACTURING
CODE: D22TCML666
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical basis regarding integrated CAD/ CAM systems and develops their knowledge related to machining processes simulation methods.
COURSE CONTENTS: CAD/ CAM/ CAPP systems; Definition; Industrial activities integration; Life cycle; Structure and components of CAD/ CAM system; Decisions type; Actions types; Computer aided design; Design systems evolution; Computer aided manufacturing; Manufacturing systems evolution; Computer aided processes and planning – CAPP; Variant method; Generative method; Manufacturing features; Group technology; Pieces codification; Design and manufacturing integration; CAD/CAM programs for design and simulation of the machining processes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PRACTICAL STAGE
CODE: D22TCML667
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: PRODUCTS MANUFACTURING TECHNOLOGY II

Code: D22TCML771
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The students' assimilation of: the concepts specific to product fabrication technology, design methodology of technological fabrication processes in classical systems production and with CNC and the typical technology for different groups of products. The development of the necessary skills to determine the influence of different factors on the manufacturing precision and the surfaces quality made in the technological systems, but also their programming and setting.
COURSE CONTENTS: The manufacturing precision; The basis of technological processes design for metal cutting; The technology for different types of surfaces machining; The fabrication technology of main products groups; General problems concerning the technologies development for manufacturing on semi-automatic and automatic machine; The basis of CNC products systems programming; Elements of the assembly technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRODUCTS MANUFACTURING TECHNOLOGY – PROJECT

CODE: D22TCML772
ECTS CREDITS: 2
TYPE OF PROJECT: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANUFACTURING DEVICES I

CODE: D22TCML773
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical basis regarding the design of the machining devices, starting with the centring and clamping-in schemes and finishing with the final design of the device (parts and assembly drawings).
COURSE CONTENTS: Devices; Introduction; Definitions; The goal of machining devices; Principles and construction of orientation elements; Surfaces geometry of orientation elements; Orientation errors; Calculus methods of real errors; Orientation and clamping-in scheme; The design of the appropriate technique scheme; Selection of the appropriate technique; Economical selection of the appropriate technique scheme; Application; The orientation basis symbol; Clamping-in pieces to the devices; The forces structure system with loads the pieces; The load analysis of the machining process; Clamping-in mechanisms to pieces; Types of clamping-in mechanisms (key type, thread type, eccentric type); Centring and clamping-in mechanisms (V-block type, jaw and plujer type, with elastic elements – collets type); Drive systems of the clamping-in mechanisms (air, hydraulic, air-hydraulic); The practice of constructive design of the devices.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SPECIAL TOOLS DESIGN

CODE: D22TCML774
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical basis regarding the special cutting tools design and, at the same time, both the knowledge of the dimensional and geometrical elements of the cutting tools.
COURSE CONTENTS: Broaches; Classification; Characterisation; Constructive and dimensional elements; Geometry; Special broaches; Drills; Classification; Drill types; Constructive and dimensional elements; Geometry of twist drill; Drill – supplementary re-sharpening; Counter-bores; Geometry and dimensional elements; Reamers; Classification; Geometry and dimensional elements; Mills; Classification; Geometry and dimensional elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: AUTOMATION OF THE PROCESSES AND PRODUCTION SYSTEMS I

CODE: D22TCML775
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical aspects of automation processes, machines and production systems.
COURSE CONTENTS: Technological flexibility: concepts, forms of organization; Typical flexible structure; Modular design concept; Reconfigurable manufacturing systems: defining principles of achievement, composition ways/ schemes; Units of work: definition, structure, selection criteria, elements calculation; Automation control, forms of organization, control systems; Automation rigid/ flexible mass production; Automation of complex production processes; Economic efficiency of introducing automation.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MICROTECHNOLOGIES

CODE: D22TCML776
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The main purpose of the course is to familiarize students with technological processes determined by the releasing of new materials, the improvement of thermal treatments or miniaturizing tendencies by precision mechanics, electronics, mechatronics, aeronautical engineering.
COURSE CONTENTS: Erosion processing technologies; General considerations; Electrical erosion microtechnologies; Electrochemical erosion microtechnologies; Abrasive erosion micro-technologies; Lapping processing micro-technologies; Magneto-abrasive processing micro-techonogies; Ultrasound processing technologies; Ultrasounds properties; Producing ultrasounds; Parts cleansing using ultrasounds; Ultrasound processing microtechnologies (plastic deformation, powder annealing, micro-cutting, galvanic deposits, welding, defectoscopy); Measuring physical characteristics (distance measuring in water, thickness measuring, liquid level measuring, flow velocity measuring, applications in medicine); Laser based microtechnologies; physical phenomenons; Types of lasers; Laser applications; Active applications (thermal micro-processing, micro-cutting or micro-cropping, micro-drilling, welding, etc.); Passive applications (optical, digital measuring of signal transmission, applications in medicine); Plasma processing microtechnologies; Definitions; Generating plasma; Plasmotron construction principles; Technical applications of plasma (micro-cutting, welding, metallic coatings); Microwaves processing; Generalities; Materials processed using microwaves; Microwave generators; Microwave applicator; Technical applications of microwaves (the microwave oven); Micro-processing applications; Laser micro-processing for fuel injector holes; Micro-drilling diesel oil injectors; Other applications of laser micro-drilling; Laser micro-milling; Marking and engraving; Tracing and dice game (dicing); Solar cells fabrication; Fine tracing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: EXPERIMENTAL RESEARCHES – BASICS

CODE: D22TCML778
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The main purpose of the course is to familiarize students with the main researches technique, experimental chains, methods and instruments using in experimental procedure.
COURSE CONTENTS: Experimental research; Research methods; Steps in experimental research; Measurements systems; Measurements of pressure, temperature, cutting forces, power, wear; Transducer, etc.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PLASTIC DEFORMATION TECHNOLOGIES

CODE: D22TCML780
ECTS CREDITS: 5
TYPE OF DISCIPLINE: optional
COURSE OBJECTIVE(S): The main objective of this course is to familiarize students with the main operations of cold plastic deformation, the analysis of forces, mechanical work, consumed power, organological analysis and kinematics of plastic deformation equipment.
COURSE CONTENTS: Generalities; Classification of operation for plastic deformation; Used materials; The cutting of materials; Forces; Mechanical work; Power; Analysis of cutting machines; Embossing operations; Tailoring blanks; Types of embossing; Mechanical presses with simple action; Precision embossing; Cropping and perforation of rubber; Cropping with plastic material; P;M; with double action; Materials folding; Elastic recovery from folding; Hydraulic presses; Shaping; Forces; Mechanical work; Power; Stencils; Special shaping; Examples; Moulding processes; Bottlenecking; Expansion; Embossing; Levelling; Volumetric compression processes; Extrusion; Discharging; Mould pressing; Specific cold pressing processes; Assembling by cold pressing; Straightening machines; Mechanization and automation of TTA operations in operations of plastic deformation; Economical efficiency of processing operations with plastic deformation; Allowed re-configurability of sustainable development in plastic deformation technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: PRODUCTION SYSTEMS WITH NC

CODE: D22TCML882
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The students' assimilation of: the concepts specific to products fabrication technology, design methodology of technological fabrication processes in classical systems production and with CNC and the typical technology for different groups of products.
COURSE CONTENTS: The basis of CNC products systems programming; Knowledge: Machine tools

with CNC, ISO G-code; Canned cycles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: AUTOMATION OF THE PROCESSES AND PRODUCTION SYSTEMS II

CODE: D22TCML884
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical aspects of automation processes, machines and production systems.
COURSE CONTENTS: Technological flexibility: concepts, forms of organization; Typical flexible structure; Modular design concept; Reconfigurable manufacturing systems: defining principles of achievement, composition ways/ schemes; Units of work: definition, structure, selection criteria, elements calculation; Automation control, forms of organization, control systems; Automation rigid/ flexible mass production; Automation of complex production processes; Economic efficiency of introducing automation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANUFACTURING DEVICES II

CODE: D22TCML883
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical basis regarding the design of the machining devices, starting with the centring and clamping-in schemes and finishing with the final design of the device (parts and assembly drawings).
COURSE CONTENTS: Devices; Introduction; Definitions; The goal of machining devices; Principles and construction of orientation elements; Surfaces geometry of orientation elements; Orientation errors; Calculus methods of real errors; Orientation and clamping-in scheme; The design of the appropriate technique scheme; Selection of the appropriate technique; Economical selection of the appropriate technique scheme; Application; The orientation basis symbol; Clamping-in pieces to the devices; The forces structure system with loads the pieces; The load analysis of the machining process; Clamping-in mechanisms to pieces; Types of clamping-in mechanisms (key type, thread type, eccentric type); Centring and clamping-in mechanisms (V-block type, jaw and plujer type, with elastic elements – collets type); Drive systems of the clamping-in mechanisms (air, hydraulic, air-hydraulic); The practice of constructive design of the devices.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MANAGEMENT

CODE: D22TCML885
ECTS CREDITS: 2
TYPE OF PROJECT: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CREATIVITY AND INVENTION

CODE: D22TCML886
ECTS CREDITS: 2
TYPE OF COURSE: specialty course
COURSE OBJECTIVE(S): At the end of the course, the students should be able to master the main technics and methods of technical creation. The students should develop the necessary skills for designing, promoting and implementing in the production process of new technical solutions.
COURSE CONTENTS: The creativity concept; Creativity factors; Intuitive techniques for technical creation; Innovation – the science and art of technical creation; Definition of inventions; Classifying inventions; Methods to protect inventions; Systems for obtaining a patent; The effects of patenting; Protecting an invention in Romania; Analysing the patentability of an innovation and the purity of a patent; Researching the patent literature; Managing the patent; International patenting.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: WELDING CONSTRUCTIONS TECHNOLOGY

CODE: D22TCML887
ECTS CREDITS: 2
TYPE OF COURSE: specialty course
COURSE OBJECTIVE(S): At the end of the course, the students should be able to master the main technics and methods of welding technology. The students should develop the necessary skills for designing welding constructions.
COURSE CONTENTS: 1. Gas Welding: Air Acetylene, Oxy Acetylene, Oxy Hydrogen Welding; 2. Arc Welding; Carbon Arc welding; Plasma Arc welding; Shield Metal Arc Welding; T.I.G. (Tungsten Inert Gas Welding); M.I.G. (Metal Inert Gas Welding); 3. Resistance Welding: Spot welding; Seam welding; Projection welding; Resistance Butt welding; Flash Butt welding; 4. Solid State Welding: Cold welding; Diffusion welding; Forge welding; Fabrication welding; Hot pressure welding; Roll welding; 5. Thermo-chemical Welding: Thermite welding; Atomic welding; 6: Radiant Energy Welding; Electric Beam Welding; Laser Beam Welding; Welding Joints; Different types of welding joints, classified as Butt, Lap, Corner or Tee.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TECHNOLOGIES AND CONTROL EQUIPMENT

CODE: D22TCML890
ECTS CREDITS: 3
TYPE OF PROJECT: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: CIVIL ENGINEERING
PROGRAMME TITLE: CIVIL, INDUSTRIAL AND AGRICULTURAL CONSTRUCTIONS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D23CCL101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of Mathematical Analysis.
COURSE CONTENTS: Convergence: Sequences and series of real numbers, Power series, Fourier series; Continuity and Differentiability: Functions of several real variables, Implicit functions, The extreme values of a real function of several variables; Integral calculus: Definite integrals with parameters, Improper integrals, Line integrals of the first type, Multiple integrals, First type surface integrals; Elements of field theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY
CODE: D23CCL102
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts from descriptive geometry, to develop the creative skills to see „deep in space" and to prepare project designs. Terms used are under current standards and international standards.
COURSE CONTENTS: Projection systems; Line; A line of positions in relation to the planes of projection; The relative positions of two lines; The Plan; Line of a plan; The relative positions of the two planes; The position of a line in a plane; The intersection of plane figures; The projection transformation methods: the method of changing the projection planes, crop rotation method and rotation method of projection planes; Representation of geometric bodies; Sections in geometrical bodies; Development of geometric surfaces; Intersection of geometric bodies; The general method for the determination of the line of intersection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING FOR BUILDING CONSTRUCTION I
CODE: D23CCL103
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent technical design, to develop the creative skills to prepare project designs. Terms used are under current standards and international standards.
COURSE CONTENTS: Rules and principles for the execution of designs; The representation of objects – sections, ruptures, hatchings; Dimensioning in technical drawing; The representation of buildings and industrial buildings; Notation on technical drawings of trace axis; The thickness of the walls, the listing of columns, foundations; Representation and dimensioning of doors and windows, stairs and lifts; Drafting and dimensioning of the architecture plans; Technical design representation for construction made of brick masonry elements; Representation of reinforced concrete constructions; Notation on technical drawings the reinforced concrete elements and extract of reinforced concrete beams; Representation in drawing for wooden constructions and its joints; Metal elements; Joints found in the case of metallic constructions handed over: by bolts, rivets and welded.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES I
Code: D23CCL104
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the general information and concepts of operating and programming with C++ language and with the mathematical calculations program Excel and MathCad.
COURSE CONTENTS: Windows operating system, Microsoft Word program used for technical documentations; Tabular mathematical calculus and technical diagrams with Excel; MathCad – program for mathematics used in technical design calculation; Creating applications in C++ programming language.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and practical stage examination

COURSE TITLE: TECHNICAL CHEMISTRY
CODE: D23CCL105
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS I
CODE: D23CCL106
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides to the students to knowledge and assess the real state of motion of bodies, qualitative and quantitative knowledge of the state of motion of bodies modelled as material points, points system materials, rigid and rigid systems. Knowledge and implementation of graphical and analytical skills working on dynamic characteristics of bodies modelled as systems of material points, rigid and rigid systems.
COURSE CONTENTS: Systems of forces; Strong reduction systems; Centre of gravity; Static material point; Rigid solid state; Equilibrium of rigid bodies systems; Equilibrium of rigid bodies systems; Plane truss; Kinematics point.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Descriptive written examination and problem solving

COURSE TITLE: PHYSICAL EDUCATION I
CODE: D23CCL107
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I
CODE: D23CCL117
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES II
CODE: D23CCL210
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the general information and concepts of operating and programming with C++ language and with the mathematical calculations program Excel and MathCad.
COURSE CONTENTS: Windows operating system, Microsoft Word program used for technical documentations; Tabular mathematical calculus and technical diagrams with Excel; MathCad – program for mathematics used in technical design calculation; Creating applications in C++ programming language.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and practical stage examination

COURSE TITLE: TECHNICAL DRAWING FOR BUILDING CONSTRUCTION II
CODE: D22CCL209
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent technical design, to develop the creative skills to prepare project designs. Terms used are under current standards and international standards.
COURSE CONTENTS: Rules and principles for the execution of designs; The representation of objects – sections, ruptures, hatchings; Dimensioning in technical drawing; The representation of buildings and industrial buildings; Notation on technical drawings of trace axis; The thickness of the walls, the listing of columns, foundations; Representation and dimensioning of doors and windows, stairs and lifts; Drafting and dimensioning of the architecture plans; Technical design representation for construction made of brick masonry elements; Representation of reinforced concrete constructions; Notation on technical drawings the reinforced concrete elements and extract of reinforced concrete beams; Representation in drawing for wooden constructions and its joints; Metal elements; Joints found in the case of metallic constructions handed over: by bolts, rivets and welded.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE: D23CCL208
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course gives the possibility to analyse the physical and mechanical phenomena using the vector notion and his properties. Many mathematical models that describe the behaviour of mechanical components, in static or dynamic regime, are obtained using geometric notions like curves and surfaces.
COURSE CONTENTS: Vectorial spaces, examples, properties; Mathematical connections among vectorial spaces; Bilinear forms and quadratic forms, applications; Euclidean spaces – the notion of length of a vector and un-oriented angle between two vectors; Orthogonality, orthogonal base; Tensors, properties; Free vectors, applications; Line and plane in space; Quadrics and Conics; Curves; Surfaces.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TOPOGRAPHY
CODE: D23CCLL211
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CONSTRUCTION MATERIALS
CODE: D23CCLL212
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS II
CODE: D23CCL213
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course provides to the students the knowledge and assess the real state of motion of bodies, qualitative and quantitative knowledge of the state of motion of bodies modelled as material points, points system materials, rigid and rigid systems, knowledge and implementation skills and analytical Desktop on the characteristics bodies modelled as dynamic systems of material points, rigid and rigid systems, experimental evaluation of mechanical quantities.
COURSE CONTENTS: Kinematics of relative motion of the material point; Kinematics of rigid solid; Kinematics of rigid solid systems; Dynamics; Mechanical inertia; General theorems; Open and dynamic material point links; Dynamic connection rigid and solid; Dynamic systems of material points and rigid bodies; Analytical Mechanics; The principle of d'Alembert; The principle of virtual mechanical work; The principle of virtual mechanical work; Lagrange equations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Descriptive written examination and problem solving exam

COURSE TITLE: HISTORY OF TECHNICS
CODE: D23CCL216
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION II
CODE: D23CCL214
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I
CODE: D23CCL218
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS
CODE: D23CCL301
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRENGTH OF MATERIALS I
Code: D23CCL302
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding the strength analysis of structures (machine parts, constructions, strength structures and so on).
COURSE CONTENTS: Mechanical structures schematization; Mechanical structures analysis (loadings, reaction forces, stresses, displacements and so on); Interpretation of mechanical loadings states for a construction; Design of mechanical structures; Strength and stiffness calculus, strength check structures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THERMOTECHNICS
CODE: D23CCL303
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This course allows students to acquire correct knowledge and skills required for thermal calculation in manufacturing and correct operation of heating and cooling. Necessary skills are acquired for conception of minimum specific energy consumption by extending the concepts of energy and energetic balance.
COURSE CONTENTS: Generalities in thermo-technics; Methods in thermodynamic; Thermo-dynamic coefficients; The first principle of thermodynamics for closed and open systems; Enthalpy; Caloric equation of state; Robert Mayer's; Perfect gas; Perfect gas laws; Perfect gas mixtures;

Simple thermodynamic transformations; The second principle of thermodynamics; Cycles motors and generators; Heat engines; Heat pumps, refrigeration machines; Entropy; Entropy in simple thermodynamics transformations; Refrigeration; Real gas; Vapours; Moist air; Thermodynamic methods; The third principle of thermodynamics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENGINEERING GEOLOGY
CODE: D23CCL304
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CONSTRUCTION MACHINES
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides to the students to understanding kinematic schemes, composed of technical drawings of machines, production flows, graphs, and understanding formulas for the determination of main parameters of machines.
COURSE CONTENTS: Mechanization of construction; Classification machinery; Structure machinery; General concepts about machine parts (materials, classification); Mechanical and hydraulic transmissions; Land excavation machines; Excavators (classification, construction, operation, main parameters); Digging machinery and land transport (bulldozers, graders); Machines compacting earth, concrete and asphalt (road rollers, vibratory plates, rammers); Machinery for preparing, transporting and placing of concrete (compaction process, mixers, stations concrete, concrete mixers, concrete casting technology); Machines for underground (sewers execution shields and underground tunnels, machinery for execution undercrossing); Lifting and transporting machines (cranes, tower cranes, jib cranes, belt conveyors); Street maintenance machinery; Machines for building facades and lamp posts (mobile platforms); Machines for superstructure rebuilding roads) mills asphalt, concrete.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination

COURSE TITLE: ECONOMICS AND LEGISLATION IN CONSTRUCTION
CODE: D23CCL306
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMMUNICATION WAYS AND BRIDGES
CODE: D23CCL307
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STATICS OF CONSTRUCTIONS I
CODE: D23CCL308
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION III
CODE: D23CCL409
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I
CODE: D23CCL410
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: STATICS OF CONSTRUCTIONS II
CODE: D23CCL416
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRENGTH OF MATERIALS II
CODE: D23CCL413
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding the strength analysis of structures (machine parts, constructions, strength structures and so on).
COURSE CONTENTS: Mechanical structures schematization; Mechanical structures analysis (loadings, reaction forces, stresses, displacements

and so on); Interpretation of mechanical loadings states for a construction; Design of mechanical structures; Strength and stiffness calculus, strength check structures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL PHYSICS

CODE: D23CCL411
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: HYDRAULICS

CODE: D23CCL412
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The aim of the course is to present the basics of fluid mechanics and elements of applied hydraulics.
COURSE CONTENTS: Physical properties of fluids; Hydrostatic pressure; Hydrostatic law; Hydrostatic forces; Lagrange and Euler's method in kinematics of fluid mechanics; Mass conservation equation; Bernoulli equations and applications; Laminar fluid flow; Navier-Stokes equation; Bernoulli generalized law; Fluid flow in hydraulics pipes; Reynolds number; Linear friction losses; Darcy-Weisbach relation; Local friction losses; Flow in pressured pipes; Serial pipes; Parallel pipes; Network pipes; Short pipes calculus; Water hammer; Fluid flow in open channels; Fluid flow through holes; Fluid flow over weirs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral test

COURSE TITLE: REINFORCED CONCRETE STRUCTURE I

CODE: D23CCL414
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: HYDRO-UTILITIES CONSTRUCTIONS

CODE: D23CCL415
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION IV

CODE: D23CCL417
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be defined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN I

CODE: D23CCL419
ECTS CREDITS: 2
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE

CODE: D23CCL418
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: INDUSTRIAL SOCIOLOGY

CODE: D23CCL420
ECTS CREDITS: 2
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Knowing and understanding by students of various aspects of the enterprise's social life and social-humanistic problematics; Improvement of abilities of fast solutioning of the social and human problems faced by students in their future jobs; Acquiring of methods, techniques and investigation tools specific to the discipline as future (applicative) support in the activity related to social relationships at the working place; Training of future engineers for the dialogue with specialists from the areas of social-human sciences, sociologists and psychologists, more in more involved in the actual enterprises development process.
COURSE CONTENTS: Sociology – social science; Industrial Sociology as a branch of the general Sociology; Methodology in Industrial Sociology; Sociology of industrial enterprises; (Problems of industrial Macrosociology; Problems of industrial Microsociology); Societal structure of industrial enterprises; Sociology of personnel from factories; Industry, Economy, society, industrial sociology; Industry – factor of urbanization and social construction.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification

COURSE TITLE: TECHNICAL STATISTICS

CODE: D23CCL501
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The students' acquaintance with the concepts and fundamental elements regarding the probability theory and the statistics calculus. The students learning with the formulas and the statistics calculus methodology, and also with the statistics control achievement for the processes and products quality assurance.
COURSE CONTENTS: The acquisition and systematization of statistical data; Elements of the probabilistic theory; Classical laws of the distribution of random variables; Elements of selection and estimation theory; Statistics hypothesis testing; Regression and correlation; Statistical quality control.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THEORY OF ELASTICITY ELEMENTS AND THIN PLATES CALCULUS

CODE: D23CCL502
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The aim of the first part of this course is to present the basic of continuum mechanics and linear elasticity. In the second part is dedicated to elements of thin plates calculus.
COURSE CONTENTS: Deformations; Strain tensor; Stress; Stress tensor; Two dimensional problem (plane stress); Mohr's circle; Fundamental laws in theory of elasticity; Hooke's law; Navier's equation; Compatibility equations; Airy function; Hypothesis in thin plates theory; Strain-curvature relations; Stress in thin plates; Moments-curvatures equations; Lagrange equation; Boundary conditions; Pure bending of thin plates; Pure torsion of thin plates; Analytical solutions for Lagrange equation; Circular plates equations; Axisymmetric bending of circular plates.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: GEOTECHNICS

CODE: D23CCL503
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course allows students to acquire the notions about the soils, the physical and mechanical properties of the soils, and testing methods of these properties.
COURSE CONTENTS: The soils mechanics object of study; Soils components; Liquid phase; Soils physical characteristics; Mechanical and physical properties of soils; Shear strength of soils Research of foundation soils; Difficult soils as foundation soils; Pushing processes of soil; Pressure of Soil pushing process; Supporting buildings; Slope stability; Distribution of stress in foundation soil; Soils behaviour subjected to dynamic loads.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: REINFORCED CONCRETE STRUCTURES II

CODE: D22CCL504
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objectives of the course are for students to learn about the principles of concrete calculation, starting with concrete plates, building concrete structure (Beams, walls and short overhangs; Flat-plates continuous supported, etc.).
COURSE CONTENTS: Principles of concrete calculation; Calculation of plain concrete elements; Calculation of reinforced concrete elements at the ultimate limit state; Fatigue calculation of reinforced concrete elements for linear loads during normal operation; Pre-stressed concrete; Stress loss in pre-stressed reinforcement; Determination of stress in concrete and reinforcement; Calculation of ultimate limit state resistance; Calculation of pre-tensioned concrete elements subjected to torsion; Calculation of pre-tensioned concrete elements subjected to fatigue; The limit state of strain calculation for pre-stressed concrete elements; Buildings elements made of reinforced concrete; Characteristic modes of monolithic structures; Calculation of the limit state of strength for bending with or without axial stress, calculation methods; Double armed elements with rectangular section; Elements with T-shaped section; Calculation of strength limit state of reinforced concrete elements subjected to eccentric compression; Calculation of strength limit state of reinforced concrete elements subjected to oblique bending with or without axial stress; Calculation of limit state of strength of reinforced concrete elements subjected to eccentric tensile load; Calculation of strength limit state of reinforced concrete elements subjected to shear forces; Calculation of strength limit state of reinforced concrete elements subjected to torsion; Cracking limit state calculation for reinforced concrete elements; Deformation limit state calculation for reinforced concrete elements; Fatigue limit state calculation of reinforced concrete elements. Calculation of strength limit state of reinforced concrete elements with rectangular and T-shaped section subjected to eccentric compression; Calculation of strength limit state of reinforced concrete elements with rectangular and T-shaped subjected to bending; Calculation of strength limit state of reinforced concrete elements with rectangular and T-shaped subjected to tensile load

Calculation strength limit state of reinforced concrete elements with rectangular and T-shaped section subjected to compression; Reinforced concrete frame structures; Structures of reinforced concrete diaphragms, vaults and arches; Prefabricated buildings, structural panels; Spatial Structures; Reinforced concrete foundation; Raft foundation made of reinforced concrete; Reinforced concrete pilots; Industrial halls; Special buildings made of reinforced concrete – supporting walls; tanks for liquids; chimneys.; Pre-stressed concrete Structures Designing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CIVIL CONSTRUCTIONS I
CODE: D23CCL505
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course allows students to acquire the notions of finishing operations in construction elements and thermal insulation of buildings, understand the behaviour of building structures for civil action gravity and horizontal loads from wind or earthquake – to know how to calculate all components of buildings.
COURSE CONTENTS: Introduction; Coordination modular construction tolerances and deviations; Shares in construction; The action of the fire on the building; Hygrothermics in buildings; Heat transfer through building elements; Assessing the risk of condensation; Hygrothermal compliance calculations for the building envelope; Influence of humidity on construction; Principles of sound insulation in buildings; Natural lighting of buildings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: WOOD CONSTRUCTIONS
CODE: D23CCL506
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FOUNDATIONS
CODE: D23CCL507
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRUCTURE DYNAMICS AND ELEMENTS OF ENGINEERING SEISMOLOGY
CODE: D23CCL606
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Assimilation by learners of specific notions of structural systems response to different types of dynamic actions. Determination of structural response is an essential element in the design of structural systems to dynamic and seismic actions for different types of construction. In this course, the student's thinking is oriented towards understanding the notion of behaviour of structural systems for these types of actions.
COURSE CONTENTS: Modelling dynamic actions; Structural modelling construction systems; Characterization of 1-DOF dynamic structural systems; Free vibrations of 1-DOF dynamic system in the absence and in the presence of damping; Forced vibration dynamic system 1GLD for actions with harmonic character; 1-DOF system response to a force pulse; The study of dynamical systems with n DOF; Vibration modes by using matrices [D] and {R}; Orthogonality property of eigenvectors; Modal analysis of dynamic response; Numerical methods for calculating values and eigenvectors; Characterization of seismic action; Records of seismic movements; Seismic movement parameters; 1-GLD system response to seismic action (equation of motion: seismic response instantly, maximum earthquake response, seismic response spectra, seismic force concept) with nDOF system response to seismic action; Modal superposition.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: REINFORCED CONCRETE STRUCTURES III
CODE: D22CCL609
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objectives of the course are for students to learn about the principles of concrete calculation, starting with concrete plates, building concrete structure (Beams, walls and short overhangs; Flat-plates continuous supported, etc.).
COURSE CONTENTS: Principles of concrete calculation; Calculation of plain concrete elements; Calculation of reinforced concrete elements at the ultimate limit state; Fatigue calculation of reinforced concrete elements for linear loads during normal operation; Pre-stressed concrete; Stress loss in pre-stressed reinforcement; Determination of stress in concrete and reinforcement; Calculation of ultimate limit state resistance; Calculation of pre-tensioned concrete elements subjected to torsion; Calculation of pre-tensioned concrete elements subjected to fatigue; The limit state of strain calculation for pre-stressed concrete elements; Buildings elements

made of reinforced concrete; Characteristic modes of monolithic structures; Calculation of the limit state of strength for bending with or without axial stress, calculation methods; Double armed elements with rectangular section; Elements with T-shaped section; Calculation of strength limit state of reinforced concrete elements subjected to eccentric compression; Calculation of strength limit state of reinforced concrete elements subjected to oblique bending with or without axial stress; Calculation of limit state of strength of reinforced concrete elements subjected to eccentric tensile load; Calculation of strength limit state of reinforced concrete elements subjected to shear forces; Calculation of strength limit state of reinforced concrete elements subjected to torsion; Cracking limit state calculation for reinforced concrete elements; Deformation limit state calculation for reinforced concrete elements; Fatigue limit state calculation of reinforced concrete elements. Calculation of strength limit state of reinforced concrete elements with rectangular and T-shaped section subjected to eccentric compression; Calculation of strength limit state of reinforced concrete elements with rectangular and T-shaped subjected to bending; Calculation of strength limit state of reinforced concrete elements with rectangular and T-shaped subjected to tensile load
Calculation strength limit state of reinforced concrete elements with rectangular and T-shaped section subjected to compression; Reinforced concrete frame structures; Structures of reinforced concrete diaphragms, vaults and arches; Prefabricated buildings, structural panels; Spatial Structures; Reinforced concrete foundation; Raft foundation made of reinforced concrete; Reinforced concrete pilots; Industrial halls; Special buildings made of reinforced concrete – supporting walls; tanks for liquids; chimneys.; Pre-stressed concrete Structures Designing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CIVIL CONSTRUCTIONS II

CODE: D23CCL610
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course allows students to acquire the notions of finishing operations in construction elements and thermal insulation of buildings, understand the behaviour of building structures for civil action gravity and horizontal loads from wind or earthquake – to know how to calculate all components of buildings.
COURSE CONTENTS: Introduction; Coordination modular construction tolerances and deviations; Shares in construction; The action of the fire on the building; Hygrothermics in buildings; Heat transfer through building elements; Assessing the risk of condensation; Hygrothermal compliance calculations for the building envelope; Influence of humidity on construction; Principles of sound insulation in buildings; Natural lighting of buildings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: METALLIC CONSTRUCTIONS I

CODE: D23CCL611
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ARCHITECTURAL ELEMENTS

CODE: D23CCL612
ECTS CREDITS: 2
TYPE OF COURSE:
COURSE OBJECTIVE(S): The course offers students general technical knowledge of design, composition and functionality of buildings and forming a unitary conception on the characteristics of architectural styles and historical developments in the world of construction. Also, the course presents the significance of key terms needed in the dialogue between structural engineers and architects in the design, implementation and operation of buildings in general and especially of buildings.
COURSE CONTENTS: General elements of construction history; Mainstream architecture; Elements of modern architecture; Architectural arts; Ancient architecture in Romania; Modern architecture in Romania; New architectural trends.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTRODUCTION IN FINITE ELEMENT METHOD

CODE: D23CCL613
ECTS CREDITS: 2
TYPE OF COURSE: technical culture of specialty
COURSE OBJECTIVE(S): This course forms and guide the students assimilation capacity for modelling and simulating, through modern methods, of the behaviour in static and dynamic mode structures and mobile mechanical systems, based on multi body systems theory and finite element method. Another aim is to develop and form students' abilities through applications by using important modelling and analysis software (ADAMS, ANSYS, etc.).
COURSE CONTENTS: Elements of matrices and vectorial algebra; Computer kinematic and dynamic modelling through computational methods of mechanical mobile systems; Kinematic modelling and simulations with ADAMS software; Linear elasticity elements; Finite element modelling basics;

Finite element modelling in static and dynamic mode of mechanical structures (theory and applications); Modelling and simulations by using finite element method with ANSYS and COSMOS software.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PRACTICAL STAGE

CODE: D23CCL614
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: AUTOCAD 3D

CODE: D22CCL615
ECTS CREDITS: 2
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course follows the basics of tri-dimensional modelling of the buildings, general knowledge and skills for knowledge and analysis, the design and creativity skills development. Used terms comply with our national and international regulations.
COURSE CONTENTS: General aspects about Computer Graphics; The evolution of Computer Graphics; A short history of the CAD (Computer Aided Design) concept; The classification of the CAD systems; The location of the CAD concept in the industrial company; New concepts in CAD; The concepts and software adjacent to the CAD concept; The CAM (Computer Aided Machining) concept; The FEA (Finite Element Analysis) concept; The dynamic and kinematic simulation software; The virtual prototyping concept; Parameterization and bi-directionality; Modelling software modules; 2D sketches; Base and additional shapes; Coordinates systems; Tri-dimensional modelling; Modelling commands; Primitive models; Extrude and revolution solids; Solid operations; Commands for surface modelling; Commands for tri-dimensional viewing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INSULATIONS FOR BUILDINGS

CODE: D23CCL517
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): This course helps students acquire the correct knowledge and skills necessary to calculate the thermal resistance, the correct choice of materials and solutions and optimal thermal and acoustic insulation. It also develops their technical skills of execution management in construction activities regarding the thermal and acoustic insulation of buildings.
COURSE CONTENTS: Overview on building insulation; Building as a factor in achieving thermal and acoustic comfort; Hygrothermal, interior and exterior climatic parameters; Heat transfer laws; Heat transfer by conduction; Heat transfer by convection; Heat transfer by thermal radiation; Overall heat transfer of building elements; Response of the building envelope elements for heat transfer in non-stationary thermal regime; Building envelope elements response to water vapour diffusion; Vapour barrier; Corrected thermal resistance of building elements with thermal bridges; Elements to optimize the degree of thermal protection to building elements; Principles of thermal rehabilitation of buildings envelope elements; Materials and thermal and acoustic insulation solutions for tiles on the ground floor; Material solutions and thermal and acoustic insulation solutions for roofs and terraces; Waterproofing construction elements; Materials and solutions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SPECIAL PROBLEMS OF STRUCTURE DYNAMICS

CODE: D23CCL620
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: REINFORCED CONCRETE STRUCTURES IV

CODE: D22CCL701
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CIVIL CONSTRUCTIONS III

CODE: D23CCL702
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course allows students to acquire the notions of finishing operations in construction elements and thermal insulation of buildings, understand the behaviour of building structures for civil action gravity and horizontal loads from wind or earthquake – to know how to calculate all components of buildings.
COURSE CONTENTS: Introduction; Coordination modular construction tolerances and deviations; Shares in construction; The action of the fire on the building; Hygrothermics in buildings; Heat transfer through building elements; Assessing the risk of

condensation; Hygrothermal compliance calculations for the building envelope; Influence of humidity on construction; Principles of sound insulation in buildings; Natural lighting of buildings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: METALLIC CONSTRUCTIONS II

CODE: D23CCL703
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANAGEMENT IN CONSTRUCTION I

CODE: D22CCL704
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER AIDED DESIGN

CODE: D23CCL705
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the general information and concepts of Computer Aided Design of the civil and industrial buildings resistance structures, and the capacity to operate with ETABS, finite elements method used in civil engineering.
COURSE CONTENTS: ETABS: 3D modelling of the civil and industrial buildings resistance structures build from reinforced concrete or metallic profiles. Setting the support and loading conditions for the buildings structures; Applying the seismic loads to the model; Creating the load combination for the seismic complete design; Obtaining the diagrams of the efforts N, T, M, for the elements of construction; The calculus for the reinforcing bars for columns, piers, slabs, walls and the calculus for the metallic profiles sections.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and practical stage examination

COURSE TITLE: SAFETY OF THE STRUCTURE IN SEISMIC AND WIND ACTIONS

CODE: D23CCL714
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: MANAGEMENT IN CONSTRUCTION II

CODE: D22CCL810
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: METAL BUILDINGS III

CODE: D23CCL809
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides to the students to explain the concepts of constructive composition of structural assembly halls strength structure steel, structural components of their role, presenting concepts related to charges faced by steel structures of halls, relaying their foundations and computational checking of structural elements.
COURSE CONTENTS: Composition whole metal structure of a hall resistance; Load on the structure halls; Location, role, composition and design verification by calculation of roof purlins; Composition design and verification by calculation of trusses of the roof; Composition design and verification by calculation of the beams supporting taxiways; Composition design and verification by calculation of metal poles halls; Composition design and verification by calculation from the roof bracing with steel; Composition design and verification by calculation of vertical bracing longitudinal row of pillars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Descriptive written examination and problem solving test

COURSE TITLE: MARKETING

CODE: D23CCL816
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: ENGINEERING AND MANAGEMENT
PROGRAMME TITLE: ECONOMICAL ENGINEERING IN THE MECHANICAL FIELD
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D22IEML101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts of Mathematical Analysis.
COURSE CONTENTS: Convergence: Sequences and series of real numbers; Power series; Fourier series; Continuity and Differentiability: Functions of several real variables; Implicit functions; The extreme values of a real function of several variables; Integral calculus: Definite integrals with parameters; Improper integrals; Line integrals of the first type; Multiple integrals; First type surface integrals; Elements of field theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL CHEMISTRY
CODE: D22IEML102
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS I
CODE: D22IEML103
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students general concepts about mechanics and how these concepts may be applied in other technical and specialized fields.
COURSE CONTENTS: Reduction of systems of vectors (forces); Mass geometry; Statics of a material point and of material points systems; Statics of a rigid solid and of rigid solids systems; Kinematics of a material point.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: BASICS OF ECONOMY
CODE: D22IEML104
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS I
CODE: D22IEML105
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Representations used in technical drawing; Representation in ortho-gonal projection; Representation of views, sections and breakage; Representation of views in technical drawing; Dimensioning in technical drawing: classification of dimensions; rules of listing; Registration quotas on the drawing; Methods of dimensioning and special cases for dimensioning; Representation of the threads; Tolerances; Dimensional accuracy; Linear and angular dimensions tolerances; Accuracy of shape and position of geometrical elements; Surface condition; Specific and conventional representations; Representation and cylindrical and tapered holes dimensions; Drawing overviews; Rules of representation, positioning of the components and dimensioning design overall; From snap-on; Threaded assembly; Elastic assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES I
CODE: D22IEML106
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop students' basic skills in the use of Windows operating systems, to familiarize them with the development of fundamental algorithms and the programming theory; to teach students how to use the "C" language program and how to develop Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications; Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STUDY OF MATERIALS

CODE: D22IEML107
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical concepts of the correlation between microstructure, properties and processing of the metallic materials.
COURSE CONTENTS: Crystal structures of metallic materials; Crystalline lattices and imperfections in crystalline solids; Plastic deformation of metallic materials (plastic deformation of single crystals and polycrystalline materials); Properties of metallic materials; Crystallization principles of metallic materials; Theory of binary alloy systems; Crystallization of iron-carbon alloys; Heat treatments and thermo-chemical treatments of ferrous materials; Non-ferrous metals and alloys; Advanced materials developments.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION I

CODE: D22IEML108
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) I

CODE: D22IEML109
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS II

CODE: D22IEML213
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Representations used in technical drawing; Representation in ortho-gonal projection; Representation of views, sections and breakage; Representation of views in technical drawing; Dimensioning in technical drawing: classification of dimensions; rules of listing; Registration quotas on the drawing; Methods of dimensioning and special cases for dimensioning; Representation of the threads; Tolerances; Dimensional accuracy; Linear and angular dimensions tolerances; Accuracy of shape and position of geometrical elements; Surface condition; Specific and conventional representations; Representation and cylindrical and tapered holes dimensions; Drawing overviews; Rules of representation, positioning of the components and dimensioning design overall; From snap-on; Threaded assembly; Elastic assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES II

CODE: D22IEML214
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To develop students' basic skills in the use of Windows operating systems, to familiarize them with the development of fundamental algorithms and the programming theory; to teach students how to use the "C" language program and how to develop Windows applications.
COURSE CONTENTS: Architecture of a computer system, internal representation of information; Numeration bases, logic functions, elements of algorithms, Introduction to C language vocabulary – operators; Instructions and statements of C language, expressions, functions, I/O operations Elementary; Pointers and arrays, structures and unions in C, use of strings, dynamic memory allocation, library functions, simple chain lists, double chain lists, recursion, files in C, solving systems of linear equations structure Windows applications; Programming mouse related events, GDI functions; Use of type menu and dialog box in Windows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D22IEML210
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course gives the possibility to analyse the physical and mechanical phenomena using the vector notion and his properties; Many mathematical models that describe the behaviour of mechanical components, in static or dynamic regime, are obtained using geometric notions like curves and surfaces.

COURSE CONTENTS: Vectorial spaces, examples, properties; Mathematical connections among vectorial spaces; Bilinear forms and quadratic forms, applications; Euclidean spaces - the notion of length of a vector and unoriented angle between two vectors; Orthogonality, orthogonal base; Tensors, properties; Free vectors, applications; Line and plane in space; Quadrics and Conics; Curves; Surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: NUMERICAL APPLICATIONS IN ENGINEERING (MATLAB, SIMULINK, MATHCAD)
CODE: D22IEML211
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS II
CODE: D22IEML212
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students general concepts about mechanics and how these concepts may be applied in other technical and specialized fields.
COURSE CONTENTS: Kinematics of a rigid solid and of rigid solids systems; Kinetics; Dynamics of a material point; Dynamics of material points systems and of a rigid solid.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ORGANIZATIONAL BEHAVIOUR
CODE: D22IEML215
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The discipline provides the students with the ability to understand: the people behaviour; the organisational environment of management processes; the modalities through which the individuals' behaviour, groups dynamics and interaction with the external environment might yield the organisation's performance and efficiency; the significance and specificities of team cooperation in an environment with continuously growing competitiveness; the role of decisions in the organizations' everyday activity with respect to aspects specific to human behaviour; the significance of both distinct and complementary activities – management and leadership – in a performing organization.
COURSE CONTENTS: Organizational behaviour – context and interactions; Individuals within the organization's framework; Groups within the organization's framework; Organization and organisational processes; Organizational management and leadership.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written evaluation

COURSE TITLE: PHYSICAL EDUCATION II
CODE: D22IEML216
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: HISTORY OF TECHNICS
CODE: D22IEML216
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) II
CODE: D22IEML220
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS
CODE: D22IEML323
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS
CODE: D22IEML324
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main aim of the course is to prepare students regard to acquiring the basic theoretical and practical concepts to represent industrial technical design, to develop the creative skills to prepare project designs. The terms used comply with current standards and international standards.
COURSE CONTENTS: Representing permanent joints; Riveted joints; Representing welded or soldered joints; Preparation of technical drawings for a welded components of an assembly; Technical representation for gears; Representing feathered joints and straight dovetail joints; Technical representation for shafts; Project theme:

preparation of technical drawings for two cylindrical gears fixed on shafts; Representation of bearings and sealing gland; Preparation of project design for gearbox assembly.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN

CODE: D22IEML325
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with general information and concepts of Computer Aided Design, and develops their capacity to operate with AutoCad and their capacity to perform design calculus using adequate programs.
COURSE CONTENTS: AutoCad: 2D drawing and editing; 3D solids modelling and editing; Design applications programming using AutoLisp; Design elements using AutoCad Mechanical; Design calculus basis with MathCad program.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANISMS

CODE: D22IEML326
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course objectives are: to familiarize students with fundamental notions regarding mechanisms and machine elements; structural calculus methods, kinematics, kinetostatics and dynamics of mechanisms. Another goal of the course is to develop students' basic skills and to teach them how to conceive and design mechanisms.
COURSE CONTENTS: Structural analysis of mechanisms; Kinematical analysis of planar mechanisms; Kinetostatical analysis of planar mechanisms; Dynamic analysis of planar mechanisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNICAL STATISTICS

CODE: D22IEML327
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course's objective is to present and to familiarize the students with the notions and fundamental elements regarding probabilistic theory and statistic calculus. Another objective is to teach the students the statistic calculus methodology, with applications in technical and economical domain.
COURSE CONTENTS: Notions of probabilistic theory; Random variables; Events; discrete random variables; Discrete repartition laws; Elements of estimative theory; Statistical hypotheses; Verification of statistical hypotheses; Notions of errors theory; Systematization of statistical data; Primary and derivative statistical indicators; Central trend indicators; Variation indicators; Statistical selection; Dispersion analysis Correlation – Regression method; Simple correlation coefficient; Correlation ratio; Regression and multiple correlation; Chronological series; Methods for trend analysis and determination.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: OPERATIONS RESEARCHES

CODE: D22IEML328
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims to form the capacity to make optimal decisions, based on advanced analytical methods in order to solve complex problems of production, transport and other. The focus is to obtain maximum profit, performance, efficiency, or to reduce to the minimum any loss, risk, cost, for some specific situations in the real world.
COURSE CONTENTS: Solutions for unfolding a production cycle, called basic programs; Special production cycles and their representation by special mathematical models; Determination of some optimal basic programs using duality; Study of some production cycles in which the number of finished products must fall between a superior edge and an inferior edge; The complete optimization of a production cycle; Decentralization of decisions and management at two levels; The transport-allocation type models; Special algorithms; General model of "transport" type; Other problems encountered during a cycle production.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICAL EDUCATION

CODE: D22IEML329
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: LAW AND ECONOMICAL LEGISLATION

CODE: D22IEML330
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) III
CODE: D22IEML332
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE
CODE: D22IEMLL440
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: TECHNICAL PHYSICS
CODE: D22IEML433
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY
CODE: D22IEML434
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding the main technology of production and processing technical materials.
COURSE CONTENTS: Classification of material properties; metal materials; obtaining metallic materials; metal casting; powder metallurgy; plastic deformation of metals; welding metallic materials; NDT materials; unconventional technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STRENGTH OF MATERIALS
CODE: D22IEML435
ECTS CREDITS: 6
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding the strength analysis of structures (machine parts, constructions, strength structures, etc.).
COURSE CONTENTS: Mechanical structures schematization; Mechanical structures analysis (loadings, reaction forces, stresses, displacement, etc.); The interpretation of mechanical loadings states for a construction; The design of mechanical structures; Strength and stiffness calculus; Structure strength check.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FLUIDS MECHANICS
CODE: D22IEML436
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical concepts about the fluids flow with application in the mechanical engineering.
COURSE CONTENTS: The main properties of fluids; The general methods of study used in the mechanics of fluids; The fundamental equations of the mechanics fluids; The kinematics of the fluid; The dynamics of the ideal fluids; The statics of fluids; The dynamics of the viscous fluids under the laminar and turbulent flow; The applied of the mechanics of fluids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DOMESTIC AND INTERNATIONAL TRADE
CODE: D22IEMLL437
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANAGEMENT
CODE: D22TCML438
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION
CODE: D22IEML439
ECTS CREDITS: 1
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): to be determined

COURSE TITLE: FOREIGN LANGUAGE (ENGLISH, FRENCH, GERMAN) IV
CODE: D22IEML441
ECTS CREDITS: 3
TYPE OF COURSE: optional
LANGUAGE OF INSTRUCTION: English/ French/ German
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: MACHINE ELEMENTS I

CODE: D22IEML547
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming students' creative skills by elaborating original solutions and modern design by means of the facilities offered by CAD/ CAM/ CAE.
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear trans-missions; Chain drives; Friction wheels trans-missions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profile assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SURFACES GENERATION ON MACHINE TOOLS-BASIS

CODE: D22IEML548
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts of the surfaces generation, physical principles of the cutting process as well as knowledge of the characteristics phenomena of the cutting processes.
COURSE CONTENTS: Kinematics of cutting process; Physical principles of cutting process (chips formation and types of chips, the importance of chips shape, built-up-edges, etc.); Plastic deformations of workpiece material; Forces and power in cutting processes, thermal phenomena in cutting processes; Cutting fluids; Tool wear and tool life; Vibration in cutting process; The quality of machined surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENGINEERING AND PRODUCT DESIGN

CODE: D22IEML549
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the theoretical and practical aspects of product design (design, ergonomics, aesthetics).
COURSE CONTENTS: Introduction to product design; Specifications of a product design; Methods of generation/ selection of concepts; Design and obtaining forms; Product modelling; Detailed design; Operational management of design; Industrial product design; Shape and colour of products; Aesthetic evaluation methods products; Technical engineer and creator of beautiful.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FINANCE AND CREDIT

CODE: D22IEML550
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANAGEMENT OF HUMAN RESOURCES

CODE: D22IEML551
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ACCOUNTING, PRICE AND COST CALCULATION

CODE: D22IEML552
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: STOCK EXCHANGES AND VALUES

CODE: D22IEML553
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTERNATIONAL ECONOMIC RELATIONS

CODE: D22IEML554
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: MACHINE ELEMENTS II
CODE: D22IEML655
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Promoting and developing some concepts, machine elements design procedures and techniques from mechanical and mechatronic systems structure, stimulating and forming students' creative skills by elaborating original solutions and modern design by means of the facilities offered by CAD/ CAM/ CAE.
COURSE CONTENTS: Machine elements design basics; Screw fastening and power screw transmissions; Gears and gear trans-missions; Chain drives; Friction wheels trans-missions; Belt drives; Continuously variable transmissions; Shafts and axes; Rolling contact bearings; Sliding contact bearings; Couplings; Sealing elements; Threaded joints; Assemblies through sunk and tapered keys; Spline assemblies; Polygonal profile assemblies; Cotter and knuckle joints; Conical couplings; Assemblies through conical friction elements; Clamp couplings; Fretting and fatigue assemblies; Assemblies through elastic and dumping elements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMODYNAMICS
CODE: D22IEML656
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course allows students to acquire correct knowledge and the necessary skills for thermal calculation in manufacturing and correct operation of heating and cooling. The necessary skills are acquired for conception of minimum specific energy consumption by extending the concepts of energy and energetic balance.
COURSE CONTENTS: Generalities in thermotechnics; Methods in thermodynamic; Thermodynamic coefficients; The first principle of thermodynamics for closed and open systems; Enthalpy; Caloric equation of state; Robert Mayer's; Perfect gas; Perfect gas laws; Perfect gas mixtures; Simple thermodynamic transformations; The second principle of thermodynamics; Cycles motors and generators; Heat engines; Heat pumps, refrigeration machines; Entropy; Entropy in simple thermodynamics transformations; Refrigeration; Real gas; Vapours; Moist air; Thermodynamic methods; The third principle of thermodynamics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF MECHANICAL SYSTEMS MODELLING
CODE: D22IEML657
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course forms and guides students' assimilation capacity for modelling and simulating, through modern methods, of the behaviour in static and dynamic mode structures and mobile mechanical systems, based on multi body systems theory and finite element method. Another aim of the course is that it can develop and form students' ability by means of specific applications using important modelling and analysis software (ADAMS, ANSYS, etc.).
COURSE CONTENTS: Elements of matrices and vectorial algebra; Computer kinematic and dynamic modelling through computational methods of mechanical mobile systems; Kinematic modelling and simulations with ADAMS software; Linear elasticity elements; Finite element modelling basics; Finite element modelling in static and dynamic mode of mechanical structures (theory and applications); Modelling and simulations by using finite element method with ANSYS and COSMOS software.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: CUTTING TOOLS
CODE: D22IEML658
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students theoretical and practical basis regarding the cutting tools design, and in the same time, both the knowledge of the dimensional and geometrical elements of the cutting tools. The course presentation is graduated, starting from the single point tool geometry and finishing with the very complex tools from point of view of geometry and dimensional elements.
COURSE CONTENTS: Tools classification; Tool-in-hand system; Position system; Kinematic system; Tool geometry in tool-in-hand system (shape of tool faces, rake angle, relief angle, the wedge angle, tool cutting edge angle, the cutting edge inclination angle); Optimum values of geometric elements of tools; Tool materials; Fixing devices for tools; Tool strength and rigidity calculations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MACHINERY AND MANUFACTURING EQUIPMENT
CODE: D22IEML655
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at familiarizing students with the components of

kinematic chains, control systems, kinematics, operation and regulation equipment and machining equipment.
COURSE CONTENTS: General Introduction; Getting concerning processes generating parts; Cutting metals; Elements of the theory of surface generation in advanced manufacturing systems; Elements of the theory of kinematic chains advanced production systems; Features and kinematic analysis of mechanisms of kinematic chains; Characteristic of advanced production devices; Theory of mechanisms of control and drive systems of advanced manufacturing systems; Advanced manu-facturing circular and flat surfaces; Production systems by turning, milling, drilling, planning, shaping, grinding, broaching; Advanced production systems toothed surfaces; Advanced production thread; Advanced manufacturing systems to complex surfaces; Production systems by copying and after the program; Kinematics of advanced manufacturing systems; Advanced production unit; Advanced flexible production systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TOLERANCE AND DIMENSIONAL CONTROL

CODE: D22IEML660
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts to establish reasonable tolerances in the industry and to engage in performing technical quality control in the manufacture of parts.
COURSE CONTENTS: General concepts about precision; Tolerances of cylindrical fits; ISO Tolerances and fits; Accuracy of geometric shape; Surface position precision; Surface roughness; Dimensional chains; Mount Tolerances and fits on the mounting of bearings in shaft and casing; Tolerances and fits of conical parts and assemblies; Tolerances and fits of threads parts and assemblies; Tolerances and fits of cylindrical wheel.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: VALUE AND QUALITY MANAGEMENT

CODE: D22IEML661
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE

CODE: D22IEML662
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SMALL AND MEDIUM-SIZE BUSINESSES

CODE: D22IEML663
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course gives students the skills necessary information on starting a business;
COURSE CONTENTS: Classification of small and medium businesses worldwide; Starting a business from scratch; Business start by buying one already existing; Business start by buying a franchise; ethics and etiquette in business; business plan.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROTECHNICS AND ELECTRICAL MACHINERY

CODE: D22IEML565
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ENGINEERING AND PRODUCTION MANAGEMENT I

CODE: D22IEML771
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course helps students gain knowledge related to production processes and systems. Students learn about the main techniques and methods for production programming. They develop the necessary skills in order to be able to analyse and optimise production processes.
COURSE CONTENTS: Introducing the concepts of engineering, production and management; Technological potential of production systems; Introduction to production programming; Production programming for prototypes, series and mass production; Production capacity; Stock control; Methods of production engineering; Management tools used in production processes; The concept of ergonomics in production systems; Design, assembly and usage of production systems; Innovating production processes.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: INFORMATION SYSTEMS MANAGEMENT

CODE: D22IEML772
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Students learn about: the structure of databases managed by MS Access, how to use relational diagrams; to filter a database with query object, to integrate form objects and get reports. The course focuses on presenting the database structure for the most important systems of a company based on a case study from a producer of automotive transmissions, and also on attaching coding sequences on events related to the objects of the database interface.
COURSE CONTENTS: Relational databases, types of relationships, normalization; MS Access 2007 system tables, properties; Different type of queries: select, append, delete, update, tables creation, cross consultation; Forms objects, reports, objects; Decision support for information system at a company which produces mechanical transmissions: system for human resources management; system for product development; system for tools and fixtures management, system for planning and monitoring production; system r payroll information; system for inventory management; events programming, objects hierarchies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination and test meant to evaluate practical skills

COURSE TITLE: PLASTIC DEFORMATION TECHNOLOGIES

CODE: D22IEML773
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objective of this course is to familiarize students with the main operations of cold plastic deformation, the analysis of forces, mechanical work, consumed power, organological analysis and kinematics of plastic deformation equipment.
COURSE CONTENTS: Generalities; Classification of operation for plastic deformation; Used materials; The cutting of materials; Forces; Mechanical work; Power; Analysis of cutting machines; Embossing operations; Tailoring blanks; Types of embossing; Mechanical presses with simple action; Precision embossing; Cropping and perforation of rubber; Cropping with plastic material; P;M; with double action; Materials folding; Elastic recovery from folding; Hydraulic presses; Shaping; Forces; Mechanical work; Power; Stencils; Special shaping; Examples; Moulding processes; Bottlenecking; Expansion; Embossing; Levelling; Volumetric compression processes; Extrusion; Discharging; Mould pressing; Specific cold pressing processes; Assembling by cold pressing; Straightening machines; Mechanization and automation of TTA operations in operations of plastic deformation; Economical efficiency of processing operations with plastic deformation; Allowed reconfigurability of sustainable development in plastic deformation technologies.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FINANCIAL AND ECONOMIC ANALYSIS

CODE: D22IEML774
ECTS CREDITS: 2
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRODUCT MANUFACTURING TECHNOLOGY

CODE: D22IEML775
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The students' assimilation of: the concepts specific to products fabrication technology, the design methodology of technological fabrication processes in classical systems production and with CNC and the typical technology for different groups of products; the forming of necessary aptitudes to determine the influence of different factors on the manufacturing precision and the surfaces quality made in the technological systems, but also their programming and setting.
COURSE CONTENTS: The manufacturing precision; The basis of technological processes design for metal cutting; The technology for different types of surfaces machining; The fabrication technology of main products groups; General problems concerning the technologies development for manufacturing on semi-automatic and automatic machine; The basis of CNC products system programming; Elements of the assembly technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INDUSTRIAL LOGISTICS

CODE: D22IEML776
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objective of this course is to make an analysis in a coherent approach of the logistic system of a factory, the material fluxes, the delivery circuits and storage networks, together with the study of network locations.

COURSE CONTENTS: Logistic system; Activities, structure and functions; Elaborating the manipulation, storage and intern transport technologies; Concepts of designing the disposal of logistic system components; Forming of the packed load units; Design elements; Forming the pallet loadings units, containerized and trans-containerized; Storages, deposit systems and technical organisational activities; Functions of logistic storage subsystem; The coordination of logistic storage subsystems with working subsystems; Mechanization, automation and robotisation of internal transport processes; Mechanical and automated conveyor; Special transport equipment; Road transportation systems; Road, railway maritime and fluvial transportation systems; Optimizing transport itineraries; Time of manufacturing cycle; Aspects of synchronising operations; The distribution of material fluxes within the logistic system; Location problem inside the internal logistic system.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MANAGEMENT OF AUXILIARY ACTIVITIES

CODE: D22IEML777
ECTS CREDITS: 3
TYPE OF COURSE: specialty, domain
COURSE OBJECTIVE(S): The course aims at developing a set of fundamental knowledge related to "auxiliary activities", improperly called „auxiliary" since at present they have become very important in the operation and functioning of the production. Their complexity and total automation requires detailed knowledge for proper operation, maintenance and repair. In the Romanian economy, it is necessary that the maintenance and repair of machinery and equipment, and other activities that make the basic productive activities, to be addressed in a new system design that students need to know and master the knowledge offered by this course.
COURSE CONTENTS: General concepts about auxiliary activities; Application of operational research in the field of maintenance and repair equipment, machinery and industrial installations; Wear of equipment, machinery and industrial installations; Repair and reconditioning methods of spare parts; Organization of systems of revisions and repairs; Reliability, maintainability and availability of equipment, machinery and industrial installations; Supply Management of Provisioning; Storage Management; Transport Management; Building Maintenance Management; Environmental Management.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS RECYCLING

CODE: D22IEML778
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course presents to students the ways for recovering and recycling reusable materials with direct implication in technology's design and equipment for obtaining basic materials from waste.
COURSE CONTENTS: Recovering and recycling metallic waste from machine industry; Specific technological process; Recycling of foundry compounds and caste iron and steel waste; Recycling of grinding cuttings; Recovering and recycling for textile and glass fibres; Recovering and recycling for waste paper; Recovering and recycling of plastics and polymers from rubber tyre; Recovering and recycling of garbage; Parts' recycling by restoring, disturbance of pieces type: shaft, bushing, gab, gear pinion; Reconditioning of pieces type carcass using HELI-COIL and METALOCK methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: ENGINEERING AND PRODUCTION MANAGEMENT II

CODE: D22IEML880
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course helps students gain knowledge related to production processes and systems. Students learn about the main techniques and methods for production programming. They develop the necessary skills in order to be able to analyse and optimise production processes.
COURSE CONTENTS: Introducing the concepts of engineering, production and management; Technological potential of production systems; Introduction to production programming; Production programming for prototypes, series and mass production; Production capacity; Stock control; Methods of production engineering; Management tools used in production processes; The concept of ergonomics in production systems; Design, assembly and usage of production systems; Innovating production processes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STRATEGIC MANAGEMENT

CODE: D22IEML881
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MARKETING

CODE: D22IEML882
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MAINTENANCE MANAGEMENT

CODE: D22IEML883
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at creating the basic knowledge related to the maintenance and reliability of technical systems, as well as knowledge related to the management techniques of the maintenance activity.
COURSE CONTENTS: Maintenance; Definition; Classification; Reliability systems; Mathematical approach of reliability; Failure of the technical systems; Total Productive Maintenance; Maintenance activity management methods.
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MANAGERIAL COMMUNICATION

CODE: D22IEML884
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNOLOGIES AND CONTROL EQUIPMENT

CODE: D22IEMLL886
ECTS CREDITS: 2
TYPE OF Project: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: ENGINEERING AND MANAGEMENT
PROGRAMME TITLE: INDUSTRIAL ECONOMIC ENGINEERING (CENTRE OF DROBETA-TURNU SEVERIN)
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D24IEIL101
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts related to the differential and integral study of functions of several variables and their applications. It allows the necessary practical skills and techniques associated to the differential and integral calculus.
COURSE CONTENTS: Sequences and series of real numbers; Power series; Taylor series; Functions of several variables (limits and continuity, differentiation, partial derivatives); Extremes for functions of several variables; Multiple integrals (double and triple); Elements of vector calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CHEMISTRY
CODE: D24IEIL102
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The development knowledge in the field of chemistry, close by practice and the relationship with the environment, contributes to technical formation of the students but also achieve a clear image of the phenomena taking place in the technological processes.
COURSE CONTENTS: Correlation between chemical structure and some properties of substances; Thermodynamic and chemical kinetics notions; Electrochemistry and electrochemical energy conversion; Corrosion and corrosion protection; Fuels and lubricants; Macromolecular compounds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICS
CODE: D24IEIL103
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to familiarize students with the main physical phenomena from mechanical elements, covering chapters such as where atomic and nuclear physics. This knowledge, provided students are required to understand and manufacturing processes as well as operational activities and equipment repair. Moreover, the knowledge gained may allow improvement of technological processes.
COURSE CONTENTS: The kinematics material point, Newtonian mechanical principles, theorems and conservation laws in the dynamics of material point, Oscillations; Sizes characteristic oscillations; Propagation of oscillations; Wave interference; Diffraction of waves; Dispersion; Doppler effect, temperature; Temperature measurement; Amount of heat, heat capacity, specific heat, Principle I of thermodynamics; Second principle of thermo-dynamics; Entropy, thermal machines ideal; Electrostatic interaction of electric charges; Electric field; Coulomb force; Flow tubing; Gauss's theorem; Working electric field; Electric potential of point load; Electrical potential gradient; Equipotential surfaces; General characterization of the magnetic field; Magnetic field flow; Movement of loads in electric and magnetic field; Lorentz force; Features ferro-magnetic substances, dia- and paramagnetic, electromagnetic waves, quantum physics elements, getting physical solid, crystalline structure; Classification; Modern applications of physics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROGRAMMING COMPUTERS AND PROGRAMMING LANGUAGES I
CODE: D24IEIL104
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students the basic computer terminology and concepts, a knowledge of the fundamental operating system functions, the theoretical and practical concepts of the Microsoft Office software applications as well as the Internet access and electronic communication.
COURSE CONTENTS: Fundamentals of Computer; Operating Computer using GUI based Operating System; Microsoft Office application: MS Word, Excel, Access, PowerPoint; Internet access and electronic communication.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE: D24IEIL212
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts of linear algebra, analytical and differential geometry and their applications. It allows the necessary practical skills used in the study and understanding

of other disciplines, and in engineering problem solving.
COURSE CONTENTS: Vector spaces; Vector coordinates; Linear transformations; Eigenvectors and eigenvalues; Bilinear and quadratic forms; Euclidean spaces; Orthonormal basis; Conics and quadrics; Straight lines and planes in the Euclidean space; Differential geometry of curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DRAWING

CODE: D24IEIL105
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of basic concepts and reasoning on the implementation of solid geometry relationships in vertical projection systems; Knowledge representation methods in two-dimensional space of elementary geometric elements such as point, line, plane or surface; Knowledge and use of the methods for determining the actual size of the specified geometric elements; Understanding how to make detail drawings and drawings.
COURSE CONTENTS: Representation of point and line in the triple vertical projection Representation plan; Methods of transformation of the figures; Assembly drawing; Assembly; Representation and dimensioning of machinery parts; Tolerances and fits; Applying the skills of working with drawing tools at the level of descriptive geometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENGLISH LANGUAGE I

CODE: D24IEIL108
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand English words and paragraph and that is very important to understand English language; Knowledge the necessary notions in English language for machine mechanisms and machinery.
COURSE CONTENTS: Introduction into Engineering Materials Technology (Production phase, usage, recycling), Present Simple and Continuous; The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; High voltage cables (description, materials, uses), means of expressing the Future; Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice, Engineering design – working with drawings (plan, cross-section, exploded view, elevation, schematic, specification), describing details Inventions: the incandescent lamp, present and past tenses revision; Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Characteristics of Materials, Some Phrases for Academic Writing Property, Some Phrases for Describing Figures, Diagrams and for Reading Formulas, Grammar: Comparison, Processing and Performance, Classification of Materials, Grammar: Verbs, Adjectives, and Nouns followed by Prepositions; Metals, Introduction .Mechanical Properties of Metals, Important Properties for Manufacturing; Metal Alloys. Case Study; Ceramics, Structure of Ceramics, Word Formation: Suffixes in Verbs, Nouns and Adjectives Properties of Ceramics, Case Study: Optical Fibers versus Copper Cables, Grammar: Adverbs II; Polymers, Word Formation: The Suffix -able/-ible, Properties of Polymers; Case Study: Common Objects Made of Polymers Grammar: Reported Speech (Indirect Speech) Polymer Processing; Composites, Case Study: Snow Ski, Grammar: Gerund (-ing Form); Case Study: Carbon Fibre Reinforced Polymer (CFRP); Word Formation: Prefixes, Advanced Materials, Semiconductors, Case Study: Integrated Circuits; Advanced Materials, Smart Materials, Nanotechnology, Case Study: Carbon Nanotubes, Grammar: Modal Auxiliaries; Technical Writing, Punctuation and capitalization, Making corrections and improvements on written drafts; Being concise, Writing style – creating a warm, professional tone, Text abbreviations, Short words for emails and text messages, Identifying parts, Engine part vocabulary.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION AND SPORTS I

CODE: D24IEIL109
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is intended for students in order to preserve their health, increase their resistance to effort, harmonious physical development and create some sporting skills.
COURSE CONTENTS: 1. Running with changing tempo after 50m and then 100-150m (3/ 4.2/ 4.4/ 4.2/ 4); Conduction of the ball (repeat); depriving the opponent of the ball (learning) – football; 2.

Processing an application hall of the hall with climbing, climbing, jumping, weight carrying; Service – pick-up/ pass (complex of procedures) passes from the top, bottom in 2 and 3 players (volleyball); 3. Initial testing through room tests – Mark, demarcation in relation 1-1 free on the whole ground (basketball); 4. Dribbling, walking – repeating items in different variants (basketball); playing 5x5 with focus on tracking balls at the board; 5. Attack crash – learning the impulse, beat, jump, landing (volleyball); a two-way game with an emphasis on performing the service and attack strike in different areas; 6. Dropping the ball in dribbling – learning; 5x5 game with emphasis on this technical process; Taking the ball out of work – repeating with emphasis on excessive leg flexion; Bilateral game with emphasis on taking two hands down.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports tests

1ST YEAR, 2ND SEMESTER

COURSE TITLE: PROGRAMMING COMPUTERS AND PROGRAMMING LANGUAGES II

CODE: D24IEIL210
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students the basic concepts of programming languages, the description of algorithms, flowchart and pseudocode, basic concepts of C/ C++ language and programming, knowledge of data structures, functions and structured programming.
COURSE CONTENTS: Basic concepts of programming languages; Algorithms; Description of algorithms through flowchart and pseudocode; C++ language structures; Variables; Constants; Operators; Basic Input/ Output; Data Structures; Functions and Arguments; Arrays; Pointers; Implementation of user-defined functions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DRAWING

CODE: D24IEIL211
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of basic concepts and reasonings on the implementation of solid geometry relationships in vertical projection systems; Knowledge representation methods in two-dimensional space of elementary geometric elements such as point, line, plane or surface; Knowledge and use of the methods for determining the actual size of the specified geometric elements; Understanding how to make detail drawings and drawings.
COURSE CONTENTS: Representation of point and line in the triple vertical projection Representation plan; Methods of transformation of the figures; Assembly drawing; Assembly; Representation and dimensioning of machinery parts; Tolerances and fits; Applying the skills of working with drawing tools at the level of descriptive geometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D24IEIL212
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts of linear algebra, analytical and differential geometry and their applications. It allows the necessary practical skills used in the study and understanding of other disciplines, and in engineering problem solving.
COURSE CONTENTS: Vector spaces; Vector coordinates; Linear transformations; Eigenvectors and eigenvalues; Bilinear and quadratic forms; Euclidean spaces; Orthonormal basis; Conics and quadrics; Straight lines and planes in the Euclidean space; Differential geometry of curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS SCIENCE

CODE: D24IEIL213
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts on the chemical bonds, materials structures and properties related to the solidification, plastic deformation and heat treatment processes.
COURSE CONTENTS: Chemical bonds; Ideal and real crystalline lattices; Plastic deformation mechanisms; Crystallization and solidification phenomena; Accompanying processes of the solidification phenomena; Alloy systems theory; Fe-C alloys; Fe-based solidification structures; Non-ferrous alloys; Basis on heat treatments of ferrous and non-ferrous alloys; Heat treatment structures of ferrous and non-ferrous alloys; Basis on composites and nanomaterial.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS

CODE: D24IEIL214
ECTS CREDITS: 4
TYPE OF COURSE: specialised

COURSE OBJECTIVE(S): The course offers the students theoretical concepts to substantiate all disciplines with mechanical character. This discipline represents the starting point for the study of phenomena that occur in the activity of the engineer, including basic scientific concepts of its activity.
COURSE CONTENTS: Statics of material point; Statics of rigid (particular systems of forces, geometry masses, moments of inertia); Kinematics of material point (basic concepts, study material point movement in different coordinate systems); Kinematics of rigid (general movement of rigid, particular movement of rigid); Dynamics of material point (basic concepts, general theorems, differential equations of movement of material point); Elements of mechanical vibration (items of kinematics vibration, items of dynamic vibration).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY

CODE: D24IEIL215
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at familiarizing students with the main ways of obtaining metallic materials and their equilibrium diagrams and the main methods of processing materials. Emphasis is placed on acquiring key technologies, phenomena and processes which matter through to become a finished product. The students are required to understand the manufacturing processes and as well the activities of exploitation and repair the equipment. Moreover, the knowledge gained may allow improvement of technological processes. The main objective is the acquisition of the method to obtain a particular product.
COURSE CONTENTS: Purpose and importance of technology materials; Metal materials; Classification and properties; Primary development; Cast iron; Developing cast iron, steels; Developing steel, non-ferrous materials; Ferrous materials development, secondary development, casting metals; Physical basis of casting, casting methods; Processing methods by plastic deformation of metallic materials; Hot and cold plastic deformation; Erosion processing; Powder aggregation processing; Permanent joints; Welding, soldering joints; Cutting metal; Protection of metallic materials against corrosion; Control of non-metallic materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENGLISH LANGUAGE II

CODE: D24IEIL216
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand English words and paragraph and that is very important to understand English language; Knowledge the necessary notions in English language for machine mechanisms and machinery.
COURSE CONTENTS: Introduction into Engineering Materials Technology (Production phase, usage, recycling), Present Simple and Continuous; The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; High voltage cables (description, materials, uses), means of expressing the Future; Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice, Engineering design – working with drawings (plan, cross-section, exploded view, elevation, schematic, specification), describing details Inventions: the incandescent lamp, present and past tenses revision; Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Characteristics of Materials, Some Phrases for Academic Writing Property, Some Phrases for Describing Figures, Diagrams and for Reading Formulas, Grammar: Comparison, Processing and Performance, Classification of Materials, Grammar: Verbs, Adjectives, and Nouns followed by Prepositions; Metals, Introduction .Mechanical Properties of Metals, Important Properties for Manufacturing; Metal Alloys. Case Study; Ceramics, Structure of Ceramics, Word Formation: Suffixes in Verbs, Nouns and Adjectives Properties of Ceramics, Case Study: Optical Fibres versus Copper Cables, Grammar: Adverbs II; Polymers, Word Formation: The Suffix -able/-ible, Properties of Polymers; Case Study: Common Objects Made of Polymers Grammar: Reported Speech (Indirect Speech) Polymer Processing; Composites, Case Study: Snow Ski, Grammar: Gerund (-ing Form); Case Study: Carbon Fibre Reinforced Polymer (CFRP); Word Formation: Prefixes, Advanced Materials, Semiconductors, Case Study: Integrated Circuits; Advanced Materials, Smart Materials, Nanotechnology, Case Study: Carbon Nanotubes, Grammar: Modal Auxiliaries; Technical Writing, Punctuation and capitalization, Making corrections and improvements on written drafts; Being concise,

Writing style – creating a warm, professional tone, Text abbreviations, Short words for emails and text messages, Identifying parts, Engine part vocabulary.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION AND SPORT II

CODE: D24IEIL217
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is intended for students in order to preserve their health, increase their resistance to effort, harmonious physical development and create some sporting skills.
COURSE CONTENTS: 1. Running with changing tempo after 50m and then 100-150m (3/ 4.2/ 4.4/ 4.2/ 4); Conduction of the ball (repeat); depriving the opponent of the ball (learning) – football; 2. Processing an application hall of the hall with climbing, climbing, jumping, weight carrying; Service – pick-up/ pass (complex of procedures) passes from the top, bottom in 2 and 3 players (volleyball); 3. Initial testing through room tests – Mark, demarcation in relation 1-1 free on the whole ground (basketball); 4. Dribbling, walking – repeating items in different variants (basketball); playing 5x5 with focus on tracking balls at the board; 5. Attack crash – learning the impulse, beat, jump, landing (volleyball); a two-way game with an emphasis on performing the service and attack strike in different areas; 6. Dropping the ball in dribbling – learning; 5x5 game with emphasis on this technical process; Taking the ball out of work – repeating with emphasis on excessive leg flexion; Bilateral game with emphasis on taking two hands down.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports tests

2ND YEAR, 1ST SEMESTER

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS

CODE: D24IEIL320
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of technical drawing and info-graphics; Knowledge in the representation of machine mechanisms and machinery.
COURSE CONTENTS: Releasable assembly; Assemblies with feathers; Threaded assemblies; Non-demountable assemblies; Welded assemblies; Classification; Welding mark; Gears and transmissions; Gears with gears; Chain transmissions; Belt transmissions; Bearings; Bearings for sliding; Rolling Bearings; Representation; Designation; Surface quality and tolerances; Signs of quality of processed surfaces; Tolerances and adjustments; Drawing the conventional quality signs and tolerances and adjustments on the drawing; Execution of the technical drawing; Formats used; Execution of the technical drawing on a scale; Drawing of the sub-assembly and the whole; Technical documentation; Drawing up the operation drawing; Drawing up the datasheet.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENVIRONMENTAL PROTECTION

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to present the basic concepts of environmental protection. The discipline contributes to the development of competences in the field of: environmental engineering; knowledge and application of environmental concepts in the formation of students; knowledge of environmental pollution characteristics; knowledge of the immediate and long-term effects of environmental pollution and degradation processes and of protection and consistency measures.
COURSE CONTENTS: Environmental protection: Basic concepts; Protection of the atmosphere; Soil protection; Water protection; Environmental pollution due to waste disposal.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: METHODS AND PROGRAMMES OF NUMERICAL CALCULUS

CODE: D24IEIL429
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts regarding the most important numerical techniques and their applications in solving problems, and the implementations of algorithms in numerical calculus programmes.
COURSE CONTENTS: Basic concepts (numerical versus analytical methods, errors); Numerical methods for linear systems of equations; Numerical methods in metrical calculus; Method of successive approximations and applications; Methods for solving nonlinear equations and systems; Approximation of functions; Numerical integration; Numerical solutions of ODE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN

CODE: D24IEIL322
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Basics of the computer aided design – 2D drawing and 3D modelling using surface and solid features; Ability to developed engineering CAD drafts from 3D computer models; Parametric design concepts, assembling, associative drafting development, basic engineering design concepts; Numerous exercises from laboratory classes will develop to students, strong abilities for using SolidWorks package.
COURSE CONTENTS: The role of a CAD system in the production cycle; Analytic representation of curves and surfaces used in CAD system; Modelling elements: layers, colours, line types; Wireframes modelling, entities selection, copy, move, editing features; Drafting, tolerances, formats, sections, views, hatching; 3D modelling using surfaces, primitives, revolution, extrusion, sweeping, lofting, blend, offset, filet and corners operations on solids; Solids editing, sketching features and concepts, profile, path 2D/ 3D cutting, splitting, design using features as holes, drafts, fillets, shells, sweeps, ribs, chamfers; Parametric modelling using relations and Excel sheets; Assembling, degrees of freedom, components table, interference checking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Computer examination

COURSE TITLE: STRENGTH OF MATERIALS I

CODE: D24IEIL324
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Dissemination of information regarding the main aspects of the mechanical resistance of materials is the main objective; Offering to the students the methods of analysis and calculation specific to the mechanical resistance of materials is objective as well.
COURSE CONTENTS: 1. Generalities; 2. Stresses in transversal sections of bars; 3. Tensile and compression; 4. Conventional calculation in shear of bars; 5. General stress and strain status; 6. Applications: 6.1. Static momentum, momentum and inertia radius; Resistance Modulus; Variation of the inertial momentum; 6.2. Twisting of circular bars; 6.3. Bending of bars; Definitions; Classifications of the bending loadings; 6.4. Stress diagrams, N, T, Mi; Conventions of signs; Normal and tangential stress in bended bars; 6.5. Strain of bended bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNIC I

CODE: D24IEIL325
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the thermodynamics of the heating processes.
COURSE CONTENTS: Fundamentals: thermo-dynamic system, state, state parameters and functions, equation, state equations, mechanical work, heat, internal energy, enthalpy; Thermo-dynamic properties of the pure substances; Phases, parts, homogenous and heterogeneous system. P-V-T surface. P-V, V-T, P-T diagrams; Clausis-Clapeyron equation: Specific heats; Thermal analysis of the ideal and real gases; Thermo-dynamic fundamentals of the burning processes; Fuels; Reaction heat; Material balance of the burning process; I-T diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROMAGNETIC ENGINEERING AND ELECTRICAL MACHINES

CODE: D24IEIL326
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers to students theoretical and practical concepts regarding electromagnetic phenomena, electric circuits analysis, construction and operating of electrical machines.
COURSE CONTENTS: Electric and magnetic status; Interdependence of electrical and magnetic parameters; (General laws; Magnetic circuit law, Faraday's law, a.s.o.); Electrostatic field, potential difference, voltage; Static electriokinetic regime; DC electrical circuits; Electrical circuits in variable regime; Electrical circuits in permanent sinusoidal periodic regime.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D24IEIL321
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to familiarize the students with Special mathematics and the basic statistical concepts and features, and also with the mathematical framework needed for statistical and informational processing of the data obtained in various measuring processes.
COURSE CONTENTS: Special mathematics, Event, probability, random variable; Typical values used in the study of the repartition for the measuring results and errors; Classical repartitions; Statistical series; Typical values of the distribution series (the indexes of the central trend, mean, median, dominant)

Correlation – definition, types, basic methods; Elements of poll theory and methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN
CODE: D24IEIL430
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Basics of the computer aided design – 2D drawing and 3D modelling using surface and solid features; Ability to developed engineering CAD drafts from 3D computer models; Parametric design concepts, assembling, associative drafting development, basic engineering design concepts; Numerous exercises from laboratory classes will develop to students, strong abilities for using SolidWorks package.
COURSE CONTENTS: The role of a CAD system in the production cycle; Analytic representation of curves and surfaces used in CAD system; Modelling elements: layers, colours, line types; Wireframes modelling, entities selection, copy, move, editing features; Drafting, tolerances, formats, sections, views, hatching; 3D modelling using surfaces, primitives, revolution, extrusion, sweeping, lofting, blend, offset, filet and corners operations on solids; Solids editing, sketching features and concepts, profile, path 2D/ 3D cutting, splitting, design using features as holes, drafts, fillets, shells, sweeps, ribs, chamfers; Parametric modelling using relations and Excel sheets; Assembling, degrees of freedom, components table, interference checking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Computer examination

COURSE TITLE: STRENGTH OF MATERIALS II
CODE: D24IEIL431
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Dissemination of information regarding the main aspects of the mechanical resistance of materials is the main objective; Offering to the students the methods of analysis and calculation specific to the mechanical resistance of materials is objective as well.
COURSE CONTENTS: 1. Generalities; 2. Stresses in transversal sections of bars; 3. Tensile and compression; 4. Conventional calculation in shear of bars; 5. General stress and strain status; 6. Applications: 6.1. Static momentum, momentum and inertia radius; Resistance Modulus; Variation of the inertial momentum; 6.2. Twisting of circular bars; 6.3. Bending of bars; Definitions; Classifications of the bending loadings; 6.4. Stress diagrams, N, T, Mi; Conventions of signs; Normal and tangential stress in bended bars; 6.5. Strain of bended bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNIC II
CODE: D24IEIL433
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the thermodynamics of the heating processes.
COURSE CONTENTS: Fundamentals: thermodynamic system, state, state parameters and functions, equation, state equations, mechanical work, heat, internal energy, enthalpy; Thermodynamic properties of the pure substances; Phases, parts, homogenous and heterogeneous system. P-V-T surface. P-V, V-T, P-T diagrams; Clausis-Clapeyron equation: Specific heats; Thermal analysis of the ideal and real gases; Thermodynamic fundamentals of the burning processes; Fuels; Reaction heat; Material balance of the burning process; I-T diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROMAGNETIC ENGINEERING AND ELECTRICAL MACHINES
CODE: D24IEIL434
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers to students theoretical and practical concepts regarding electromagnetic phenomena, electric circuits analysis, construction and operating of electrical machines.
COURSE CONTENTS: Electric and magnetic status; Interdependence of electrical and magnetic parameters; (General laws; Magnetic circuit law, Faraday's law, a.s.o.); Electrostatic field, potential difference, voltage; Static electriokinetic regime; DC electrical circuits; Electrical circuits in variable regime; Electrical circuits in permanent sinusoidal periodic regime.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TOLERANCES AND DIMENSIONAL CONTROL
CODE: D24IEIL435
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding precision, deviations, tolerances, fits of different types of parts used in industry.
COURSE CONTENTS: Inter-changeability; Deviations from the geometrical shape of revolution surfaces and flat surfaces; Surface roughness; Fits; Tolerances and fits for different types of parts; Measurement of deviations from roundness and

cilindricity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: CAE (COMPUTER AIDED ENGINEERING) INTEGRATED SYSTEMS

CODE: D24IEIL541
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): This course cover principles of design, analysis and computer simulation in engineering. Starting with advanced CAD knowledge of product shape design, finite elements method theory is presented and applied to simulate various manufacturing processes as metal moulding, stamping and plastic injection. Static and dynamic structural analysis, contact, non-linear and thermal simulations are also explained through multiple examples in course and laboratory classes.
COURSE CONTENTS: Basic theory of finite elements method; FEM analysis: static, frequency, buckling, thermal, optimization; Using SolidWorks Simulation: boundary conditions, loading, materials, initial conditions; Theory of optimal part design; Parameters and structural optimization of parts; Thermoplastic materials injection using Simpoe, best parameters computation, avoiding defects; Stamping process simulation using Stampack – Autoform, process visualization, part defects detection; Metal moulding simulation using Vulcan – process visualization, optimal parameters computation, avoiding defects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Practical skills examination – computer test

COURSE TITLE: FLUID MECHANICS AND HYDRAULIC MACHINES

CODE: D24IEIL542
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): This course is an introduction in fundamental theory of fluid mechanics and application of these principles to solving various technical problems. Numerous examples, hydraulic machines functioning and practical problem solutions are presented to the students in laboratory classes for a better understanding of theoretical knowledge.
COURSE CONTENTS: Fluid properties; Fluid modelling models; Pressure in fluids; Cauchy equations; Static of fluids: equations, pressure distribution on plane and curve surfaces; Principle of Archimedes; Fluid kinematics; Continuum equation; Cauchy-Lagrange theorem; Potential and rotational movements; Fluid dynamics; Constitutive equation – laminar flow, Navier-Stokes equations; Bernoulli laminar flow; Hydrodynamics; Applications; Dynamic of viscous fluids; Laminar, transitional and turbulent flow; Turbulent flow equations; Laplace equation; Major loss in ducts, tubes and pipes; Darcy-Weisbach equation for pressure and head loss; Energy and hydraulic grade line; Hydraulic diameter; Water flow in tubes; Orifice, nozzle and venture flow rate meters; Pipe in series and parallel; Pumps, compressors, blowers and fans; Total pressure or head loss in pipe or duct systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTRONICS AND AUTOMATION

CODE: D24IEIL543
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course intends to familiarize the students with the general issues of modern electronics, with the procedures that are used in the study of the electronic devices and the characteristic functions, and also with the most usual electronic circuits. Also, it will be realized an introduction in the field of the general industrial automation.
COURSE CONTENTS: The general methods those are useful in electronics study; The conduction in semi-conductors; The *pn* junction; The semi-conductor diodes, The bipolar transistors; The electronics amplifiers; The amplification with reaction; The operational amplifiers (OA); Parameters; The linear applications with OA; The manual regulation; The automate regulation; The automate control systems; The disturbances in the unfolding the processes; Transducers; Regulators; The execution elements; The features of a control system; The modelling of the automation control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: GENERAL ECONOMICS

CODE: D24IEIL548
ECTS CREDITS: 3
TYPE OF COURSE: B
COURSE OBJECTIVE(S): The essential aim of the course is to train specialists in economics by accumulating theoretical and methodological knowledge necessary to understand the complexity of real economic life, economic structures' dynamics and of multiple relationships between economic agents. Another purpose is to arouse interest in economics as an e exciting and useful science. Initiation of students into this science will allow analysing real economic situation, making the right economic decisions and acting accordingly.
COURSE CONTENTS: Economics – form of human

activity; Economy and economic sciences system; Market economy; Consumer behaviour theory; Theory of manufacturer, supply and demand; Market, competition and price; Income; Distribution; Measuring economic activity at macroeconomic level; Labour market and unemployment; Monetary market and inflation, financial market, income, consumption and investments; Economic fluctuations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SELECTION AND USE OF MATERIALS
CODE: D24IEIL768
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to familiarize students with the main metallic materials and their equilibrium diagrams. The focus is laid on steel and cast Fe-C diagram shown in going through the elements of heat treatment and non-ferrous materials. This knowledge, provided students are required to understand the main qualities that a product must meet. Also, the knowledge gained may allow improvement of technological processes. The main objective is the acquisition mode selection for a particular product.
COURSE CONTENTS: Properties of metallic materials, physical properties, mechanical properties, technological properties, structure-property; Interdependence, steels and cast irons; Classification; Influence of alloying elements, typing, choice of materials metal of choice criteria, factors to be considered in the design, form part properties of metallic materials, external factors, chemical composition of materials; Welded structures, tanks, boilers; Parts and O.M. annealed; Equipment working in corrosive/ oxidizing; Equipment working in environments with hydrogen; Springs; Parts formed by stamping; Bearings; Fasteners; Valves; Tools.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ORGANS AND MECHANISMS
CODE: D24NTMFL546
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, gain knowledge of the necessary notions in the representation of machine mechanisms and machinery, gain knowledge of the application states studied and applied to the machine organs in operation.
COURSE CONTENTS: Introduction; Mechanism structure; Mechanics kinematics; Dynamic analysis; Mechanics of the mechanism; Camshafts; Helical gear transmissions; Gear transmissions; Belt transmissions; Chains transmissions; Demountable assemblies; Non-assembled assemblies; Axles and shafts Pivots; Friction gears; Mechanical drives; Couplings; Elastic couplings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENVIRONNEMENTAL MANAGEMENT
CODE: D24IEIL657
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Limited interpretation of the concepts, approaches, theories, models and basic methods used in well-defined exploitation issues that take place in the treatment and depollution of environmental factors; Interpretation of basic theories, models and methods used in well-defined technological calculations of depollution installations; Explaining basic theories, models and methods specific to pollutant monitoring programs in industrial installations; Applying fundamental concepts and theories in the field of communication and management for professional development regarding the reduction of environmental impact of industrial pollutants; Defining elementary concepts related to environmental quality control, risk assessment and low-impact technology development; Selection of concepts, approaches, theories, models and basic methods for the development and operation of pollutant monitoring programs in industrial installations.
COURSE CONTENTS: National Strategy for Sustainable Development of Romania; Horizons 2013-2020-2030; The general foundations of management; Defining the environmental management system (EMS); Characteristics of EMS – Environmental management systems – according to ISO 14001; Components of EMS; Environmental policy; Environmental inspection; EMAS – European Union Environmental Management System; Integrated quality-environment management systems; Integrated management systems; Quality – environment – occupational health and safety; Process-based approach – Life Cycle Analysis; Process Approach – Eco-Design; Labels and environmental statements; Assessment of environmental performance; Waste management is an integral part of organic management.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: CUTTING OPERATIONS
CODE: D24IEIL547

ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the surfaces generation, physical principles of the cutting process as well as knowledge of the characteristics phenomena of the cutting processes.
COURSE CONTENTS: Kinematics of cutting process; Physical principles of cutting process (chips formation and types of chips, the importance of chips shape, built-up-edges, etc.); Plastic deformations of work-piece material; Forces and power in cutting processes, thermal phenomena in cutting processes; Cutting fluids; Tool wear and tool life; Vibration in cutting process; The quality of machined surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: TECHNOLOGIES AND EQUIPMENT FOR PLASTIC DEFORMATION

CODE: D24IEIL656
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts of the metallic materials processing by cold plastic deformation, physical principles of the cold plastic deformation as well as designing of the technologies, stamps and cold dies for processing by cold plastic deformation.
COURSE CONTENTS: Processing methods by cold plastic deformation; Physical basis of the cold plastic deformation process (Basic plastic deformation laws; Plasticity criteria; Metallic materials deformation behaviour, etc.); Theoretical and experimental methods used for plastic deformation analysis; Materials processing by stamping (analysis of the stamping process, force, mechanical work and power in stamping process, influence of the technological parameters, cutting by claws, stamps, etc.); Materials processing by bending (analysis of the banding process, force, mechanical work and power in banding process, elastic recovery, bending technology for different work-pieces); Materials processing by drawing (analysis of the drawing process, state of stress analysis, force, mechanical work and speed in drawing process, drawing technology of work-pieces, active elements sizing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MODELLING AND SIMULATION OF MANUFACTURING SYSTEM

CODE: D24IEIL655
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic concepts of the production systems, knowledge of the modelling and simulation techniques as well as the main methods of reducing the complexity of a simulation model.
COURSE CONTENTS: Production systems; Types of production systems; Flexible Manufacturing Systems; Flexible manufacturing principles; Integration of computer in process industries; Petri net type models; Modelling of the manufacturing systems using Petri nets; Behavioural and structural properties; Deadlock in systems with shared resources; Performance evaluation of manufacturing systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ORGANS AND MECHANISMS

CODE: D24NTMFL651
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, gain knowledge of the necessary notions in the representation of machine mechanisms and machinery, gain knowledge of the application states studied and applied to the machine organs in operation.
COURSE CONTENTS: Introduction; Mechanism structure; Mechanics kinematics; Dynamic analysis; Mechanics of the mechanism; Camshafts; Helical gear transmissions; Gear transmissions; Belt transmissions; Chains transmissions; Demountable assemblies; Non-assembled assemblies; Axles and shafts Pivots; Friction gears; Mechanical drives; Couplings; Elastic couplings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ACCOUNTING

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Knowledge, understanding and deepening of the notions of general economy; Appropriate use of these in the study of economic disciplines; Developing some practical skills for evaluating the patrimonial elements, some skills necessary for drawing up some documents, performing the inventory of patrimonial elements; To acquire the necessary methods and techniques in studying and analysing economic phenomena and processes: supply, production, sales.
COURSE CONTENTS: 1. Subject and method of accounting; 2. Joint Research Processes in Economic Sciences; 3. Methods specific to accounting; 4. Content and importance of costing;

5. The accounting analysis of the main economic operations taking place in an economic entity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: RESEARCH AND DESIGN ACTIVITIES

CODE: D24IEIL894
ECTS CREDITS: 4
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course offers students the theoretical and practical aspects of product design (design, ergonomics, aesthetics).
COURSE CONTENTS: Introduction to product design; Specifications of a product design; Methods of generation/ selection of concepts; Design and obtaining forms; Product modelling; Detailed design; Operational management of design; Industrial product design; Shape and colour of products; Aesthetic evaluation methods products; Technical engineer and creator of beautiful.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRODUCTION SYSTEMS ENGINEERING

CODE: D24IEIL881
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course gives to the students the main tools of the production management and production processes design, strategic problems of the production (productivity, competitive, quality assurance of the products etc.). Also, the students will be able to know the manufacturing system, enterprise topology, and study and analysis of the methods and techniques of the production system.
COURSE CONTENTS: Enterprise – basic component of the production system; The structural organization of the production system; Methods and technique for study and analysis of the production process; Spatial system organization of the enterprise; Organization systems of the auxiliary production units; In time organization production system; Production cycle; The products quality and services in contemporary economy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COIN CREDIT BANKS

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): To explain the phenomena and the monetary and credit processes in the light of the factors that influence them, in order to identify the directions of action for influencing them; To acquire and apply knowledge, methods, techniques and tools to enable them to perform financial transactions and transactions: 1. to provide a basis for understanding and to become familiar with the main activities related to the financial and monetary sphere; 2. to present the configuration of the monetary systems and the payment system; 3. to capitalize on the financial instruments in order to substantiate the decisions aimed at rationalizing the monetary and credit activities; 4. Identify and describe the operations performed by financial-banking institutions; 5. to analyse and to interpret the phenomena and processes in the financial-banking field; 6. simulate transactions or financial-banking transactions; 7. Explain the nature and configuration of anti-inflationary policies.
COURSE CONTENTS: The Role of the Coin in the Contemporary Economy; The genesis of the coin; Coin definition; Definition of money; Coin Forms in Contemporary Economies; The functions of the coin; Money Features; The concept of monetary system; European Monetary System; Romanian Monetary System; Monetary mass; Contents and structure of monetary mass; Monetary situation analysis based on monetary components; Currency counterparties; Bank deposit, credit and interest; Definition, forms and role of deposits; Definition, forms and role of credit; Functions and forms of interest in the market economy; Modalities and payment instruments; General considerations on the means of payment; Payments by transfer; Electronic funds transfer system; Banks and banking The genesis of banks; The contents and structure of the banking apparatus; Commercial banks; Issuing banks; Banks and specialized credit institutions; Monetary policy; Monetary policy: concept and objectives; Excise fee; Mandatory reserve system; Open-market operations; Other monetary policy instruments; Banking regulations; Monetary equilibrium and inflation; The concept of monetary equilibrium; Concepts and theories on inflation; Causes and consequences of inflation; Anti-inflationary policies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: PRODUCT LIFE CYCLE MANAGEMENT

CODE: D24IEIL887
ECTS CREDITS: 4
TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): Dissemination of information regarding the fundamental principles of a planning-organizing-control of phases and resources processes specific to implementation of projects.
COURSE CONTENTS: Project – life cycle, components, applications, elaboration proposal;
Management – characterization of management system, relations of management, modernization of management system; Project Management – feasibility study, business plan, evaluation; Management of the material resources in project; Management of risk of project implementation; Management of quality of project implementation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Individual project and written examination

COURSE TITLE: ENVIRONMENTAL MANAGEMENT
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at initiating students on environmental protection and waste management Law no. 137/1995 on environmental protection and government decisions on waste management track pollution regulations and operation of national and international organizations for environmental protection. The focus is put on acquiring the main methods and clean technologies used in industry. The main objective is knowledge and characterization of clean energy sources
COURSE CONTENTS: The monitoring of environmental quality, Introduction to Environmental Impact Assessment; Clean energy and clean energy sources; Classification of unconventional technologies for energy: Renewable and non-renewable; Energy sources; Clean technologies for power generation; Solar energy; Wind energy; Construction, types of turbines; Unconventional technologies for obtaining clean energy: a. hydropower; b. Types of turbines; Biotechnology – Classical and modern biotechnology; Geothermal energy; Construction equipment; XXI Energy century; Nuclear energy and human society; Hydrogen production technologies; Recovery techniques and waste processing; The concept of sustainable development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PRODUCTION SYSTEMS ENGINEERING
CODE: D24IEIL881
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course gives to the students the main tools of the production management and production processes design, strategic problems of the production (productivity, competitive, quality assurance of the products etc.). Also, the students will be able to know the manufacturing system, enterprise topology, and study and analysis of the methods and techniques of the production system.
COURSE CONTENTS: Enterprise – basic component of the production system; The structural organization of the production system; Methods and technique for study and analysis of the production process; Spatial system organization of the enterprise; Organization systems of the auxiliary production units; In time organization production system; Production cycle; The products quality and services in contemporary economy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANUFACTURING TECHNOLOGIES
CODE: D24IEIL885
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding machinability of the parts, precision as well as knowledge to design a machining process.
COURSE CONTENTS: Machinability of the parts, Machining precision; The quality of machined surfaces; Calculus of the cutting regime parameters; Cutting process of the flat surfaces; Cutting process of the revolution surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RECONDITIONING TECHNOLOGIES
CODE: D24IEIL884
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course shows students how the recover and recycle reusable materials with direct involvement in the design of technologies and equipment that lead to obtaining raw materials from waste.
COURSE CONTENTS:
Effective management of waste; Recovery of waste iron and steel; Waste recovery and metal alloys; Recycling swarf from grinding; Recovery and recycling of textile fibres and glass fibres; Paper recovery and recycling of waste paper; Recovery and recycling of plastics; Recovery and recycling of polymers from rubber tires; Recovery and recycling of waste; Recycling parts by reconditioning, regeneration reshuffle; The wearing of tree, bush, housing.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THERMAL AND SURFACE TREATMENT

CODE: D24IEIL890
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge of the specific thermal, thermo-chemical and surface treatments applicable to ferrous alloy parts in the machine and appliance industry, the development of knowledge in the field, the development of communication skills and the formation of a creative attitude; Understanding the application of thermal and surface treatments to improve the mechanical properties of materials used in machine tool manufacturing; Explanation and interpretation of thermal, thermo-chemical and surface treatment techniques applicable to parts made of ferrous alloys.
COURSE CONTENTS: 1. Diagram of Fe3C; The importance of surface treatments in the practice of thermal treatments (structure and properties of iron, Fe-Fe3C metallist system balance diagram, phases and constituents in the Fe-Fe3C alloy system, structure of carbon steels and white pigments, primary and secondary crystallisation, classification of treatments thermal, the importance of surface treatments in the practice of thermal treatments); 2. Theory of thermal treatments (structural changes in steels, critical points, transformations to steel heating, transformations to steel cooling); 3. Thermal treatment technology (parameters of thermal treatments and used equipment, heating, heating speed and duration, heating media, maintenance, thermal equalization duration, structural transformation duration, cooling, cooling rates and cooling times, cooling media); 4. Thermal quenching treatments: Volumizing; surface quenching (superficial: superficial flame healing, superficial induction hardening, superficial quenching in the electrolyte); 5. Thermochemical treatments (carburizing, nitriding, carbonitrulation); 6. Metal diffusion deposition (alloying, chromium plating, nickel plating, silicification, titanisation, sherardization and zinc coating, boring); 7. Modern superficial treatments and thermal treatments specific to powder metallurgy (treatments in water vapour, thermosonic treatments, microwave treatments, laser treatments, specific powder metallurgy treatments).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LABOUR LAW

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Transmission to students of basic, theoretical and practical knowledge of labour law: 1. Understanding the need to develop the role of labour law as a tool for strengthening the rule of law; 2. The need to respect the social values protected by labour law; 3. Compliance with the rules of professional deontology of those involved in the work process and in the settlement of disputes between employers and employees; 4. Strengthening constitutionality and legality in the work of employers and employees.
COURSE CONTENTS: 1. The object, definition, features and sources of labour law; 2. Individual labour contract; 3. Working time and rest time; 4. Payroll system; 5. Safety and health at work; Work inspection; 6. Liability; 7. Individual labour conflicts and labour jurisdiction; 8. Social Partners; 9. Collective labour agreements; 10. Collective labour conflicts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: ENVIRONMENT ENGINEERING
PROGRAMME TITLE: ENGINEERING AND ENVIRONMENT PROTECTION IN INDUSTRY (CENTRE OF DROBETA-TURNU SEVERIN)
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D24IPMSL101
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts related to the differential and integral study of functions of several variables and their applications. It allows the necessary practical skills and techniques associated to the differential and integral calculus.
COURSE CONTENTS: Sequences and series of real numbers; Power series; Taylor series; Functions of several variables (limits and continuity, differentiation, partial derivatives); Extremes for functions of several variables; Multiple integrals (double and triple); Elements of vector calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CHEMISTRY
CODE: D24IPMSL102
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The development knowledge in the field of chemistry, close by practice and the relationship with the environment, contributes to technical formation of the students but also achieve a clear image of the phenomena taking place in the technological processes.
COURSE CONTENTS: Correlation between chemical structure and some properties of substances; Thermodynamic and chemical kinetics notions; Electrochemistry and electrochemical energy conversion; Corrosion and corrosion protection; Fuels and lubricants; Macromolecular compounds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICS
CODE: D24IPMSL103
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to familiarize students with the main physical phenomena from mechanical elements, covering chapters such as where atomic and nuclear physics. This knowledge, provided students are required to understand and manufacturing processes as well as operational activities and equipment repair. Moreover, the knowledge gained may allow improvement of technological processes.
COURSE CONTENTS: The kinematics material point, Newtonian mechanical principles, theorems and conservation laws in the dynamics of material point, Oscillations; Sizes characteristic oscillations; Propagation of oscillations; Wave interference; Diffraction of waves; Dispersion; Doppler effect, temperature; Temperature measurement; Amount of heat, heat capacity, specific heat, Principle I of thermodynamics; Second principle of thermodynamics; Entropy, thermal machines ideal; Electrostatic interaction of electric charges; Electric field; Coulomb force; Flow tubing; Gauss's theorem; Working electric field; Electric potential of point load; Electrical potential gradient; Equipotential surfaces; General characterization of the magnetic field; Magnetic field flow; Movement of loads in electric and magnetic field; Lorentz force; Features ferro-magnetic substances, dia- and paramagnetic, electromagnetic waves, quantum physics elements, getting physical solid, crystalline structure; Classification; Modern applications of physics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written/oral

COURSE TITLE: PROGRAMMING COMPUTERS AND PROGRAMMING LANGUAGES I
CODE: D24IPMSL104
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students the basic computer terminology and concepts, a knowledge of the fundamental operating system functions, the theoretical and practical concepts of the Microsoft Office software applications as well as the Internet access and electronic communication.
COURSE CONTENTS: Fundamentals of Computer; Operating Computer using GUI based Operating System; Microsoft Office application: MS Word, Excel, Access, PowerPoint; Internet access and electronic communication.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE: D24IPMSL212
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts of linear algebra, analytical and differential geometry

and their applications. It allows the necessary practical skills used in the study and understanding of other disciplines, and in engineering problem solving.
COURSE CONTENTS: Vector spaces; Vector coordinates; Linear transformations; Eigenvectors and eigenvalues; Bilinear and quadratic forms; Euclidean spaces; Orthonormal basis; Conics and quadrics; Straight lines and planes in the Euclidean space; Differential geometry of curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DRAWING

CODE: D24IPMSL105
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of basic concepts and reasoning on the implementation of solid geometry relationships in vertical projection systems; Knowledge representation methods in two-dimensional space of elementary geometric elements such as point, line, plane or surface; Knowledge and use of the methods for determining the actual size of the specified geometric elements; Understanding how to make detail drawings and drawings.
COURSE CONTENTS: Representation of point and line in the triple vertical projection Representation plan; Methods of transformation of the figures; Assembly drawing; Assembly; Representation and dimensioning of machinery parts; Tolerances and fits; Applying the skills of working with drawing tools at the level of descriptive geometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENGLISH LANGUAGE I

CODE: D24IPMSL108
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand English words and paragraph and that is very important to understand English language and gain the necessary knowledge of the notions used by the English language for machine mechanisms and machinery.
COURSE CONTENTS: 1. Introduction into Engineering Materials Technology (Production phase, usage, recycling), Present Simple and Continuous; The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; High voltage cables (description, materials, uses), means of expressing the Future; Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice, Engineering design- working with drawings (plan, cross-section, exploded view, elevation, schematic, specification), describing details Inventions: the incandescent lamp, present and past tenses revision; Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Characteristics of Materials, Some Phrases for Academic Writing Property, Some Phrases for Describing Figures, Diagrams and for Reading Formulas, Grammar: Comparison, Processing and Performance, Classification of Materials, Grammar: Verbs, Adjectives, and Nouns followed by Prepositions; Metals, Introduction. Mechanical Properties of Metals, Important Properties for Manufacturing; Metal Alloys. Case Study; Ceramics, Structure of Ceramics, Word Formation: Suffixes in Verbs, Nouns and Adjectives Properties of Ceramics, Case Study: Optical fibres versus Copper cables, Grammar: Adverbs II; Polymers, Word Formation: The Suffix -able/-ible, Properties of Polymers; Case Study: Common Objects Made of Polymers Grammar: Reported Speech (Indirect Speech) Polymer Processing; Composites, Case Study: Snow Ski, Grammar: Gerund (-ing Form); Case Study: Carbon Fibre Reinforced Polymer (CFRP); Word Formation: Prefixes, Advanced Materials, Semiconductors, Case Study: Integrated Circuits; Advanced Materials, Smart Materials, Nanotechnology, Case Study: Carbon Nanotubes, Grammar: Modal Auxiliaries; Technical Writing, Punctuation and capitalization, Making corrections and improvements on written drafts; Being concise, Writing style – creating a warm, professional tone, Text abbreviations, Short words for emails and text messages, Identifying parts, Engine part vocabulary.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION AND SPORT I

CODE: D24IPMSL109
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is intended for students in order to preserve their health, increase

their resistance to effort, harmonious physical development and create some sporting skills.
COURSE CONTENTS: 1. Running with changing tempo after 50m and then 100-150m (3/ 4.2/ 4.4/ 4.2/ 4); Conduction of the ball (repeat); depriving the opponent of the ball (learning) – football; 2. Processing an application hall of the hall with climbing, climbing, jumping, weight carrying; Service – pick-up/ pass (complex of procedures) passes from the top, bottom in 2 and 3 players (volleyball); 3. Initial testing through room tests – Mark, demarcation in relation 1-1 free on the whole ground (basketball); 4. Dribbling, walking – repeating items in different variants (basketball); playing 5x5 with focus on tracking balls at the board; 5. Attack crash – learning the impulse, beat, jump, landing (volleyball); a two-way game with an emphasis on performing the service and attack strike in different areas; 6. Dropping the ball in dribbling – learning; 5x5 game with emphasis on this technical process; Taking the ball out of work – repeating with emphasis on excessive leg flexion; Bilateral game with emphasis on taking two hands down.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports tests

1ST YEAR, 2ND SEMESTER

COURSE TITLE: PROGRAMMING COMPUTERS AND PROGRAMMING LANGUAGES II

CODE: D24IPMSL210
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the basic concepts of programming languages, the description of algorithms, flowchart and pseudocode, basic concepts of C/ C++ language and programming, a knowledge of data structures, functions and structured programming.
COURSE CONTENTS: Basic concepts of programming languages; Algorithms; Description of algorithms through flowchart and pseudocode; C++ language structures; Variables; Constants; Operators; Basic Input/Output; Data Structures; Functions and Arguments; Arrays; Pointers; Implementation of user-defined functions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D24IPMSL212
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts of linear algebra, analytical and differential geometry and their applications. It allows the necessary practical skills used in the study and understanding of other disciplines, and in engineering problem solving.
COURSE CONTENTS: Vector spaces; Vector coordinates; Linear transformations; Eigenvectors and eigenvalues; Bilinear and quadratic forms; Euclidean spaces; Orthonormal basis; Conics and quadrics; Straight lines and planes in the Euclidean space; Differential geometry of curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS SCIENCE

CODE: D24IPMSL213
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts on the chemical bonds, materials structures and properties related to the solidification, plastic deformation and heat treatment processes.
COURSE CONTENTS: Chemical bonds; Ideal and real crystalline lattices; Plastic deformation mechanisms; Crystallization and solidification phenomena; Accompanying processes of the solidification phenomena; Alloy systems theory; Fe-C alloys; Fe-based solidification structures; Non-ferrous alloys; Basis on heat treatments of ferrous and non-ferrous alloys; Heat treatment structures of ferrous and non-ferrous alloys; Basis on composites and nanomaterials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DRAWING

CODE: D24IPMSL211
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of basic concepts and reasoning on the implementation of solid geometry relationships in vertical projection systems; Knowledge representation methods in two-dimensional space of elementary geometric elements such as point, line, plane or surface; Knowledge and use of the methods for determining the actual size of the specified geometric elements; Understanding how to make detail drawings and drawings.
COURSE CONTENTS: Representation of point and line in the triple vertical projection Representation plan; Methods of transformation of the figures; Assembly drawing; Assembly; Representation and dimensioning of machinery parts; Tolerances and

fits; Applying the skills of working with drawing tools at the level of descriptive geometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MECHANICS
CODE: D24IPMSL214
ECTS CREDITS: 4
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The course teaches students about the theoretical concepts to substantiate all disciplines with mechanical character. This discipline represents the starting point for the study of phenomena that occur in the activity of the engineer, including basic scientific concepts of its activity.
COURSE CONTENTS: Statics of material point; Statics of rigid (particular systems of forces, geometry masses, moments of inertia); Kinematics of material point (basic concepts, study material point movement in different coordinate systems); Kinematics of rigid (general movement of rigid, particular movement of rigid); Dynamics of material point (basic concepts, general theorems, differential equations of movement of material point); Elements of mechanical vibration (items of kinematics vibration, items of dynamic vibration).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY
CODE: D24IPMSL215
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims at familiarizing students with the main ways of obtaining metallic materials and their equilibrium diagrams and the main methods of processing materials. Emphasis is placed on acquiring key technologies, phenomena and processes which matter through to become a finished product. This knowledge, provided to the students are required to understand the manufacturing processes and as well the activities of exploitation and repair the equipment. Moreover, the knowledge gained may allow improvement of technological processes. The main objective is the acquisition of the method to obtain a particular product.
COURSE CONTENTS: Purpose and importance of technology materials, metal materials, classification and properties, primary development, Cast iron; Developing cast iron, steels; Develop steel, non-ferrous materials; Ferrous materials development, secondary development, casting metals, Physical basis of casting, casting methods, processing methods by plastic deformation of metallic materials, hot and cold plastic deformation, erosion processing; powder aggregation processing, permanent joints; welding, soldering joints, Cutting, metal, Protection of metallic materials against corrosion, control of non-metallic materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENGLISH LANGUAGE II
CODE: D24IPMSL216
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand English words and paragraph and that is very important to understand English language and gain the necessary knowledge of the notions used by the English language for machine mechanisms and machinery.
COURSE CONTENTS: 1. Introduction into Engineering Materials Technology (Production phase, usage, recycling), Present Simple and Continuous; The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; High voltage cables (description, materials, uses), means of expressing the Future; Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice, Engineering design- working with drawings (plan, cross-section, exploded view, elevation, schematic, specification), describing details Inventions: the incandescent lamp, present and past tenses revision; Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Characteristics of Materials, Some Phrases for Academic Writing Property, Some Phrases for Describing Figures, Diagrams and for Reading Formulas, Grammar: Comparison, Processing and Performance, Classification of Materials, Grammar: Verbs, Adjectives, and Nouns followed by Prepositions; Metals, Introduction. Mechanical Properties of Metals, Important Properties for Manufacturing; Metal Alloys. Case Study; Ceramics, Structure of Ceramics, Word Formation: Suffixes in Verbs, Nouns and Adjectives Properties of Ceramics, Case Study: Optical fibres versus Copper cables, Grammar: Adverbs II; Polymers, Word Formation: The Suffix -able/-ible, Properties of Polymers; Case Study: Common Objects Made of Polymers

Grammar: Reported Speech (Indirect Speech) Polymer Processing; Composites, Case Study: Snow Ski, Grammar: Gerund (-ing Form); Case Study: Carbon Fibre Reinforced Polymer (CFRP); Word Formation: Prefixes, Advanced Materials, Semiconductors, Case Study: Integrated Circuits; Advanced Materials, Smart Materials, Nanotechnology, Case Study: Carbon Nanotubes, Grammar: Modal Auxiliaries; Technical Writing, Punctuation and capitalization, Making corrections and improvements on written drafts; Being concise, Writing style – creating a warm, professional tone, Text abbreviations, Short words for emails and text messages, Identifying parts, Engine part vocabulary.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION AND SPORT II

CODE: D24IPMSL216
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is intended for students in order to preserve their health, increase their resistance to effort, harmonious physical development and create some sporting skills.
COURSE CONTENTS: 1. Running with changing tempo after 50m and then 100-150m (3/ 4.2/ 4.4/ 4.2/ 4); Conduction of the ball (repeat); depriving the opponent of the ball (learning) – football; 2. Processing an application hall of the hall with climbing, climbing, jumping, weight carrying; Service – pick-up/ pass (complex of procedures) passes from the top, bottom in 2 and 3 players (volleyball); 3. Initial testing through room tests – Mark, demarcation in relation 1-1 free on the whole ground (basketball); 4. Dribbling, walking – repeating items in different variants (basketball); playing 5x5 with focus on tracking balls at the board; 5. Attack crash – learning the impulse, beat, jump, landing (volleyball); a two-way game with an emphasis on performing the service and attack strike in different areas; 6. Dropping the ball in dribbling – learning; 5x5 game with emphasis on this technical process; Taking the ball out of work – repeating with emphasis on excessive leg flexion; Bilateral game with emphasis on taking two hands down.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports tests

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS

CODE: D24IPMSL320
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of technical drawing and info-graphics; Knowledge in the representation of machine mechanisms and machinery.
COURSE CONTENTS: Releasable assembly; Assemblies with feathers; Threaded assemblies; Non-demountable assemblies; Welded assemblies; Classification; Welding mark; Gears and transmissions; Gears with gears; Chain transmissions; Belt transmissions; Bearings; Bearings for sliding; Rolling Bearings; Representation; Designation; Surface quality and tolerances; Signs of quality of processed surfaces; Tolerances and adjustments; Drawing the conventional quality signs and tolerances and adjustments on the drawing; Execution of the technical drawing; Formats used; Execution of the technical drawing on a scale; Drawing of the sub-assembly and the whole; Technical documentation; Drawing up the operation drawing; Drawing up the datasheet.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL MATHEMATICS

CODE: D24IPMSL321
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the basic theoretical and practical concepts regarding Special mathematics, the most important numerical techniques and their applications in solving problems, and the implementations of algorithms in numerical calculus programs.
COURSE CONTENTS: Special mathematics; Basic concepts (numerical versus analytical methods, errors); Numerical methods for linear systems of equations; Numerical methods in metrical calculus; Method of successive approximations and applications; Methods for solving nonlinear equations and systems; Approximation of functions; Numerical integration; Numerical solutions of ODE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN

CODE: D24IPMSL322
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Basics of the computer aided design – 2D drawing and 3D modelling using surface and solid features; Ability to developed engineering CAD drafts from 3D computer models; Parametric design concepts, assembling, associative drafting development,

basic engineering design concepts; Numerous exercises from laboratory classes will develop to students, strong abilities for using SolidWorks package.
COURSE CONTENTS: The role of a CAD system in the production cycle; Analytic representation of curves and surfaces used in CAD system; Modelling elements: layers, colours, line types; Wireframes modelling, entities selection, copy, move, editing features; Drafting, tolerances, formats, sections, views, hatching; 3D modelling using surfaces, primitives, revolution, extrusion, sweeping, lofting, blend, offset, filet and corners operations on solids; Solids editing, sketching features and concepts, profile, path 2D/ 3D cutting, splitting, design using features as holes, drafts, fillets, shells, sweeps, ribs, chamfers; Parametric modelling using relations and Excel sheets; Assembling, degrees of freedom, components table, interference checking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Computer examination

COURSE TITLE: STRENGTH OF MATERIALS I

CODE: D24IPMSL323
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Dissemination of information regarding the main aspects of the mechanical resistance of materials is the main objective; Offering to the students the methods of analysis and calculation specific to the mechanical resistance of materials is objective as well.
COURSE CONTENTS: 1. Generalities; 2. Stresses in transversal sections of bars; 3. Tensile and compression; 4. Conventional calculation in shear of bars; 5. General stress and strain status; 6. Applications: 6.1. Static momentum, momentum and inertia radius; Resistance Modulus; Variation of the inertial momentum; 6.2. Twisting of circular bars; 6.3. Bending of bars; Definitions; Classifications of the bending loadings; 6.4. Stress diagrams, N, T, Mi; Conventions of signs; Normal and tangential stress in bended bars; 6.5. Strain of bended bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS

CODE: D24IPMSL325
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the thermodynamics of the heating processes.
COURSE CONTENTS: Fundamentals: thermo-dynamic system, state, state parameters and functions, equation, state equations, mechanical work, heat, internal energy, enthalpy; Thermo-dynamic properties of the pure substances; Phases, parts, homogenous and heterogeneous system. P-V-T surface. P-V, V-T, P-T diagrams; Clausis-Clapeyron equation: Specific heats; Thermal analysis of the ideal and real gases; Thermo-dynamic fundamentals of the burning processes; Fuels; Reaction heat; Material balance of the burning process; I-T diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROMAGNETIC ENGINEERING AND ELECTRICAL MACHINES

CODE: D24IPMSL326
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers to students theoretical and practical concepts regarding electromagnetic phenomena, electric circuits analysis, construction and operating of electrical machines.
COURSE CONTENTS: Electric and magnetic status; Interdependence of electrical and magnetic parameters; (General laws; Magnetic circuit law, Faraday's law, a.s.o.); Electrostatic field, potential difference, voltage; Static electriokinetic regime; DC electrical circuits; Electrical circuits in variable regime; Electrical circuits in permanent sinusoidal periodic regime.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RADIATION SOURCE AND TECHNICAL PROTECTION

CODE: D24IPMSL434
ECTS CREDITS: 5
TYPE OF COURSE: of the domain
COURSE OBJECTIVE(S): The aim of the course is for specialists to know: detection and measurement of radiation flow counters, scintillation, fissile material detectors (detectors used in reactor adjustment) Measures to be taken in case of nuclear accident (removal of the causes that lead to radiation above the permitted maximum level). During the course, students interested in working in the nuclear field gain basic knowledge of dosimetry. They also learn how to work with modern measuring devices and laboratory equipment to perform measurements that relate to basic dosimetric quantities.
COURSE CONTENTS: Natural radioactivity; The life of radioactive elements; Radioactive dating; Nuclear radiation sources; Sources of charged particles; Radioactive isotopes as sources of nuclear radiation; Absorbed dose and absorbed dose rate (appropriate units); Exposure; External exposure – dose calculation for different sources; Mitigating primary radiation and secondary radiation accumulation; Corpuscular radiation interaction with matter; Spontaneous fission as a

source of neutrons; Nuclear reactors; Detecting and measuring radioactive radiation; Types of dosimeters; Individual dosimeters; History isotopes and their applications; Effects of ionizing radiation, radioactive pollution of the environment and protection of radioactive waste; Radioactive waste management, radiation protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENVIRONNEMENTAL PROTECTION
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course aims to present the basic concepts of environmental protection. The discipline contributes to the development of competences in the field of environmental engineering, knowledge and application of environmental concepts in the formation of students, knowledge of environmental pollution characteristics and knowledge of the immediate and long-term effects of environmental pollution and degradation processes and of protection and consistency measures.
COURSE CONTENTS: Environment protection; Basic concepts; Protection of the atmosphere; Soil protection; Water protection; Environmental pollution due to waste disposal.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN
CODE: D24IPMSL430
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Basics of the computer aided design – 2D drawing and 3D modelling using surface and solid features; Ability to developed engineering CAD drafts from 3D computer models; Parametric design concepts, assembling, associative drafting development, basic engineering design concepts; Numerous exercises from laboratory classes will develop to students, strong abilities for using SolidWorks package.
COURSE CONTENTS: The role of a CAD system in the production cycle; Analytic representation of curves and surfaces used in CAD system; Modelling elements: layers, colours, line types; Wireframes modelling, entities selection, copy, move, editing features; Drafting, tolerances, formats, sections, views, hatching; 3D modelling using surfaces, primitives, revolution, extrusion, sweeping, lofting, blend, offset, filet and corners operations on solids; Solids editing, sketching features and concepts, profile, path 2D/ 3D cutting, splitting, design using features as holes, drafts, fillets, shells, sweeps, ribs, chamfers; Parametric modelling using relations and Excel sheets; Assembling, degrees of freedom, components table, interference checking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Computer examination

COURSE TITLE: STRENGTH OF MATERIALS II
CODE: D24IPMSL431
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Dissemination of information regarding the main aspects of the mechanical resistance of materials is the main objective; Offering to the students the methods of analysis and calculation specific to the mechanical resistance of materials is objective as well.
COURSE CONTENTS: 1. Generalities; 2. Stresses in transversal sections of bars; 3. Tensile and compression; 4. Conventional calculation in shear of bars; 5. General stress and strain status; 6. Applications: 6.1. Static momentum, momentum and inertia radius; Resistance Modulus; Variation of the inertial momentum; 6.2. Twisting of circular bars; 6.3. Bending of bars; Definitions; Classifications of the bending loadings; 6.4. Stress diagrams, N, T, Mi; Conventions of signs; Normal and tangential stress in bended bars; 6.5. Strain of bended bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS
CODE: D24IPMSL432
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the thermodynamics of the heating processes.
COURSE CONTENTS: Fundamentals: thermodynamic system, state, state parameters and functions, equation, state equations, mechanical work, heat, internal energy, enthalpy; Thermodynamic properties of the pure substances; Phases, parts, homogenous and heterogeneous system. P-V-T surface. P-V, V-T, P-T diagrams; Clausis-Clapeyron equation: Specific heats; Thermal analysis of the ideal and real gases; Thermodynamic fundamentals of the burning processes; Fuels; Reaction heat; Material balance of the burning process; I-T diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROMAGNETIC ENGINEERING AND ELECTRICAL MACHINES

CODE: D24IPMSL433
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers to students theoretical and practical concepts regarding electromagnetic phenomena, electric circuits analysis, construction and operating of electrical machines.
COURSE CONTENTS: Electric and magnetic status; Interdependence of electrical and magnetic parameters; (General laws; Magnetic circuit law, Faraday's law, a.s.o.); Electrostatic field, potential difference, voltage; Static electriokinetic regime; DC electrical circuits; Electrical circuits in variable regime; Electrical circuits in permanent sinusoidal periodic regime.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NUMERICAL METHODS

CODE: D24IPMSL429
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts regarding the most important numerical techniques and their applications in solving problems, and the implementations of algorithms in numerical calculus programs.
COURSE CONTENTS: Basic concepts (numerical versus analytical methods, errors); Numerical methods for linear systems of equations; Numerical methods in matriceal calculus; Method of successive approximations and applications; Methods for solving nonlinear equations and systems; Approximation of functions; Numerical integration; Numerical solutions of ODE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: CAE (COMPUTER AIDED ENGINEERING) INTEGRATED SYSTEMS

CODE: D24IPMSL540
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): This course cover principles of design, analysis and computer simulation in engineering. Starting with advanced CAD knowledge of product shape design, finite elements method theory is presented and applied to simulate various manufacturing processes as metal moulding, stamping and plastic injection. Static and dynamic structural analysis, contact, non-linear and thermal simulations are also explained through multiple examples in course and laboratory classes.
COURSE CONTENTS: Basic theory of finite elements method; FEM analysis: static, frequency, buckling, thermal, optimization; Using SolidWorks Simulation: boundary conditions, loading, materials, initial conditions; Theory of optimal part design; Parameters and structural optimization of parts; Thermoplastic materials injection using Simpoe, best parameters computation, avoiding defects; Stamping process simulation using Stampack – Autoform, process visualization, part defects detection; Metal moulding simulation using Vulcan – process visualization, optimal parameters computation, avoiding defects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Practical skills examination – computer test

COURSE TITLE: FLUID MECHANICS

CODE: D24IPMSL541
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): This course is an introduction in fundamental theory of fluid mechanics and application of these principles to solving various technical problems. Numerous examples, hydraulic machines functioning and practical problem solutions are presented to the students in laboratory classes for a better understanding of theoretical knowledge.
COURSE CONTENTS: Fluid properties; Fluid modelling models; Pressure in fluids; Cauchy equations; Static of fluids: equations, pressure distribution on plane and curve surfaces; Principle of Archimedes; Fluid kinematics; Continuum equation; Cauchy-Lagrange theorem; Potential and rotational movements; Fluid dynamics; Constitutive equation – laminar flow, Navier-Stokes equations; Bernoulli laminar flow; Hydrodynamics; Applications; Dynamic of viscous fluids; Laminar, transitional and turbulent flow; Turbulent flow equations; Laplace equation; Major loss in ducts, tubes and pipes; Darcy-Weisbach equation for pressure and head loss; Energy and hydraulic grade line; Hydraulic diameter; Water flow in tubes; Orifice, nozzle and venture flow rate meters; Pipe in series and parallel; Pumps, compressors, blowers and fans; Total pressure or head loss in pipe or duct systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTRONICS AND AUTOMATION

CODE: D24IPMSL542
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course intends to familiarize the students with the general issues of

modern electronics, with the procedures that are used in the study of the electronic devices and the characteristic functions, and also with the most usual electronic circuits. Also, it will be realized an introduction in the field of the general industrial automation.
COURSE CONTENTS: The general methods those are useful in electronics study; The conduction in semi-conductors; The *pn* junction; The semi-conductor diodes, The bipolar transistors; The electronics amplifiers; The amplification with reaction; The operational amplifiers (OA); Parameters; The linear applications with OA; The manual regulation; The automate regulation; The automate control systems; The disturbances in the unfolding the processes; Transducers; Regulators; The execution elements; The features of a control system; The modelling of the automation control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: GENERAL ECONOMICS

CODE: D24IPMSL547
ECTS CREDITS: 3
TYPE OF COURSE: B
COURSE OBJECTIVE(S): The essential aim of the course is to train specialists in economics by accumulating theoretical and methodological knowledge necessary to understand the complexity of real economic life, economic structures' dynamics and of multiple relationships between economic agents. Another purpose is to arouse interest in economics as an e exciting and useful science. Initiation of students into this science will allow analysing real economic situation, making the right economic decisions and acting accordingly.
COURSE CONTENTS: Economics – form of human activity; Economy and economic sciences system; Market economy; Consumer behaviour theory; Theory of manufacturer, supply and demand; Market, competition and price; Income; Distribution; Measuring economic activity at macroeconomic level; Labour market and unemployment; Monetary market and inflation, financial market, income, consumption and investments; Economic fluctuations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENVIRONMENTAL ECONOMY AND ACCOUNTING

CODE: D24IPMSL657
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): This course introduces students in the field of environmental engineering while focusing on environmental issues, so that they can turn after graduation to the economic, managerial and accounting knowledge in environment science learned. Because of its content, the course aims at deepening the theoretical knowledge of the economic framework and applied research in economics and environmental accounting.
COURSE CONTENTS: Environmental economics in the environmental sciences system; Environment-economy relationship; Environment and economic structures; Sustainable development; Economic component in the global environmental policy; Economic evaluation of environmental goods and services, National system of accounting and environmental accounts; Financial and economic measures for the protection of environment and natural resources; Content and importance of the environment' economy; Analysis of economic structures from ecological perspective; Composition of accounts and costs' system and evaluation of economic results; Environmental costs, environmental indicators and environmental strategies – economic instruments that encourage conservation of natural resources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ORGANS AND MECHANISMS

CODE: D24NTMFL546
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, gain knowledge of the necessary notions in the representation of machine mechanisms and machinery, gain knowledge of the application states studied and applied to the machine organs in operation.
COURSE CONTENTS: Introduction; Mechanism structure; Mechanics kinematics; Dynamic analysis; Mechanics of the mechanism; Camshafts; Helical gear transmissions; Gear transmissions; Belt transmissions; Chains transmissions; Demountable assemblies; Non-assembled assemblies; Axles and shafts Pivots; Friction gears; Mechanical drives; Couplings; Elastic couplings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENVIRONNEMENTAL MANAGEMENT

CODE: D24IPMSL652
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Limited interpretation of the concepts, approaches, theories, models and

basic methods used in well-defined exploitation issues that take place in the treatment and depollution of environmental factors; Interpretation of basic theories, models and methods used in well-defined technological calculations of depollution installations; Explaining basic theories, models and methods specific to pollutant monitoring programs in industrial installations; Applying fundamental concepts and theories in the field of communication and management for professional development regarding the reduction of environmental impact of industrial pollutants; Defining elementary concepts related to environmental quality control, risk assessment and low-impact technology development; Selection of concepts, approaches, theories, models and basic methods for the development and operation of pollutant monitoring programs in industrial installations.
COURSE CONTENTS: National Strategy for Sustainable Development of Romania; Horizons 2013-2020-2030; The general foundations of management; Defining the environmental management system (EMS); Characteristics of EMS – Environmental management systems – according to ISO 14001; Components of EMS; Environmental policy; Environmental inspection; EMAS – European Union Environmental Management System; Integrated quality-environment management systems; Integrated management systems; Quality – environment – occupational health and safety; Process-based approach – Life Cycle Analysis; Process Approach – Eco-Design; Labels and environmental statements; Assessment of environmental performance; Waste management is an integral part of organic management.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: TECHNOLOGIES AND EQUIPMENT FOR PLASTIC DEFORMATION
CODE: D24IPMSL654
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts of the metallic materials processing by cold plastic deformation, physical principles of the cold plastic deformation as well as designing of the technologies, stamps and cold dies for processing by cold plastic deformation.
COURSE CONTENTS: Processing methods by cold plastic deformation; Physical basis of the cold plastic deformation process (Basic plastic deformation laws; Plasticity criteria; Metallic materials deformation behaviour, etc.); Theoretical and experimental methods used for plastic deformation analysis; Materials processing by stamping (analysis of the stamping process, force, mechanical work and power in stamping process, influence of the technological parameters, cutting by claws, stamps, etc.); Materials processing by bending (analysis of the banding process, force, mechanical work and power in banding process, elastic recovery, bending technology for different workpieces); Materials processing by drawing (analysis of the drawing process, state of stress analysis, force, mechanical work and speed in drawing process, drawing technology of workpieces, active elements sizing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MACHINE ORGANS AND MECHANISMS
CODE: D24NTMFL651
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, gain knowledge of the necessary notions in the representation of machine mechanisms and machinery, gain knowledge of the application states studied and applied to the machine organs in operation.
COURSE CONTENTS: Introduction; Mechanism structure; Mechanics kinematics; Dynamic analysis; Mechanics of the mechanism; Camshafts; Helical gear transmissions; Gear transmissions; Belt transmissions; Chains transmissions; Demountable assemblies; Non-assembled assemblies; Axles and shafts Pivots; Friction gears; Mechanical drives; Couplings; Elastic couplings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ECONOMY AND ENVIRONMENTAL ACCOUNTING
CODE:
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The main objective of the course is to introduce professionals to the specific notions of the field of environmental economy and gain profound theoretical and methodological knowledge, indispensable for understanding the complexity of the environment and economic development, indicators and performance environment. Another goal is to raise interest in the environment, to know the ecological behaviour of consumers and businesses. Getting started in this science will allow us to analyse the situation of the current environment, making the right decisions and acting rationally and developing strategies to protect it.

COURSE CONTENTS: Environment protection; Sustainable development and indicators; Sustainable development; Environmental indicators and performance; Mechanisms and tools of sustainable development; Macroeconomic management of environmental protection; Elements of environmental accounting; Modelling of socio-media macro- relations; Elaboration of an environmental protection strategy; Organic behaviour of consumers and businesses; Organic product policy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: BIODIVERSITY
CODE: D24IPMSL763
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts on environmental issues. Acquiring basics on soil characteristics, soil physical and chemical properties – identify the main human activities impact on the natural environment and consideration of environmental concerns into sustainable development.
COURSE CONTENTS: Scope and role biodiversity: Definitions of biodiversity; Biodiversity evolution as science; History; biodiversity factors and their role in soil formation process; Climate; Relief; Time; Water; Bodies; Human factor; Solid phase of the soil; Mineral; Organic; Formation and composition of the soil profile; biodiversity processes; biodiversity horizons and features; Soil profiles; Morphological properties of the soil; Physical properties of soil; Texture; Structure; Other (water, air, temperature); Chemical properties of the soil; Soil solution; Soil colloids and their properties; Soil acidity and alkalinity; Redox processes; Soil classification and characterization; Soil types in Romania; Degradation and soil pollution; Soil pollution abatement processes; Measures against soil pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DRINKING WATER AND INDUSTRIAL WATER TECHNOLOGY
CODE: D24IPMSL767
ECTS CREDITS: 4
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The course provides students with theoretical and practical on water flow in aquifers, aquifer formation, modelling flow in aquifers, their interaction with the environment, physical aspects of the problem, the phenomena governing equations and methods of solving these equations, modern notions about groundwater pollution, modern computer programs, specific to groundwater, water and industrial water technology.
COURSE CONTENTS: Introduction; General concepts of hydrogeology; Origin of groundwater; Factors influencing water infiltration and hydrogeological characteristics of the land; Groundwater flow; Groundwater flow factors; Laminar and turbulent groundwater; The main parameters characterizing groundwater flow; Groundwater direction; Height aquifers free and pressure (captive); Variation of groundwater levels; Springs; Classification springs; Mineral waters; Water; Research and exploitation of groundwater; Groundwater resources in Romania; Pollution and groundwater pollution prevention; Groundwater remediation methods; Water and industrial water technology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SOURCES, PROCESSES AND POLLUTING PRODUCTS
CODE: D24IPMSL768
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts on environmental issues. It aims at presenting and learning key aspects of environmental preservation technologies under development sweeping the exploitation of natural resources, with a focus on the most important pollutants affecting the three components of global environmental, soil, water and air.
COURSE CONTENTS: Natural environnemental polluants; Activities of human communities that pollute the environment; Industrialization: mining, steel industry, chemical industry, building materials and other industries; Production of electricity and heat; Environmental impact of power plants; Transport; Agriculture; Household activities; Noise as a factor of environmental pollution; Environmental impact of waste: packaging waste, medical waste, VSU, DEEE; Major sources of pollution risk to human health; Physicochemical methods of analysis of environmental pollutants factors; Methods for reducing emissions of pollutants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SELECTION AND USE OF MATERIALS
CODE: D24IPMSL764
ECTS CREDITS: 4

TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to familiarize students with the main metallic materials and their equilibrium diagrams. The focus is laid on steel and cast Fe-C diagram shown in going through the elements of heat treatment and non-ferrous materials. This knowledge, provided students are required to understand the main qualities that a product must meet. Also, the knowledge gained may allow improvement of technological processes. The main objective is the acquisition mode selection for a particular product.
COURSE CONTENTS: Properties of metallic materials, physical properties, mechanical properties, technological properties, structure-property; Interdependence, steels and cast irons; Classification; Influence of alloying elements, typing, choice of materials metal of choice criteria, factors to be considered in the design, form part properties of metallic materials, external factors, chemical composition of materials; Welded structures, tanks, boilers; Parts and O.M. annealed; Equipment working in corrosive/ oxidizing; Equipment working in environments with hydrogen; Springs; Parts formed by stamping; Bearings; Fasteners; Valves; Tools.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: SURFACE ENGINEERING

CODE: D24IPMSL879
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts regarding machinability of the parts, precision as well as knowledge to design a machining process.
COURSE CONTENTS: Machinability of the parts; Machining precision; The quality of machined surfaces; Calculus of the cutting regime parameters; Cutting process of the flat surfaces; Cutting process of the revolution surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS AND CLEAN TECHNOLOGIES

CODE: D24IPMSL765
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at initiating students on environmental protection and waste management Law 137/1995 on environmental protection and government decisions on waste management track pollution regulations and operation of national and international organizations for environmental protection. The focus is put on acquiring the main methods and clean technologies used in industry. The main objective is knowledge and characterization of clean energy sources.
COURSE CONTENTS: The monitoring of environmental quality; Introduction to Environmental Impact Assessment; Clean energy and clean energy sources; Classification of unconventional technologies for energy: Renewable and non-renewable; Energy sources; Clean technologies for power generation; Solar energy; Wind energy; Construction, types of turbines; Unconventional technologies for obtaining clean energy: a. hydropower; b. Types of turbines; Bio-technology – Classical and modern bio-technology; Geothermal energy; Construction equipment; XXI Energy century; Nuclear energy and human society; Hydrogen production technologies; Recovery techniques and waste processing; The concept of sustainable development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: RECONDITIONING TECHNOLOGIES

CODE: D24IPMSL881
ECTS CREDITS: 3
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course shows students how the recover and recycle reusable materials with direct involvement in the design of technologies and equipment that lead to obtaining raw materials from waste.
COURSE CONTENTS:
Effective management of waste; Recovery of waste iron and steel; Waste recovery and metal alloys; Recycling swarf from grinding; Recovery and recycling of textile fibres and glass fibres; Paper recovery and recycling of waste paper; Recovery and recycling of plastics; Recovery and recycling of polymers from rubber tires; Recovery and recycling of waste; Recycling parts by reconditioning, regeneration reshuffle; The wearing of tree, bush, housing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CUTTING MACHINES

CODE: D24IPMSL771
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the theoretical and practical concepts of the surfaces generation, physical principles of the cutting process as well as a

knowledge of the characteristics phenomena of the cutting processes.
COURSE CONTENTS: Kinematics of cutting process; Physical principles of cutting process (chips formation and types of chips, the importance of chips shape, built-up-edges, etc.); Plastic deformations of workpiece material; Forces and power in cutting processes, thermal phenomena in cutting processes; Cutting fluids; Tool wear and tool life; Vibration in cutting process; The quality of machined surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THERMAL AND SURFACE TREATMENT

CODE: D24IPMSL878
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge of the specific thermal, thermo-chemical and surface treatments applicable to ferrous alloy parts in the machine and appliance industry, the development of knowledge in the field, the development of communication skills and the formation of a creative attitude; Understanding the application of thermal and surface treatments to improve the mechanical properties of materials used in machine tool manufacturing; Explanation and interpretation of thermal, thermo-chemical and surface treatment techniques applicable to parts made of ferrous alloys.
COURSE CONTENTS: 1. Diagram of Fe3C; The importance of surface treatments in the practice of thermal treatments (structure and properties of iron, Fe-Fe3C metallist system balance diagram, phases and constituents in the Fe-Fe3C alloy system, structure of carbon steels and white pigments, primary and secondary crystallisation, classification of treatments thermal, the importance of surface treatments in the practice of thermal treatments); 2. Theory of thermal treatments (structural changes in steels, critical points, transformations to steel heating, transformations to steel cooling); 3. Thermal treatment technology (parameters of thermal treatments and used equipment, heating, heating speed and duration, heating media, maintenance, thermal equalization duration, structural transformation duration, cooling, cooling rates and cooling times, cooling media); 4. Thermal quenching treatments: Volumizing; surface quenching (superficial: superficial flame healing, superficial induction hardening, superficial quenching in the electrolyte); 5. Thermochemical treatments (carburizing, nitriding, carbonitrulation); 6. Metal diffusion deposition (alloying, chromium plating, nickel plating, silicification, titanisation, sherardization and zinc coating, boring); 7. Modern superficial treatments and thermal treatments specific to powder metallurgy (treatments in water vapour, thermosonic treatments, microwave treatments, laser treatments, specific powder metallurgy treatments).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENVIRONNEMENTAL AUDIT

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Acquiring specific notions and practices of managerial environmental auditing and how they align with the organization's policies to meet current environmental regulations: 1. Complying with the requirements of ISO 19011; 2. Carrying out the environmental audit plan in organizations; 3. Continuous improvement through internal and external auditing.
COURSE CONTENTS: Audit within the Environmental Management System; Standard 19011; Auditing principles; Types of environmental audit; Coordination of the environmental audit program; Performing the environmental audit; Competence and evaluation of auditors; Community eco-management and audit scheme (EMAS).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: MARITIME AND NAVIGATION ENGINEERING
PROGRAMME TITLE: NAVIGATION AND MARITIME AND RIVER TRANSPORT (CENTRE OF DROBETA-TURNU SEVERIN)
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D24NTMFL101
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts related to the differential and integral study of functions of several variables and their applications. It allows the necessary practical skills and techniques associated to the differential and integral calculus.
COURSE CONTENTS: Sequences and series of real numbers; Power series; Taylor series; Functions of several variables (limits and continuity, differentiation, partial derivatives); Extremes for functions of several variables; Multiple integrals (double and triple); Elements of vector calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CHEMISTRY
CODE: D24NTMFL102
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The development knowledge in the field of chemistry, close by practice and the relationship with the environment, contributes to technical formation of the students but also achieve a clear image of the phenomena taking place in the technological processes.
COURSE CONTENTS: Correlation between chemical structure and some properties of substances; Thermodynamic and chemical kinetics notions; Electrochemistry and electrochemical energy conversion; Corrosion and corrosion protection; Fuels and lubricants; Macromolecular compounds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PHYSICS
CODE: D24NTMFL103
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to familiarize students with the main physical phenomena from mechanical elements, covering chapters such as where atomic and nuclear physics. This knowledge, provided students are required to understand and manufacturing processes as well as operational activities and equipment repair. Moreover, the knowledge gained may allow improvement of technological processes.
COURSE CONTENTS: The kinematics material point, Newtonian mechanical principles, theorems and conservation laws in the dynamics of material point, Oscillations; Sizes characteristic oscillations; Propagation of oscillations; Wave interference; Diffraction of waves; Dispersion; Doppler effect, temperature; Temperature measurement; Amount of heat, heat capacity, specific heat, Principle I of thermodynamics; Second principle of thermo-dynamics; Entropy, thermal machines ideal; Electrostatic interaction of electric charges; Electric field; Coulomb force; Flow tubing; Gauss's theorem; Working electric field; Electric potential of point load; Electrical potential gradient; Equipotential surfaces; General characterization of the magnetic field; Magnetic field flow; Movement of loads in electric and magnetic field; Lorentz force; Features ferro-magnetic substances, dia- and paramagnetic, electromagnetic waves, quantum physics elements, getting physical solid, crystalline structure; Classification; Modern applications of physics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROGRAMMING COMPUTERS AND PROGRAMMING LANGUAGES I
CODE: D24NTMFL104
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students the basic computer terminology and concepts, a knowledge of the fundamental operating system functions, the theoretical and practical concepts of the Microsoft Office software applications as well as the Internet access and electronic communication.
COURSE CONTENTS: Fundamentals of Computer; Operating Computer using GUI based Operating System; Microsoft Office application: MS Word, Excel, Access, PowerPoint; Internet access and electronic communication.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts of linear algebra, analytical and differential geometry and their applications. It allows the necessary practical skills used in the study and understanding

of other disciplines, and in engineering problem solving.
COURSE CONTENTS: Vector spaces; Vector coordinates; Linear transformations; Eigenvectors and eigenvalues; Bilinear and quadratic forms; Euclidean spaces; Orthonormal basis; Conics and quadrics; Straight lines and planes in the Euclidean space; Differential geometry of curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DRAWING

CODE: D24NTMFL105
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of basic concepts and reasoning on the implementation of solid geometry relationships in vertical projection systems; Knowledge representation methods in two-dimensional space of elementary geometric elements such as point, line, plane or surface; Knowledge and use of the methods for determining the actual size of the specified geometric elements; Understanding how to make detail drawings and drawings.
COURSE CONTENTS: Representation of point and line in the triple vertical projection Representation plan; Methods of transformation of the figures; Assembly drawing; Assembly; Representation and dimensioning of machinery parts; Tolerances and fits; Applying the skills of working with drawing tools at the level of descriptive geometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: TECHNICAL DRAWING AND INFOGRAPHICS

CODE: D24NTMFL320
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of technical drawing and info-graphics; Knowledge in the representation of machine mechanisms and machinery.
COURSE CONTENTS: Releasable assembly; Assemblies with feathers; Threaded assemblies; Non-demountable assemblies; Welded assemblies; Classification; Welding mark; Gears and transmissions; Gears with gears; Chain transmissions; Belt transmissions; Bearings; Bearings for sliding; Rolling Bearings; Representation; Designation; Surface quality and tolerances; Signs of quality of processed surfaces; Tolerances and adjustments; Drawing the conventional quality signs and tolerances and adjustments on the drawing; Execution of the technical drawing; Formats used; Execution of the technical drawing on a scale; Drawing of the sub-assembly and the whole; Technical documentation; Drawing up the operation drawing; Drawing up the datasheet.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: PROGRAMMING COMPUTERS AND PROGRAMMING LANGUAGES II

CODE: D24NTMFL210
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students the basic concepts of programming languages, the description of algorithms, flowchart and pseudocode, basic concepts of C/ C++ language and programming, knowledge of data structures, functions and structured programming.
COURSE CONTENTS: Basic concepts of programming languages; Algorithms; Description of algorithms through flowchart and pseudocode; C++ language structures; Variables; Constants; Operators; Basic Input/ Output; Data Structures; Functions and Arguments; Arrays; Pointers; Implementation of user-defined functions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DRAWING

CODE: D24NTMFL211
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Knowledge of basic concepts and reasoning on the implementation of solid geometry relationships in vertical projection systems; Knowledge representation methods in two-dimensional space of elementary geometric elements such as point, line, plane or surface; Knowledge and use of the methods for determining the actual size of the specified geometric elements; Understanding how to make detail drawings and drawings.
COURSE CONTENTS: Representation of point and line in the triple vertical projection Representation plan; Methods of transformation of the figures; Assembly drawing; Assembly; Representation and dimensioning of machinery parts; Tolerances and fits; Applying the skills of working with drawing tools at the level of descriptive geometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D24NTMFL212
ECTS CREDITS: 4

TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic theoretical and practical concepts of linear algebra, analytical and differential geometry and their applications. It allows the necessary practical skills used in the study and understanding of other disciplines, and in engineering problem solving.
COURSE CONTENTS: Vector spaces; Vector coordinates; Linear transformations; Eigenvectors and eigenvalues; Bilinear and quadratic forms; Euclidean spaces; Orthonormal basis; Conics and quadrics; Straight lines and planes in the Euclidean space; Differential geometry of curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS SCIENCE
CODE: D24NTMFL213
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts on the chemical bonds, materials structures and properties related to the solidification, plastic deformation and heat treatment processes.
COURSE CONTENTS: Chemical bonds; Ideal and real crystalline lattices; Plastic deformation mechanisms; Crystallization and solidification phenomena; Accompanying processes of the solidification phenomena; Alloy systems theory; Fe-C alloys; Fe-based solidification structures; Non-ferrous alloys; Basis on heat treatments of ferrous and non-ferrous alloys; Heat treatment structures of ferrous and non-ferrous alloys; Basis on composites and nanomaterial.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS
CODE: D24NTMFL214
ECTS CREDITS: 4
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The course offers the students theoretical concepts to substantiate all disciplines with mechanical character. This discipline represents the starting point for the study of phenomena that occur in the activity of the engineer, including basic scientific concepts of its activity.
COURSE CONTENTS: Statics of material point; Statics of rigid (particular systems of forces, geometry masses, moments of inertia); Kinematics of material point (basic concepts, study material point movement in different coordinate systems); Kinematics of rigid (general movement of rigid, particular movement of rigid); Dynamics of material point (basic concepts, general theorems, differential equations of movement of material point); Elements of mechanical vibration (items of kinematics vibration, items of dynamic vibration).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PREPARING FOR MARINE
CODE: D24NTMFL215
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course teaches students about theoretical and practical concepts related to ships in general. It contributes to the development of their knowledge in the field of marine activity and inland vessels. The course develops the basic practice and theoretical knowledge for mariner activities, the general terminology of this branch.
COURSE CONTENTS: The general terminology of ship's parts, ropes, deck systems, gears, installations; Masting, rigging, sails; Anchorage systems, anchors, chains, steering gears; Rescue and usage boats; Ship maintenance, waterproofing doors and hatches.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENGLISH LANGUAGE I
CODE: D24NTMFL108
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand English words and paragraph and that is very important to understand English language and gain the necessary knowledge of the notions used by the English language for machine mechanisms and machinery.
COURSE CONTENTS: 1. Introduction into Engineering Materials Technology (Production phase, usage, recycling), Present Simple and Continuous; The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; High voltage cables (description, materials, uses), means of expressing the Future; Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice, Engineering design- working with drawings (plan, cross-section,

exploded view, elevation, schematic, specification), describing details Inventions: the incandescent lamp, present and past tenses revision; Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Characteristics of Materials, Some Phrases for Academic Writing Property, Some Phrases for Describing Figures, Diagrams and for Reading Formulas, Grammar: Comparison, Processing and Performance, Classification of Materials, Grammar: Verbs, Adjectives, and Nouns followed by Prepositions; Metals, Introduction. Mechanical Properties of Metals, Important Properties for Manufacturing; Metal Alloys. Case Study; Ceramics, Structure of Ceramics, Word Formation: Suffixes in Verbs, Nouns and Adjectives Properties of Ceramics, Case Study: Optical fibres versus Copper cables, Grammar: Adverbs II; Polymers, Word Formation: The Suffix -able/-ible, Properties of Polymers; Case Study: Common Objects Made of Polymers Grammar: Reported Speech (Indirect Speech) Polymer Processing; Composites, Case Study: Snow Ski, Grammar: Gerund (-ing Form); Case Study: Carbon Fibre Reinforced Polymer (CFRP); Word Formation: Prefixes, Advanced Materials, Semiconductors, Case Study: Integrated Circuits; Advanced Materials, Smart Materials, Nanotechnology, Case Study: Carbon Nanotubes, Grammar: Modal Auxiliaries; Technical Writing, Punctuation and capitalization, Making corrections and improvements on written drafts; Being concise, Writing style – creating a warm, professional tone, Text abbreviations, Short words for emails and text messages, Identifying parts, Engine part vocabulary.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION AND SPORT I
CODE: D24NTMFL109
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is intended for students in order to preserve their health, increase their resistance to effort, harmonious physical development and create some sporting skills.
COURSE CONTENTS: 1. Running with changing tempo after 50m and then 100-150m (3/ 4.2/ 4.4/ 4.2/ 4); Conduction of the ball (repeat); depriving the opponent of the ball (learning) – football; 2. Processing an application hall of the hall with climbing, climbing, jumping, weight carrying; Service – pick-up/ pass (complex of procedures) passes from the top, bottom in 2 and 3 players (volleyball); 3. Initial testing through room tests – Mark, demarcation in relation 1-1 free on the whole ground (basketball); 4. Dribbling, walking – repeating items in different variants (basketball); playing 5x5 with focus on tracking balls at the board; 5. Attack crash – learning the impulse, beat, jump, landing (volleyball); a two-way game with an emphasis on performing the service and attack strike in different areas; 6. Dropping the ball in dribbling – learning; 5x5 game with emphasis on this technical process; Taking the ball out of work – repeating with emphasis on excessive leg flexion; Bilateral game with emphasis on taking two hands down.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports tests

2ND YEAR, 1ST SEMESTER

COURSE TITLE: NUMERICAL METHODS
CODE: D24NTMFL429
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course teaches students about the basic theoretical and practical concepts regarding the most important numerical techniques and their applications in solving problems, and the implementations of algorithms in numerical calculus programs.
COURSE CONTENTS: Basic concepts (numerical versus analytical methods, errors); Numerical methods for linear systems of equations; Numerical methods in matriceal calculus; Method of successive approximations and applications; Methods for solving nonlinear equations and systems; Approximation of functions; Numerical integration; Numerical solutions of ODE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SPECIAL MATHEMATICS
CODE: D24NTMFL321
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course aims to familiarize the students with Special mathematics and the basic statistical concepts and features, and also with the mathematical framework needed for statistical and informational processing of the data obtained in various measuring processes.
COURSE CONTENTS: Special mathematics, Event, probability, random variable; Typical values used in the study of the repartition for the measuring results and errors; Classical repartitions; Statistical series; Typical values of the distribution series (the indexes of the central trend, mean, median, dominant) Correlation – definition, types, basic methods; Elements of poll theory and methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENGLISH LANGUAGE II

CODE: D24NTMFL216
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand English words and paragraph and that is very important to understand English language and gain the necessary knowledge of the notions used by the English language for machine mechanisms and machinery.
COURSE CONTENTS: 1. Introduction into Engineering Materials Technology (Production phase, usage, recycling), Present Simple and Continuous; The braking system in power cars (how brakes work, the concept of green brakes, ecological materials for brakes), describing events with Past Simple and Continuous; Composite technology (definition, applications, making a speech), Present Perfect vs. Past Simple, role-play; High voltage cables (description, materials, uses), means of expressing the Future; Describing properties of materials (using adverbs of manner), noun formation, vocabulary (describing tools, properties, uses), role-play; Describing components and assemblies (plugs and sockets), presenting advantages and disadvantages; Manufacturing techniques (drilling, flame-cutting, milling, sawing, shearing); Describing position of assembled components (cluster ballooning), prepositions for describing position, The Passive Voice, Engineering design- working with drawings (plan, cross-section, exploded view, elevation, schematic, specification), describing details Inventions: the incandescent lamp, present and past tenses revision; Working with complex numbers, mathematical operations, fractions, Greek and Latin numeric prefixes; Characteristics of Materials, Some Phrases for Academic Writing Property, Some Phrases for Describing Figures, Diagrams and for Reading Formulas, Grammar: Comparison, Processing and Performance, Classification of Materials, Grammar: Verbs, Adjectives, and Nouns followed by Prepositions; Metals, Introduction. Mechanical Properties of Metals, Important Properties for Manufacturing; Metal Alloys. Case Study; Ceramics, Structure of Ceramics, Word Formation: Suffixes in Verbs, Nouns and Adjectives Properties of Ceramics, Case Study: Optical fibres versus Copper cables, Grammar: Adverbs II; Polymers, Word Formation: The Suffix -able/-ible, Properties of Polymers; Case Study: Common Objects Made of Polymers Grammar: Reported Speech (Indirect Speech) Polymer Processing; Composites, Case Study: Snow Ski, Grammar: Gerund (-ing Form); Case Study: Carbon Fibre Reinforced Polymer (CFRP); Word Formation: Prefixes, Advanced Materials, Semiconductors, Case Study: Integrated Circuits; Advanced Materials, Smart Materials, Nanotechnology, Case Study: Carbon Nanotubes, Grammar: Modal Auxiliaries; Technical Writing, Punctuation and capitalization, Making corrections and improvements on written drafts; Being concise, Writing style – creating a warm, professional tone, Text abbreviations, Short words for emails and text messages, Identifying parts, Engine part vocabulary.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PHYSICAL EDUCATION AND SPORT II

CODE: D24NTMFL217
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): The course is intended for students in order to preserve their health, increase their resistance to effort, harmonious physical development and create some sporting skills.
COURSE CONTENTS: 1. Running with changing tempo after 50m and then 100-150m (3/ 4.2/ 4.4/ 4.2/ 4); Conduction of the ball (repeat); depriving the opponent of the ball (learning) – football; 2. Processing an application hall of the hall with climbing, climbing, jumping, weight carrying; Service – pick-up/ pass (complex of procedures) passes from the top, bottom in 2 and 3 players (volleyball); 3. Initial testing through room tests – Mark, demarcation in relation 1-1 free on the whole ground (basketball); 4. Dribbling, walking – repeating items in different variants (basketball); playing 5x5 with focus on tracking balls at the board; 5. Attack crash – learning the impulse, beat, jump, landing (volleyball); a two-way game with an emphasis on performing the service and attack strike in different areas; 6. Dropping the ball in dribbling – learning; 5x5 game with emphasis on this technical process; Taking the ball out of work – repeating with emphasis on excessive leg flexion; Bilateral game with emphasis on taking two hands down.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Sports tests

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN

CODE: D24NTMFL322
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Basics of the computer aided design – 2D drawing and 3D modelling using surface and solid features; Ability to developed engineering CAD drafts from 3D computer models; Parametric design concepts, assembling, associative drafting development, basic engineering design concepts; Numerous exercises from laboratory classes will develop to students, strong abilities for using SolidWorks package.
COURSE CONTENTS: The role of a CAD system in the production cycle; Analytic representation of

curves and surfaces used in CAD system; Modelling elements: layers, colours, line types; Wireframes modelling, entities selection, copy, move, editing features; Drafting, tolerances, formats, sections, views, hatching; 3D modelling using surfaces, primitives, revolution, extrusion, sweeping, lofting, blend, offset, filet and corners operations on solids; Solids editing, sketching features and concepts, profile, path 2D/ 3D cutting, splitting, design using features as holes, drafts, fillets, shells, sweeps, ribs, chamfers; Parametric modelling using relations and Excel sheets; Assembling, degrees of freedom, components table, interference checking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Computer examination

COURSE TITLE: STRENGTH OF MATERIALS I
CODE: D24NTMFL323
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Dissemination of information regarding the main aspects of the mechanical resistance of materials is the main objective; Offering to the students the methods of analysis and calculation specific to the mechanical resistance of materials is objective as well.
COURSE CONTENTS: 1. Generalities; 2. Stresses in transversal sections of bars; 3. Tensile and compression; 4. Conventional calculation in shear of bars; 5. General stress and strain status; 6. Applications: 6.1. Static momentum, momentum and inertia radius; Resistance Modulus; Variation of the inertial momentum; 6.2. Twisting of circular bars; 6.3. Bending of bars; Definitions; Classifications of the bending loadings; 6.4. Stress diagrams, N, T, Mi; Conventions of signs; Normal and tangential stress in bended bars; 6.5. Strain of bended bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS I
CODE: D24NTMFL325
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the thermodynamics of the heating processes.
COURSE CONTENTS: Fundamentals: thermodynamic system, state, state parameters and functions, equation, state equations, mechanical work, heat, internal energy, enthalpy; Thermodynamic properties of the pure substances; Phases, parts, homogenous and heterogeneous system. P-V-T surface. P-V, V-T, P-T diagrams; Clausis-Clapeyron equation: Specific heats; Thermal analysis of the ideal and real gases; Thermodynamic fundamentals of the burning processes; Fuels; Reaction heat; Material balance of the burning process; I-T diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROMAGNETIC ENGINEERING AND ELECTRICAL MACHINES I
CODE: D24NTMFL326
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers to students theoretical and practical concepts regarding electromagnetic phenomena, electric circuits analysis, construction and operating of electrical machines.
COURSE CONTENTS: Electric and magnetic status; Interdependence of electrical and magnetic parameters; (General laws; Magnetic circuit law, Faraday's law, a.s.o.); Electrostatic field, potential difference, voltage; Static electriokinetic regime; DC electrical circuits; Electrical circuits in variable regime; Electrical circuits in permanent sinusoidal periodic regime.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PORTS AND WATERWAYS
CODE: D24NTMFL324
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Knowledge, understanding, explanation and interpretation of the design, construction and operation of inland waterways. Knowledge, understanding, explanation and interpretation of port activities resulting from the economic efficiency of water transport.
COURSE CONTENTS: Water transport; Technical and economic characteristics of water transport; The main traffic indicators; The waterway; Definitive classifications; Navigation gauges; Radius of curvature and curvature of the waterways; Laying of waterways; Methods of arrangement; Waterways; Navigation Locks; Main dimensions, water calculation levels; Ports waiting at the locks; Traffic capacity of the lock; Fill-drainage systems; Location and Functions of Ports; Classification; Factors influencing port design; Traffic; Ships for transport; Natural conditions; Port plan and construction elements; Territory of the port; Aquatorium; Mooring Front; Specialized sections of port – terminal activities; Ports in Romania; Danube ports; Seaports; Inland Navigation Network of Romania; Danube, Danube-Black Sea Channel, Poarta Alba-Midia-Navodari Channel; Constanta Maritime Port.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: BASICS OF COMPUTER AIDED DESIGN II

CODE: D24NTMFL430
ECTS CREDITS: 3
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Basics of the computer aided design – 2D drawing and 3D modelling using surface and solid features; Ability to developed engineering CAD drafts from 3D computer models; Parametric design concepts, assembling, associative drafting development, basic engineering design concepts; Numerous exercises from laboratory classes will develop to students, strong abilities for using SolidWorks package.
COURSE CONTENTS: The role of a CAD system in the production cycle; Analytic representation of curves and surfaces used in CAD system; Modelling elements: layers, colours, line types; Wireframes modelling, entities selection, copy, move, editing features; Drafting, tolerances, formats, sections, views, hatching; 3D modelling using surfaces, primitives, revolution, extrusion, sweeping, lofting, blend, offset, filet and corners operations on solids; Solids editing, sketching features and concepts, profile, path 2D/ 3D cutting, splitting, design using features as holes, drafts, fillets, shells, sweeps, ribs, chamfers; Parametric modelling using relations and Excel sheets; Assembling, degrees of freedom, components table, interference checking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Computer examination

COURSE TITLE: STRENGTH OF MATERIALS II

CODE: D24NTMFL431
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Dissemination of information regarding the main aspects of the mechanical resistance of materials is the main objective; Offering to the students the methods of analysis and calculation specific to the mechanical resistance of materials is objective as well.
COURSE CONTENTS: 1. Generalities; 2. Stresses in transversal sections of bars; 3. Tensile and compression; 4. Conventional calculation in shear of bars; 5. General stress and strain status; 6. Applications: 6.1. Static momentum, momentum and inertia radius; Resistance Modulus; Variation of the inertial momentum; 6.2. Twisting of circular bars; 6.3. Bending of bars; Definitions; Classifications of the bending loadings; 6.4. Stress diagrams, N, T, Mi; Conventions of signs; Normal and tangential stress in bended bars; 6.5. Strain of bended bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THERMOTECHNICS II

CODE: D24NTMFL432
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts of the thermodynamics of the heating processes.
COURSE CONTENTS: Fundamentals: thermodynamic system, state, state parameters and functions, equation, state equations, mechanical work, heat, internal energy, enthalpy; Thermodynamic properties of the pure substances; Phases, parts, homogenous and heterogeneous system. P-V-T surface. P-V, V-T, P-T diagrams; Clausis-Clapeyron equation: Specific heats; Thermal analysis of the ideal and real gases; Thermodynamic fundamentals of the burning processes; Fuels; Reaction heat; Material balance of the burning process; I-T diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTROMAGNETIC ENGINEERING AND ELECTRICAL MACHINES II

CODE: D24NTMFL433
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers to students theoretical and practical concepts regarding electromagnetic phenomena, electric circuits analysis, construction and operating of electrical machines.
COURSE CONTENTS: Electric and magnetic status; Interdependence of electrical and magnetic parameters; (General laws; Magnetic circuit law, Faraday's law, a.s.o.); Electrostatic field, potential difference, voltage; Static electriokinetic regime; DC electrical circuits; Electrical circuits in variable regime; Electrical circuits in permanent sinusoidal periodic regime.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MATERIALS TECHNOLOGY

CODE: D24NTMFL434
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at familiarizing students with the main ways of obtaining metallic materials and their equilibrium diagrams and the main methods of processing materials. Emphasis is placed on acquiring key technologies, phenomena and processes which matter through to become a finished product. The students are required to understand the manufacturing processes, as well as the activities of equipment exploitation and repair. Moreover, the knowledge gained may allow improvement of technological processes. The main objective of the

course is for students to understand the methods used to obtain a particular product.
COURSE CONTENTS: Purpose and importance of technology materials, metal materials, classification and properties, primary development; Cast iron; Developing cast iron, steels; Developing steel, non-ferrous materials; Ferrous materials development, secondary development, casting metals; Physical basis of casting, casting methods, processing methods by plastic deformation of metallic materials, hot and cold plastic deformation, erosion processing; powder aggregation processing, permanent joints; welding, soldering joints; Cutting metal; Protection of metallic materials against corrosion, control of non-metallic materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 1ST SEMESTER

COURSE TITLE: FLUID MECHANICS
CODE: D24NTMFL540
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): This course is an introduction in fundamental theory of fluid mechanics and application of these principles to solving various technical problems. Numerous examples, hydraulic machines functioning and practical problem solutions are presented to the students in laboratory classes for a better understanding of theoretical knowledge.
COURSE CONTENTS: Fluid properties; Fluid modelling models; Pressure in fluids; Cauchy equations; Static of fluids: equations, pressure distribution on plane and curve surfaces; Principle of Archimedes; Fluid kinematics; Continuum equation; Cauchy-Lagrange theorem; Potential and rotational movements; Fluid dynamics; Constitutive equation – laminar flow, Navier-Stokes equations; Bernoulli laminar flow; Hydrodynamics; Applications; Dynamic of viscous fluids; Laminar, transitional and turbulent flow; Turbulent flow equations; Laplace equation; Major loss in ducts, tubes and pipes; Darcy-Weisbach equation for pressure and head loss; Energy and hydraulic grade line; Hydraulic diameter; Water flow in tubes; Orifice, nozzle and venture flow rate meters; Pipe in series and parallel; Pumps, compressors, blowers and fans; Total pressure or head loss in pipe or duct systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ELECTRONICS AND AUTOMATION
CODE: D24NTMFL541
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course intends to familiarize the students with the general issues of modern electronics, with the procedures that are used in the study of the electronic devices and the characteristic functions, and also with the most usual electronic circuits. Also, it will be realized an introduction in the field of the general industrial automation.
COURSE CONTENTS: The general methods those are useful in electronics study; The conduction in semi-conductors; The *pn* junction; The semi-conductor diodes, The bipolar transistors; The electronics amplifiers; The amplification with reaction; The operational amplifiers (OA); Parameters; The linear applications with OA; The manual regulation; The automate regulation; The automate control systems; The disturbances in the unfolding the processes; Transducers; Regulators; The execution elements; The features of a control system; The modelling of the automation control systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THEORY CONSTRUCTION AND VITALITY SHIP
CODE: D24NTMFL543
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course addresses issues regarding ship types, fundamental nautical qualities, buoyancy, ship stability, unsinkability, ship building so the graduate can make safe decisions in the design, construction and operation of the vessel can load situations and behaviour analysis of ship during navigation.
COURSE CONTENTS: Ship geometry; Main parts of the ship; The main dimensions of the ship; Ratios between dimensions; Plan forms; Buoyancy of the vessel; Floating parameters; Forces acting on the vessel and equilibrium equations; Calculation of weight and centre of gravity coordinates of the ship; Displacement, load capacity, tonnage; Change draft of the ship at boarding or landing loads; Initial stability; Izocarene floating; Recovery time the ship; Ship stability on trips weights; Boarding landing weights, the influence on the stability of the ship; Stability at high angles of inclination; Static stability at high angles of inclination; Dynamic stability of the ship; Methods of calculating the draft and stability to flooding of compartments; Ways and means to ensure ship sinkability; Ship vitality;
Ship construction; Regulations and international conventions; Class ship class restrictions; Framing systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PORTS AND WATERWAYS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, implementation and operation of inland waterway, complex activities at ports resulting in great economic efficiency of water transport.
COURSE CONTENTS: The transports waterway; Economic and technical characteristics of water transport; Main indicators of traffic; The waterway; Classification definitions; Dimensions navigation;
The locks of waterways; Location and port functions; The area plan of port; Port area; Aquatorium; Fronts of docking; Specialized sectors of port activities – terminal ports in Romania; The Danube ports; Seaports of Romania network waterway.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PLANNING AND EXECUTION OF THE VOYAGE

CODE: D24NTMFL656
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The discipline addresses specialty fundamental themes of port activities in maritime and river transport of goods.
COURSE CONTENTS: Role and transport features; Facilities and port facilities; Specialized areas of port activity; Port warehouses; Technical characteristics and transport vessels; Stacking and transporting goods; General merchandise packed and unpacked; Carriage of solid bulk cargoes; Liquid bulk cargo transport; Transport of dangerous goods; Refrigerated and frozen goods transport; Documents prepared for loading/ unloading.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: GENERAL ECONOMICS

CODE: D24NTMFL548
ECTS CREDITS: 3
TYPE OF COURSE: B
COURSE OBJECTIVE(S): The essential aim of the course is to train specialists in economics by accumulating theoretical and methodological knowledge necessary to understand the complexity of real economic life, economic structures' dynamics and of multiple relationships between economic agents. Another purpose is to arouse interest in economics as an e exciting and useful science. Initiation of students into this science will allow analysing real economic situation, making the right economic decisions and acting accordingly.
COURSE CONTENTS: Economics – a kind of human activity; Economy and economic sciences system; Market economy; Consumer behaviour theory; Theory of manufacturer, supply and demand; Market, competition and price; Income distribution; Measuring economic activity at macroeconomic level; Labour market and unemployment; Monetary market and inflation, financial market, income, consumption and investments; Economic fluctuations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ELEMENTS AND MECHANISMS

CODE: D24NTMFL546
ECTS CREDITS: 5
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, to gain knowledge of the necessary notions in the representation of machine mechanisms and machinery, to gain knowledge in terms of the application states studied and applied to the machine elements in operation.
COURSE CONTENTS: Introduction; Mechanism structure; Mechanics kinematics; Dynamic analysis; Mechanics of the mechanism; Camshafts; Helical gear transmissions; Gear transmissions; Belt transmissions; Chains transmissions; Demountable assemblies; Non-assembled assemblies; Axles and shafts Pivots; Friction gears; Mechanical drives; Couplings; Elastic couplings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: NAVIGATION EQUIPMENT AND SYSTEMS

CODE: D24NTMFL653
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts of electrical and navigation on board the ship, which ensures proper navigation, integrity of transported goods, the necessary living conditions and crew and passengers activities.
COURSE CONTENTS: Particularities of electrical and marine navigation; Naval power plants; Indicators of IEN; The choice of current, voltage and frequency, block diagrams of IEN and C.E.N.; Electric propulsion of ships; Electric propulsion of continuous current; Electric propulsion of alternating current; Requirements R.N.R. on generators and engines used in marine propulsion; Navigation devices; Destination and classification;

Gyrocompass shipping; Cruise control, classification, block diagrams, operating principle; Ultrasonic probe, types, block diagram, working principle; Loch, types, block diagram, working principle; Navigation facilities; General terms; Navigation systems; Radar installations; Radiogoniometry; Radio navigation satellite communication facilities; Telegraph machines; Axonometry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NAVIGATION ON INLAND CHANNELS

CODE: D24NTMFL658
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding navigation activity on inland waterways. It also teaches students about the basic navigation principles regarding the way of the ship, the route, weather and water level predictions and convoy dimensions calculation. It also refers to the evaluation of the waterway flow for navigation safety.
COURSE CONTENTS: The water flow dynamics; Channel and convoy dimensions, nautical documents; Principles for day and night navigation; Electronic navigation, Automatic Identity Signal, Electronic Charts Display and Information System, Geographical Positioning System, Differential Geographical Positioning Systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PLANNING AND EXECUTION OF THE VOYAGE

CODE: D24NTMFL657
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The discipline addresses specialty fundamental themes of port activities in maritime and river transport of goods.
COURSE CONTENTS: Role and transport features; Facilities and port facilities; Specialized areas of port activity; Port warehouses; Technical characteristics and transport vessels; Stacking and transporting goods; General merchandise packed and unpacked; Carriage of solid bulk cargoes; Liquid bulk cargo transport; Transport of dangerous goods; Refrigerated and frozen goods transport; Documents prepared for loading/ unloading.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THE BASICS OF RADIOLOCATION AND HYDRO-COLOCATION

CODE: D24NTMFL655
ECTS CREDITS: 3
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts about the basis of radio transmissions and receptions and the role of radio communication between the inland vessels (radio connections between ships, ships and shore, internal communications). At the same time, the target is to familiarize students with activities such as radio handling on board of inland vessels and the use of standard naval vocabulary, as a possibility to increase the safety and reduce the frequency of accidents.
COURSE CONTENTS: International Regional Convention related to radio traffic in Very High Frequency; Different types of messages, danger (MayDay), emergency (PanPan), security (Securite) and usual messages; The official rules for message writing and ways to respond to such messages; Rules about radio stations and radio operators; Channels and frequencies, types of connections; The rules relates to radio stations, technical and handling rules.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MACHINE ELEMENTS AND MECHANISMS

CODE: D24NTMFL651
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): The course is designed to help students understand the importance of design, to gain knowledge of the necessary notions in the representation of machine mechanisms and machinery, to gain knowledge in terms of the application states studied and applied to the machine elements in operation.
COURSE CONTENTS: Introduction; Mechanism structure; Mechanics kinematics; Dynamic analysis; Mechanics of the mechanism; Camshafts; Helical gear transmissions; Gear transmissions; Belt transmissions; Chains transmissions; Demountable assemblies; Non-assembled assemblies; Axles and shafts Pivots; Friction gears; Mechanical drives; Couplings; Elastic couplings.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PREVENTION OF ENVIRONMENTAL POLLUTION

CODE: D24NTMFL659
ECTS CREDITS: 3
TYPE OF COURSE: specialised

COURSE OBJECTIVE(S): Identifying the main sources of pollution on board ships and the technical means of limiting pollution, organising deployment operations on board the ship; Understanding, explaining the analysis and solving specific problems in the field of pollution and rules for preventing water pollution.
COURSE CONTENTS: 1. Introduction; 2. Prevention of water pollution; 3. Sources of pollution, effects of pollution, pollutants; 4. Control organizations; 5. International collaboration in the fight for the prevention of trans-boundary pollution of Danube waters by navigational activity; 6. Technical requirements imposed on ships to prevent pollution; 7. Measures against water pollution; 8. Requirements for ships to prevent and reduce navigational accidents: actions taken in the event of fire or explosion, action taken in the event of a collision, actions in case of structural damage, actions in case of excessive inclination; 9. The current dimensions of environmental pollution; 10. Main IMO Conventions ratified by the Romanians: SOLAS, MARPOL, COLREG, TONMAGE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

4TH YEAR, 1ST SEMESTER

COURSE TITLE: INSTALLATIONS OF BOARD AND DECK

CODE: D24NTMFL765
ECTS CREDITS: 4
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): The course, by means of the lectures and practical work, to provide a theoretical and experimental study of each type of installations on board, as well as to discuss their operation and malfunction.
COURSE CONTENTS: Hydro-pneumatic characteristics of naval installations; Loading/ unloading installations; The steering equipment; The anchoring equipment; Mooring and tying ships; Towing; Salvage equipment; Handling facility covers; Propulsion system; Bilge ballast system; Oil separator residues; Fire equipment; Plumbing equipment; Operation, maintenance and overhaul of naval installations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ORGANIZING AND LEADING THE CREW

CODE: D24NTMFL766
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding the main aspects related to the activity of the crew on board inland vessels. Students learn how to organise and lead the crew during navigation and cargo handling.
COURSE CONTENTS: The bindings and attributions relates to the activity of organising and leading the crew; The competences of the leader that can be transferred to other crew members; Interactions between members of the same professional group; Criteria suitable for organising and leading different crew activities; Tiredness effects and tendencies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INLAND NAVIGATION, COASTAL WATERS AND SEA NAVIGATION I

CODE: D24INTMFL769
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding navigation activity on inland waterways. It also teaches students about the basic navigation principles regarding the way of the ship, the route, weather and water level predictions and convoy dimensions calculation on different sectors of the Danube. The practical knowledge gained by students during their summer-time practical stage is also discussed.
COURSE CONTENTS: Applying theoretical knowledge related to water flow dynamics, channel and convoy dimensions, nautical documents, principles for day and night navigation; The use of electronic systems for inland navigation AIS, ECDIS.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SHIPS BUSINESS ADMINISTRATION I

CODE: D24NTMFL770
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts about applicability of transportation contract. Knowledge related to technical and commercial/ mercantile parameters are essential to achieve transportation efficient and avoid loses. The subject related to the “control of loses” by means of applying insurance rules such as P&I or Lloyd is also discussed.
COURSE CONTENTS: The law of the commercial deal and its requirements; INCOTERMS regulations. Freight contracts, types of contracts; Good navigability status of the vessel; Charging documents, cargo documents, time sheet, cargo list, bill of loading, types of bills; Insurance contracts; York-Anvers regulations; Gross average and particular average; Damage report and sea protest; Naval accidents analysis.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: USE OF RADAR ON INTERNATIONAL WATERWAYS

CODE: D24NTMFL771
ECTS CREDITS: 3
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Knowledge, understanding, explanation and interpretation of the theoretical foundations and methods of using the radar installation.
COURSE CONTENTS: Radar equipment used in maritime and river navigation; Block diagram and radar operation; Recommendations on the main technical and operational parameters of radar installations used in Danube navigation; Provisions relating to the installation and control of the operation of Radar Installations; Danube Commission 1995; Identification of external factors of radar equipment that affect radar detection; Identifying and presenting factors that can cause misconception of the radar image; Interpretation of radar images; Formation of echoes; Suppression of parasitic echoes; Reflective properties of targets; Establishment of helpdesks for radar navigation and safe navigation; Radar detectors and beacons; Recommendations on optimal types of radar reflectors and how to install them on the Danube; The Danube Commission 1995.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SHIP COMMUNICATION EQUIPMENT

CODE: D24NTMFL767
ECTS CREDITS: 4
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Knowledge of the processes and phenomena that occur in the functioning of the ship communication equipment, the development of knowledge in the field; Identifying and explaining the constructional and functional particularities of each on-board communication equipment.
COURSE CONTENTS: Development of radio-communications; Short history; Fundamental notions of radio waves; Propagation of radio waves; Global maritime distress and safety system (GMDSS); Configuring the GMDSS system; Elementary knowledge about frequencies and frequency bands; Frequencies used in maritime communications; Basic knowledge of satellite communications; Communication and traffic surveillance (VTS) systems and equipment in inland navigation; Presentation of the RIS system; The components of the RORIS system (or VTMIS on the Danube); Automatic identification system – AIS; Coupling the system with other navigation equipment on board ships; Radiotelephone communication systems; Radio-communications Regulation of the International Telecommunication Union (ITU); International radiotelephone service on VHF and UHF covering inland waterways; Types of communications: ship-to-shore radio-communication, ship radio-communication, radio-communication within a convoy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTERNATIONAL MARITIME LAW

CODE: D24NTMFL768
ECTS CREDITS: 3
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Knowledge, understanding, explanation and interpretation of the legal regime of waterways in Romania; general notions of labour law, normative acts specific to the labour law; maritime and river courts; the legal aspects of shipping, the registration and deletion of ships, the documents of the ship, the transcription of the constitution, modification and extinction of real rights over the vessel, the rights and obligations of the seafarers, their documents and their professional attestation.
COURSE CONTENTS: General notions of law; General notions of constitutional and administrative law; General notions of labour law; River and Maritime Law; The sailing staff; Marine and river basins.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

4TH YEAR, 2ND SEMESTER

COURSE TITLE: INLAND NAVIGATION, COASTAL WATERS AND SEA NAVIGATION II

CODE: D24NTMFL878
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts regarding navigation activity on inland waterways. It also teaches students about the basic navigation principles regarding the way of the ship, the route, weather and water level predictions and convoy dimensions calculation on different sectors of the Danube. The practical knowledge gained by students during their summer-time practical stage is also discussed.
COURSE CONTENTS: Applying theoretical knowledge related to water flow dynamics, channel and convoy dimensions, nautical documents, principles for day and night navigation; The use of electronic systems for inland navigation AIS, ECDIS.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COURSE TITLE: SHIPS BUSINESS ADMINISTRATION II

CODE: D24NTMFL879
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts about applicability of transportation contract. Knowledge related to technical and commercial/ mercantile parameters are essential to achieve transportation efficient and avoid loses. The subject related to the "control of loses" by means of applying insurance rules such as P&I or Lloyd is also discussed.
COURSE CONTENTS: The law of the commercial deal and its requirements; INCOTERMS regulations. Freight contracts, types of contracts; Good navigability status of the vessel; Charging documents, cargo documents, time sheet, cargo list, bill of loading, types of bills; Insurance contracts; York-Anvers regulations; Gross average and particular average; Damage report and sea protest; Naval accidents analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MARITIME AND RIVER TOWING

CODE: D24NTMFL773
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts for inland navigation and towing, transport and salvage using river tugs.
COURSE CONTENTS: Inland tug handling, evolution, classification, procedures, towing technics; Different inland tugs type, harbour types; Evaluation of the stability of the harbour tug, how to compound the inland towed barge convoy and towing activity in different conditions; Typical towing manoeuvres; Towing for salvage/ recue, refloating manoeuvres, special towing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COLREG – COLLISION REGULATION

CODE: D24NTMFL775
ECTS CREDITS: 3
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts about how inland navigation vessels may apply the COLREG regulations in mixed navigation zones, inland and sea going vessels.
COURSE CONTENTS: General definitions, rules for under way vessel; General navigation rules for the crew; Steering the vessel in difficult conditions; Vessels which can see each other; Vessel manoeuvring in difficult conditions; Lights and signs; Acoustic and light signals; Special signals; Search and rescue procedures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ENFORCEMENT PROCEEDINGS – NAVIGATIONAL WATCH-KEEPING

CODE: D24NTMFSL772
ECTS CREDITS: 3
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): The course, by means of its lectures and practical work, aims at conducting a theoretical and experimental study of naval propulsion installations in order to design, study and exploit them.
COURSE CONTENTS: Classification of propulsion installations; The engine of shipping; Transmission systems; Installation steam turbine propulsion; Propulsion plant gas turbine; Propulsion plant with internal combustion engines; Electric propulsion; Marine engines; Propeller; Voigt-Schneider propulsion; Propulsion with propellers; Water jet propulsion.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: REGULATIONS FOR DANUBE AND CHANNEL NAVIGATION

CODE: D24NTMFL776
ECTS CREDITS: 5
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts for inland navigation, applying manoeuvring regulation, visual and acoustical signalisation rules, convoys' navigation dimensions, manoeuvring signals and signs. All procedures are mentioned in international inland navigation regulations.
COURSE CONTENTS: General accepted definitions; Vessel day and night signalling; Waterway signalling; Special visual and acoustical signalling; Regular and special convoy signalling; Pollution preventing rules for inland waterways; Other special rules and conditions for navigation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SHIP HANDLING, SALVAGE AND FIRST AID

CODE: D24NTMFL877
ECTS CREDITS: 3
TYPE OF COURSE: speciality

COURSE OBJECTIVE(S): The course offers students the theoretical and practical concepts about the main nautical qualities of the ship, knowledge about how the vessel is manoeuvred in different conditions.
COURSE CONTENTS: Nautical and manoeuvring qualities of the ships; Rudder and propulsion effects and different combinations thereof; Factors which determine specific movements of the vessel (flow, wind, power of the propulsion, surface of the rudder); The manoeuvre of one-propeller or two-propeller vessels; Manoeuvres related anchor drop and heave; Turning manoeuvre, come alongside and clearance manoeuvre; First aid and fire fighting activities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RIVER NAVIGATION

CODE: D24NTMFL885
ECTS CREDITS: 2
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Knowledge and understanding of the phenomena that influence navigation on inland waterways and factors that influence the ability to navigate safely; Understanding the theoretical background of ship and convoy behavior during navigation.
COURSE CONTENTS: Navigation on the Romanian Danube sector; General principles for river navigation; Information Documents for Danube Navigation; Day and night sailing; Optimization of navigation conditions, RIS standards.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

FIELD: AUTOMOTIVE ENGINEERING
PROGRAMME TITLE: AUTOMOTIVE ENGINEERING – DESIGN, MANUFACTURING AND DEVELOPMENT (ENGLISH-TAUGHT PROGRAMME)
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: FUNDAMENTALS OF AUTOMOTIVE ENGINEERING
CODE: D22AED101
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the theoretical and practical concepts of the kinematic and dynamic theories defining the motions of road vehicles.
COURSE CONTENTS: General organization and main parameters of road vehicles; The process of self-propulsion of the cars; Clutch; Gearbox; Front and rear axis; Steering system; Break system.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: QUALITY TECHNIQUES
CODE: D22AED102
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Students' understanding of the concepts, principles, techniques and quality tools for the continuous improvement of the activity of an organization in order to fulfil the policy and objectives.
COURSE CONTENTS: Introduction in theory and quality management; Managerial techniques – quality management systems; (ISO 9000 model; Total Quality Management; Six Sigma; Lean Manufacturing); Traditional technical techniques of quality (Histogram; Pareto diagram, Fishbone diagram, etc.); Modern techniques of quality management; Other quality improvement techniques.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MEASUREMENTS AND ERGONOMIC MODELLING IN AUTOMOTIVE INDUSTRY
CODE: D22AED103
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Knowledge of the human body's abilities relative to the work process in the car and the environment necessary for the driving activity.
COURSE CONTENTS: Ergonomics – the basic science of designing the workplace; Anthropometric measurements – overview; Specific environmental parameters in the automotive industry and effects on the human body; Principles of ergonomic work place organization and measurement of the main ergonomic parameters; Principles of ergonomic organization of the driving position of the vehicle; Use of ergonomic analysis software specific to the automotive industry.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MANUFACTURING PROCESSES AND EQUIPMENT FOR AUTOMOTIVE
CODE: D22AED104
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the main manufacturing equipment and technological processes used in the automotive industry.
COURSE CONTENTS: Forming and Joining: Materials Forming – Forming of Polymer and Composite Materials; Forming and Joining: Metal Forming; Machining and Tolerance Systems: Tolerance System; Nano-manufacturing and Non-Traditional Machining; Robotics and Automation; 3D prototyping (Additive Manufacturing); Surface Technology.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: AUTOMATION AND ROBOTICS IN AUTOMOTIVE ENGINEERING
CODE: D22AED105
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Presentation of the methods for using automated systems and robotic structures in the automotive industry.
COURSE CONTENTS: Basic Automation: Dynamic models; Transfer function; State variable models; Feedback control systems: poles and zeros, steady state error, time domain performances, frequency domain performances, stability of linear feedback systems, design of closed-loop control; Robotics: Basic components of the robot system; Functionality of the robot system in industrial applications; Basic kinematics of the industrial robots; Direct and inverse kinematics; Motion generation: pick-and-place operation and continuous-path motion; Compliant motion; Dynamics Sensing and Perception: Measurement systems: linear and rotational sensors for position, velocity and acceleration; Sensor systems: tactile sensors, force sensors, and torque sensors; Actuators: principles, hydraulic actuation, pneumatic actuation, electrical actuation; Robot control: principles, conventional closed-loop control, state variable control; Principles of robot programming; Automated manufacturing; Splitting assembly systems and the manufacturing process.

LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ETHICS AND ACADEMICS INTEGRITY

CODE: D22AED106
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22AED107
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Developing specific study program abilities by identifying the fundamental and documentary elements related to the analysis of technical norms and research in the field.
COURSE CONTENTS: Scientific research: defining the theoretical, applied, experimental and analytical elements; Classical and modern bibliographic research techniques on a given theme; Drawing up a bibliography; references and footnotes; Choosing the field of research and proposing a theme; Establish the main objective within the activity; Documentation on the fundamentals of the research-design field chosen; Search engines specific to scientific research; Identifying important achievements, defining the proposed themes; Scientific report resulting from bibliographic research on a given topic; summary and keywords that characterize the theme; Content of ideas, critical analysis, personal opinions, conclusions; Presentation of scientific articles: elaboration of the presentation of the article; estimating the length of the presentation according to the time limits; designing the presentation form; preparation of the presentation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ELEMENTS OF VIRTUAL PROTOTYPING IN AUTOMOTIVE ENGINEERING

CODE: D22AED208
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Forming students' skills in modelling of parts and assemblies, kinematic and dynamic simulation, analysis of stress states and deformations of the studied parts and assemblies, using the finite element method.
COURSE CONTENTS: Introduction to the virtual prototyping; CAD software system, main modules, analysis module, user interface; Introduction to Sketching; Basic Part Modelling; Assembly software module; Drawing module; Motion module; FEA module; Modelling and kinematic analysis; Introduction to the virtual prototyping; CAD software system, main modules, analysis module, user interface.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESIGN FOR MANUFACTURE

CODE: D22AED209
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course provides the students with the specific knowledge and the appropriate use of specific fundamental concepts of the discipline, and explaining moreover specific methods and techniques as well as advanced calibration tests upon vehicles, aiming thus at acquiring advanced knowledge in the field of vehicle testing.
COURSE CONTENTS: Design for manufacture; Design for X; Definitions; Introduction; Design for manufacture General Principles of manufacturability; Design for Manufacturability Methodology (DFM); Problem Formulation; New Product Vision; Concept Generation; Concept Selection; Detail Design; Design Validation; Design and drawing tips (Fasteners, Material selection, Final design details, Leverage DFM knowledge); Rules for all parts designed and drawings submitted to manufacture; Criteria and technique for DFM; Key to advantages; Key to disadvantages;; Design automation requirements to support integrated product development; Product design; Process design; Data interchange; Design for manufacturing processes; General guidelines; Machining; CNC machining guidelines.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INNOVATIVE TECHNOLOGIES IN AUTOMOBILES MANUFACTURING

CODE: D22AED210
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge of modern technologies for obtaining automotive parts other than cutting processes.
COURSE CONTENTS: Modern technologies for the development of automotive parts by powder metallurgy: the technological flow of parts development through MP; MP applications self-lubricating bearings; electric brushes; toothed wheels obtained by sinter-moulding; MIM metal injection moulding; Modern manufacturing technologies by casting in special temporary moulds: casting parts with light fusible patterns; casting parts with thermo-resistant models; Modern Manufacturing Technologies by Casting in Permanent Forms: Pressure Die Casting;

Centrifugal Casting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED PRODUCTION SYSTEMS IN AUTOMOTIVE ENGINEERING

CODE: D22AED211
ECTS CREDITS: 5
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Presentation of automotive production strategies and automation levels, flexible manufacturing systems, slim production, Kanban strategy, Six Sigma.
COURSE CONTENTS: Manufacturing strategy and levels of automation; Design for sustainability in automotive industry; Cellular manufacturing systems; Flexible manufacturing systems; Lean manufacturing; Toyota Production System; Just in time production and the Kanban System.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODELLING AUTOMOBILES DYNAMICS

CODE: D22AED212
ECTS CREDITS: 5
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Presentation of automotive production strategies and automation levels, flexible manufacturing systems, slim production, Kanban strategy, Six Sigma.
COURSE CONTENTS: Dynamics of the car in Newton's formalism; Forces and moments; Euler's angles; Dynamic car model with one degree of freedom; The dynamic response of the car model with one degree of freedom; Dynamic car model with two degrees of freedom; The dynamic response of the car model with two degrees of freedom; The general mechanical model of a vehicle used in the study of vehicle vibrations; Vibration study and analysis on the model with one degree of freedom with Simulink/ Matlab.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22AED214
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Developing specific study program abilities by identifying the fundamental and documentary elements related to the analysis of technical norms and research in the field.
COURSE CONTENTS: Scientific research: defining the theoretical, applied, experimental and analytical elements; Classical and modern bibliographic research techniques on a given theme; Drawing up a bibliography; references and footnotes; Choosing the field of research and proposing a theme; Establish the main objective within the activity; Documentation on the fundamentals of the research-design field chosen; Search engines specific to scientific research; Identifying important achievements, defining the proposed themes; Scientific report resulting from bibliographic research on a given topic; summary and keywords that characterize the theme; Content of ideas, critical analysis, personal opinions, conclusions; Presentation of scientific articles: elaboration of the presentation of the article; estimating the length of the presentation according to the time limits; designing the presentation form; preparation of the presentation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRODUCT DEVELOPMENT

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Acquiring knowledge and methods necessary for effective management of integrated product development.
COURSE CONTENTS: Products, design products, design methods; Functional analysis: objectives, implementation stages, tools; Determination of elements, methods and functions of an environmental product; Lifecycle product modelling; Product development: concepts, directions, methods, interaction time, as, medium; Development of integrated products: parallelization, standardization, integration and integrated development methods (DFM, DFA, DFQ, DFE, DFC, DFCO); Innovative concepts TRIZ methods; Rapid product development: building the numerical model, rapid prototyping; Integrated product policy: new product features, development strategies, methods of information/ promotion.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: UNCONVENTIONAL SOURCES OF ENERGY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, domain
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding training of original thinking in the field of the energies engineering, used as heat source.
COURSE CONTENTS: General concepts of thermodynamics; Classical and modern propulsion solutions; Use of hydrogen into internal combustion engines; Use of biofuel; Solar energy.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTATIONAL METHODS FOR CALCULATING INTERNAL COMBUSTION ENGINES

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Deepening computing and construction of internal combustion engines concepts using various computational methods of analysis real phenomena that occur in certain conditions on this type of engine.
COURSE CONTENTS: Introduction on computational solutions utilized internal combustion engines study; Mechanical stresses in the study of internal combustion engines components; Thermic stresses in the study of internal combustion engines components; Numerical and variational methods in the study of thermal, structural and harmonic components of internal combustion engines; Analysis of working conditions of internal combustion engines dynamic components; Numerical analysis for stationary processes developed in the motor mechanism; Numerical analysis for transient processes developed in the motor mechanism.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: FUNCTIONAL DESIGN OPTIMIZATION OF AUTOMOBILES ENGINES

CODE: D22AED321
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Presentation to the students of existing principles, methods, models and technical novelties in the field of optimization of internal combustion engines.
COURSE CONTENTS: Considerations on experimental research in the field of internal combustion engines; Combustion Diagnostic Techniques; Basic principles for pressure measurement; Piezoelectric measuring systems; Variants of assembly; Optical diagnostic techniques; Laser measuring techniques; Combustion analysis of internal combustion engines; Diesel Engines; Fuel Injection Methods; Formation of the mixture; Combustion analysis of internal combustion engines; Gasoline engines; Structure of the ignition system; The ignition sequence; Propagation of flame after ignition, turbulence effect; Abnormal combustion; Formation of the mixture; The layered injection; New technologies used in internal combustion engines; Variable distribution; Turning off cylinders; Reduction of engines; New types of engines; Engine with variable compression ratio; The REVETEC engine; The Hüttlin engine; Rotary engine; Duke Motor; Five-stroke engine; Mixing and burning simulation programs; AVL Fire; GT-Power; Ricardo Wave; Lotus Engine Simulations.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: FUNCTIONAL DESIGN OPTIMIZATION OF AUTOMOBILES TRANSMISSIONS AND SYSTEMS

CODE: D22AED322
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Increasing knowledge on modern vehicles transmissions required in design and research, acquiring calculation methods, modelling and design optimization for transmission vehicle's elements.
COURSE CONTENTS: Introduction to optimization theory; Classical methods for optimum determination (problems with and without restrictions); Direct search methods for the optimal solution; Programming methods; Topological optimisation; Constructive optimisation for the mechanical clutch, mechanical gearbox, planetary shaft, suspension system, steering system and brake system.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: DESIGN FOR SAFETY & COMFORT

CODE: D22AED325
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Description of methods to increase safety and comfort in the use of motor vehicles, the formation of general knowledge of the information provided by the mathematical models of automobile dynamics, measurements as well as the experience gained in the field of automotive engineering.
COURSE CONTENTS: Generalities on ergonomics; Ergonomic principles used in vehicle construction; The role of ergonomic organization in increasing safety and comfort; Movements of the human body and their influence on ergonomic design methods; In order to increase safety and comfort; Raising safety and comfort levels by focusing on ergonomic principles when designing the cockpit; Mathematical models for the study of vehicle vibrations; Effects of noise and vibrations on human body and activity; How noise and vibration affect safety and comfort; Methods to reduce vibrations in vehicles to increase safety and comfort; Soundproofing and Sound Absorbing Materials; Enhancing safety and comfort when using active noise attenuators and

reactive noise attenuators; Functional features of attenuators, constructive solution; Solutions to increase safety and comfort used by prestigious vehicle manufacturers.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED ROBOTICS
CODE: D22AED326
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S):
COURSE CONTENTS: Advanced Robot Structures: Kinematically Redundant Manipulators; Parallel Mechanisms and Robots; Robots with Flexible Elements; Robot Hands; Sensing and Perception: Force and Tactile Sensors; Inertial Sensors, GPS, and Odometry; Sonar Sensing; Range Sensors; 3-D Vision and Recognition; Visual Serving and Visual Tracking; Multisensory Data Fusion; Manipulation and Interfaces: Motion for Manipulation Tasks; Contact Modelling and Manipulation; Grasping; Cooperative Manipulators; Haptics; Telerobotics; Mobile Robotics: Motion Control of Mobile Robots; Motion Planning and Obstacle Avoidance; World Modelling; Simultaneous Localization and Mapping; Robotic Applications for Automotive Engineering: Industrial Robotics (Typical Robot Applications, Configurations, Kinematics and Mechanisms, Task Descriptions, Teaching and Programming, End-Effectors, Integration); Welding Robots in auto manufacturing; Painting Robots in auto manufacturing; Robots for material handling applications in auto manufacturing; Robot Programming by Demonstration – Engineering-Oriented; Intelligent Vehicles (Road Scene Understanding, Advanced Driver AssistanceDriver Monitoring, Automated Vehicles).
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTER ASSISTED AUTOMOBILES DIAGNOSIS
CODE: D22AED327
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Advanced knowledge in the field of electronic diagnostics of motor vehicles, acquisition of advanced methods and techniques of the on-board and laboratory diagnostics C.
COURSE CONTENTS: General principles of vehicle diagnostics; General Diagnostics of Vehicles; Diagnosis of main vehicle systems; Modern computer assisted diagnostic elements; Self-diagnosis or on-board diagnosis – equipment and method; Diagnosis – off-board diagnosis – equipment and method.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE
CODE: D22AED329
ECTS CREDITS: 7
TYPE OF COURSE: mandatory

2ND YEAR, 2ND SEMESTER

COURSE TITLE: RESEARCH STAGE
CODE: D22AED430
ECTS CREDITS: 10
TYPE OF COURSE: mandatory

COURSE TITLE: RESEARCH FOR DISSERTATION PREPARATION
CODE: D22AED431
ECTS CREDITS: 20
TYPE OF COURSE: mandatory

FIELD: AUTOMOTIVE ENGINEERING
PROGRAMME TITLE: OPTIMISATION OF ROAD TRANSPORT SYSTEMS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED SOLUTIONS FOR VEHICLES

CODE: D22OSTM101
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge understanding and deepening by students of the construction and operation of advanced vehicle systems; Establishment of operating conditions, vehicle operating requirements and the choice criteria as transport solutions.
COURSE CONTENTS: Power-driven vehicles – short history; Getting Started about Electric Vehicle Traction; Power storage devices; Electric vehicles with traction battery; Construction and operating of a pure electric propulsion vehicle; Hybrid cars; Classification, methods of operating, advantages of hybrid propulsion comparative with the conventional systems; Basic architectures of the hybrid propulsion chain; Hybrid chains: series, parallel and mixed.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED MODELLING AND SIMULATION TECHNIQUES IN MECHANICAL ENGINEERING

CODE: D22OSTM102
ECTS CREDITS: 5
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Students need to have knowledge in the following fields: Mechanics, Strength Materials, Machine Elements, Mechanical Systems Modelling Basics, Automotive Dynamics, Automotive Design and Calculations. The course aims at promoting modern design methods, finite element modelling and analysis in the aim of solving some complex problems from Automotive Engineering. Another aim is the one that it can be develop and form, students' ability through applications by using important modelling and analysis software (ADAMS, ANSYS, etc.). All of these are used for studying the behaviour in static and dynamic mode of subassemblies from modern auto vehicles frame.
COURSE CONTENTS: Theory of Elasticity Elements; 3D Modelling Techniques of Mechanical Systems; Mathematical Models for Finite Element Analysis in Static Mode for Mechanical Structures; Numerical Applications by Using MATLAB; Mathematical Models for Finite Element Analysis in Dynamic Mode for Mechanical Structures; Numerical Applications by Using MATLAB; Modal Analysis of Mechanical Structures; Finite Element Modelling in Contact Problems Cases; Mechanical Structures Analysis in Thermal-Structural Coupled Mode; Finite Element Modelling and Simulation of an Impact Problems on Automotive Engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZATION OF MOBILE MECHANICAL SYSTEMS

CODE: D22OSTM103
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Learning by the students of the theoretical and instrumental methods, means and procedures for the optimization of mobile mechanical systems.
COURSE CONTENTS: Kinematic and dynamics modelling by computational methods of mobile mechanical systems; General Aspects of Optimizing Problems; Numerical methods to solve minimal and maximum problems; Topological optimization (constructive) by the finite element method of mechanical structures; Solving optimization problems with and without constraints (restriction functions); Theoretical aspects on multiple objective optimization problems; Theoretical aspects regarding the stability of dynamic systems (Lyapunov stability of systems); System optimization issues; Theoretical aspects regarding the use of software for the optimization of mobile mechanical systems (ADAMS, ANSYS); Application study on the optimization of a mobile mechanical system by parametric methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED ELEMENTS OF ROAD VEHICLE DYNAMICS

CODE: D22OSTM104
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of theoretical concepts and practical concepts of kinematic and dynamic theories that define vehicle motion, advanced knowledge in the field of dynamical systems, vehicle dynamics, chaotic movements and the use of specialized computer programs or simulation of vehicle movement.
COURSE CONTENTS: Dynamical systems theory; Stability of dynamical systems; Chaotic movements: Methods of study; Shape optimization of vehicle by vehicle-air interaction study; Vehicle stability; Mathematical models used; Vehicle stability analysis; Maniable vehicles: Maniability study, criteria for assessing maniability; Using mathematical analysis software stability and maniable vehicles; Study of maniability stability and

computational simulation of vehicles through their movement.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: RESEARCH BASICS
CODE: D22OSTM105
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the basic principles of the various methods and means of measuring the quantities that characterize the technological processes.
COURSE CONTENTS: Measurement basics; Measuring systems; Parametric and Generators transducers; Electrical Tensometry; Foto-elasticimetria; Experimental Measurement of stress and deformations; Circuits for the transducers connecting; Statistical processing of experimental data; Methods of measuring displacements; Speed measurement methods; Methods of measuring forces, moments, power, temperature, pressure; Methods and principles for measuring surface roughness; Vibration measurement methods in mechanical systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN SYSTEMS FOR MAINTENANCE OF THE ROAD VEHICLE
CODE: D22OSTM106
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course teaches students about theoretical and practical concepts regarding training of original thinking in the field of the energies engineering, used as heat source.
COURSE CONTENTS: Quality-Reliability Inter-dependence; Reliability of products; Maintainability and availability of elements and technical systems; Predictive evaluation and optimization methods of maintainability; Maintenance strategy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NOT INCLUDING MOTOR VEHICLE DIAGNOSTICS
CODE: D22OSTM107
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course provides students with specific notions of this discipline aiming further at their application in the design of vehicle's structural components and explaining moreover advanced methods and techniques and advanced on-board and laboratory diagnostics.
COURSE CONTENTS: General principles of diagnosis vehicles; General diagnosis of motor vehicles; Main vehicle diagnostics systems; Modern diagnostic elements; Self-diagnosis and diagnosis of board (on board diagnose) – Equipment and method; Laboratory diagnosis – service (off-board diagnose) – Equipment and method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ETHICS AND ACADEMICS INTEGRITY
CODE: D22OSTM108
ECTS CREDITS: 4
Type of Course: mandatory

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE
CODE: D22OSTM109
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Developing specific study program abilities by identifying the fundamental and documentary elements related to the analysis of technical norms and research in the field.
COURSE CONTENTS: Scientific research: defining the theoretical, applied, experimental and analytical elements; Classical and modern bibliographic research techniques on a given theme; Drawing up a bibliography; references and footnotes; Choosing the field of research and proposing a theme; Establish the main objectives within the activity; Documentation on the fundamentals of the research-design field chosen; Search engines specific to scientific research; Identifying important achievements, defining the proposed themes; Scientific report resulting from bibliographic research on a given topic; summary and keywords that characterize the theme; Content of ideas, critical analysis, personal opinions, conclusions; Presentation of scientific articles: elaboration of the presentation of the article; estimating the length of the presentation according to the time limits; designing the presentation form; preparation of the presentation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MODERN TECHNOLOGIES TO MANUFACTURE AND REPAIR OF ROAD VEHICLES
CODE: D22OSTM210
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Deepening modern to manufacture and repair methodologies of the vehicle.
COURSE CONTENTS: Generalities about the repair process; Determination of the necessary elements to reach the technological repair processes; Advanced

materials for repair process; Actual tendencies for materials and their manufacture; Ni based super alloys; Multifunctional materials with low density; Metallic materials, „Metallic foam": type, extremely light, multiple uses; Structural and functional materials, Bio-metals (Ni-based implants); Abrasive materials; Modern methods for reconditioning of the vehicle components, Advanced technologies for shaft, bushing, pistons etc. reconditioning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED SYSTEMS OF MULTIMODAL TRANSPORT

CODE: D22OSTM211
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with the specific knowledge about advanced systems of multimodal transport.
COURSE CONTENTS: Context on the development of intelligent transport systems; Concept of Intelligent Transport System; The concept of multimodality; Strategies and policies on intelligent transport systems; Transport systems; Transport modes; Elements of the transport system; Interfaces of the transport system with the environment; Information flow and physical flow; The information system specific to the transport system; Carrying out of trade in merchandise; Stages of the trade transaction; Information feeds for contracting; Information flows specific to the commercial transaction; Documents used in a commercial transaction; Structure of Intelligent Transport Systems; Advanced Traffic Management Systems (ATMS); Advanced passenger information systems (ATIS); Advanced Vehicle Control Systems (AVCS); Commercial Vehicle Operation Systems (CVO); Advanced Public Transport Systems (APTS); Emergency Management Systems (EMS); Electronic payment systems (EPS); Techniques and methods used in the development of modern multimodal transport systems Electronic tracking; Automated location of vehicles; Travel metering; Emergency management; Dispatch/ monitoring; Creation of integrated information systems in the transport system; Structure and formation of information systems; Representation of the data structure; Representing the architecture of information systems; Models used to optimize transport routes; Integrated computer system in multimodal freight transport; Concept of integrated computer system in multimodal freight transport.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN TESTING AND CALIBRATION OF ROAD VEHICLES

CODE: D22OSTM212
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course provides students with the specific knowledge and the appropriate use of specific fundamental concepts of the discipline, and explaining moreover specific methods and techniques as well as advanced calibration tests upon vehicles, aiming thus at acquiring advanced knowledge in the field of vehicle testing.
COURSE CONTENTS: Qualitative evaluation experiments and calculation errors; Electronic measuring of non-electrical quantities; Choosing and preparing vehicles for testing; Attempting vehicle handling and stability; Sources of vibration in a vehicle; Indices for assessing the quality automotive suspension; Trying sealing body; Considerations on the calibration concept vehicle; Engine calibration; Fuel calibration; Establishing specific calibration methodology vehicles; Calibration equipment necessary for vehicles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: URBAN LOGISTICS

CODE: D22OSTM213
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Assimilation of the concepts of urban logistics by the learners; Knowledge of the basic concepts of advanced systems in the field of motor vehicle and transport engineering, using urban logistics methods.
COURSE CONTENTS: Logistics of freight transport logistics (Transport modes; General characteristics of road freight transport; Transport design in the logistics infrastructure implantation strategy; Road transport in a European vision; Types of logistics; State of research in the field of intermodal distribution of goods; Marketing strategy and types of physical distribution networks of goods); Freight transport – an essential process in the distribution of goods; Modelling the distribution of goods; Analysis and evaluation of the urban transport system; Urban Transport Planning (PTU) in the short term; Urban roads and logistics evolution; Developing useful computer logistics applications; Urban transport – component of the urban logistics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22OSTM214
ECTS CREDITS: 7
TYPE OF COURSE: mandatory

COURSE OBJECTIVE(S): Developing specific study program abilities by identifying the fundamental and documentary elements related to the analysis of technical norms and research in the field.
COURSE CONTENTS: Scientific research: defining the theoretical, applied, experimental and analytical elements; Classical and modern bibliographic research techniques on a given theme; Drawing up a bibliography; references and footnotes; Choosing the field of research and proposing a theme; Establish the main objectives within the activity; Documentation on the fundamentals of the research-design field chosen; Search engines specific to scientific research; Identifying important achievements, defining the proposed themes; Scientific report resulting from bibliographic research on a given topic; summary and keywords that characterize the theme; Content of ideas, critical analysis, personal opinions, conclusions; Presentation of scientific articles: elaboration of the presentation of the article; estimating the length of the presentation according to the time limits; designing the presentation form; preparation of the presentation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTELLIGENT TRANSPORT SYSTEMS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Development of control systems that can ensure efficient utilization of circulation's limited space, in conditions of increased safety and pollution reduction, development of concepts and models utilized in road control systems and ways of approach light signalling; Tendencies of road control systems integration in combined transport logistics systems.
COURSE CONTENTS: Introduction; Road traffic management elements; The concept of command and control system in transportation; Informational systems specific to transport systems; Methods and techniques utilized in intelligent transport systems; Integrated informational systems; Management of traffic command and control projects; Protection of technological and management information; National and European traffic control policies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SYSTEMS OF RAIL, WATER AND AIR TRANSPORT

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental (specialised, domain)
COURSE OBJECTIVE(S): Identifying components of the transport system; Setting features transport systems; Analysis of factors influencing development strategies of national and international transport.
COURSE CONTENTS: Transport and socio-politico-economic; Transportation systems; Road transport mode; Main components and operation of rail; Railway traffic organization; Sorting of wagons; General organization of traffic; The components and operation of shipping; Constituents and functioning of river transport on rivers and channels; Main components and operation of air transport.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: STANDARDIZATION AND QUALITY IN TRANSPORTS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts of: familiarity with new concepts and the 8 quality management principles underlying the new edition of ISO 9001; familiarity with terminology in quality management according to ISO 9000 and ISO TS 16949; familiarity with ISO 9001si ISO TS 16949; identify directions for future action.
COURSE CONTENTS: Standardization and quality concepts and evolution; Standards in quality management, automotive and transport standards; Quality trends in the automotive and transportation; Family documents automotive (FMEA, MSA, SPC, PPAP, APQP); Quality management in transport specificity; Accreditation, certification and legislation; ISO ISO TS 16949 requirements 9001si, ICOTERMS 2000, RAFTD 1941; Principles of total quality management and its components; Implementation of Total Quality Management System; General rules for the interpretation of quality; Principles of Deming, Juran, Crosby; Application of quality in transport; Particular aspects of quality in transport; General actions to improve the quality of transport, transport service intangibility compensation; Inseparability Service transport; Limiting variability services, perishable transport tasks; Compensate for the lack of ownership of the transport service; Features of quality management in the transport of goods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ANALYSIS AND RECONSTRUCTION ON TRAFFIC ACCIDENTS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: thoroughgoing study

COURSE OBJECTIVE(S): Assimilation of advanced concepts related to road traffic accidents evaluation starting from persons and vehicles movement reconstruction from pre-crash phase, related to accident, through the event with violent action provoking damages and injuries tracking as well the determination of causes which triggered a perturbation of the intentional motion and generated it.
COURSE CONTENTS: Road accidents expertise; Particularities and principles of effectuation; Acquisition and traces interpretation; Possibilities of kinematic and dynamic measurements of the vehicles involved in the road accident reconstruction; Driver's reaction; Pedestrians accidents expertise.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: BIOMECHANICAL SOLUTIONS IN ACCIDENTOLOGY

CODE: D22OSTM321
ECTS CREDITS: 4
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course follows: the familiarization of the students with the notions of human musculoskeletal system, with the main types of devices and implants used for the trauma problems; the knowledge of the main procedures and techniques used to solve the trauma problems; fundamentals elements for design of implants, prosthesis, orthotics and other rehabilitation devices.
COURSE CONTENTS: Elements of human lower limb biomechanics; Elements of human upper limb biomechanics; Elements of human trunk, neck and spine biomechanics; Biomaterials used in trauma and orthopaedics; Biomechanical solutions for rehabilitation of the human lower limb joints; Biomechanical solutions for rehabilitation of the human upper limb joints; Biomechanical solutions for the replacement of the human lower limb joints; Biomechanical solutions for the replacement of the human upper limb joints; Biomechanical solutions for spine rehabilitation; Biomechanical solutions for human fractures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODELLING, SYSTEMATIZATION AND TRAFFIC ORGANIZATION

CODE: D22OSTM322
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Assimilation by the students of the knowledge for the modelling, systematization and organization of the road traffic.
COURSE CONTENTS: Theoretical background of traffic flows; Traffic parameters; Traffic volume variation; Crossroads: Systematization of crossroads; Factors influencing the design of the crossroads; Conflict points in crossroads; The choice of crossroad types; Methods and techniques for systematization, coordination, guidance and control of traffic flows; modern solutions in road traffic management; use of ITS technologies in road traffic management; modelling and simulation of the road traffic.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ANALYSIS OF THE TRANSPORT COSTS

CODE: D22OSTM324
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Students acquiring the basic knowledge of carrying out the necessary economic analysis during the evaluation process of the transport projects.
COURSE CONTENTS: Object and necessity of economic and financial analysis; Economic analysis; Financial analysis; The correlation between economic and financial evaluation; Costs; Cost typology; Costs and benefits of transport service providers; Costs of transport users; Methodology for achieving economic analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ANALYSIS AND RECONSTRUCTION OF THE TRAFFIC ACCIDENT

CODE: D22OSTM325
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Learning by students of the elements specific to the road traffic accident analysis; Developing the skills required to reconstruct a traffic accident.
COURSE CONTENTS: Basic problems of the traffic accident reconstruction; Identification and taking of the traces for traffic accident expertise; Ways to reconstruction of the Kinematics and dynamics sizes of the vehicles involve in traffic accidents; Human factor and traffic accident; Pedestrian accident expertise; Modelling and simulation in the reconstruction of traffic accidents.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN SYSTEMS FOR AIR CONDITIONING IN TRANSPORT

CODE: D22OSTM326
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course offers students the opportunity to learn about subject-specific concepts, explanation and interpretation some processes, the concepts necessary to the design of constructive solution.
COURSE CONTENTS: General concepts of technique thermodynamics; Principles of thermodynamics; Real gases; The moist air; Compressors used in air-conditioning; Refrigeration systems; Heat pumps.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22OSTM328
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Developing specific study program abilities by identifying the fundamental and documentary elements related to the analysis of technical norms and research in the field.
COURSE CONTENTS: Scientific research: defining the theoretical, applied, experimental and analytical elements; Classical and modern bibliographic research techniques on a given theme; Drawing up a bibliography; references and footnotes; Choosing the field of research and proposing a theme; Establish the main objectives within the activity; Documentation on the fundamentals of the research-design field chosen; Search engines specific to scientific research; Identifying important achievements, defining the proposed themes; Scientific report resulting from bibliographic research on a given topic; summary and keywords that characterize the theme; Content of ideas, critical analysis, personal opinions, conclusions; Presentation of scientific articles: elaboration of the presentation of the article; estimating the length of the presentation according to the time limits; designing the presentation form; preparation of the presentation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN DESIGN OF SUPPORT STRUCTURES FOR ROAD VEHICLES

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Knowledge of computing elements and aspects of design and Structures vehicle bodies; Defining the fundamental structural and constructive elementary surfaces supporting structure; Correlating static and dynamic load bearing structure analysis using special programs.
COURSE CONTENTS: Economic and technical analysis of modern automobiles constructive solutions; Interior design, optimize volumes and establish fundamental structural lines; Technical design and aerodynamic shape of a car; Solution Structures and structural elements of the body; Elements of calculating the bearing structure; Getting elasticity theory to calculate bearing structures by finite element method; Assessment of impact behaviour of automotive structures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN SYSTEMS OF MAINTENANCE AND RELIABILITY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at providing students with the basic knowledge about the maintenance and reliability of the technical systems, as well as knowledge about the management techniques of the maintenance activity are presented.
COURSE CONTENTS: Maintenance; Definition; Classification; Reliability systems; Mathematical approach of reliability; Failure of the technical systems; Total Productive Maintenance; Management methods of the maintenance activity; Modern methods for maintenance: Thermography; Vibration diagnosis of the mechanical systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MODERN SYSTEMS CLIMATE CONTROL IN TRANSPORT

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, domain
COURSE OBJECTIVE(S): The course provides students with knowledge relates to subject-specific concepts, explanation and interpretation some processes, the concepts necessary to the design of constructive solution.
COURSE CONTENTS: General concepts of technique thermodynamics; Principles of thermodynamics; Real gases; The moist air; Compressors used in air-conditioning; Refrigeration systems; Heat pumps.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH
CODE: D22OSTM429
ECTS CREDITS: 10
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE FOR DISSERTATION PREPARATION
CODE: D22CPAM430
ECTS CREDITS: 20
TYPE OF COURSE: mandatory

COURSE TITLE: PRESENTATION OF DISSERTATION THESIS
CODE: D22CPAM431
ECTS CREDITS: 10
TYPE OF COURSE: mandatory

FIELD: AUTOMOTIVE ENGINEERING
PROGRAMME TITLE: CONCEPT AND DESIGN OF MODERN AUTOMOTIVES
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED SOLUTIONS FOR VEHICLES
CODE: D22CPAM101
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Understanding and deepening of knowledge by master's degree students of the construction and operation of advanced vehicle systems. Establishment of operating conditions, vehicle operating requirements and the choice criteria as transport solutions.
COURSE CONTENTS: Power-driven vehicles - short history; Getting Started about Electric Vehicle Traction; Power storage devices; Electric vehicles with traction battery; Construction and operating of a pure electric propulsion vehicle; Hybrid cars; Classification, methods of operating, advantages of hybrid propulsion comparative with the conventional systems; Basic architectures of the hybrid propulsion chain; Hybrid chains: series, parallel and mixed.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED MODELLING AND SIMULATION TECHNIQUES IN MECHANICAL ENGINEERING
CODE: D22CPAM102
ECTS CREDITS: 5
TYPE OF COURSE: technical culture of specialty
COURSE OBJECTIVE(S): Students need to have knowledge from the following domains: Mechanics, Strength Materials, Machine Elements, Mechanical Systems Modelling Basics, Automotive Dynamics, Automotive Design and Calculations. The course aims at promoting the modern design methods, finite element modelling and analysis in the aim of solving some complex problems from Automotive Engineering. Another aim is the one that it can be develop and form, the students' ability through applications by using important modelling and analysis software (ADAMS, ANSYS, etc.). All of these are used for studying the behaviour in static and dynamic mode of subassemblies from modern auto vehicles frame.
COURSE CONTENTS: Theory of Elasticity Elements; 3D Modelling Techniques of Mechanical Systems; Mathematical Models for Finite Element Analysis in Static Mode for Mechanical Structures; Numerical Applications by Using MATLAB; Mathematical Models for Finite Element Analysis in Dynamic Mode for Mechanical Structures; Numerical Applications by Using MATLAB; Modal Analysis of Mechanical Structures; Finite Element Modelling in Contact Problems Cases; Mechanical Structures Analysis in Thermal-Structural Coupled Mode; Finite Element Modelling and Simulation of an Impact Problems on Automotive Engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZATION OF MOBILE MECHANICAL SYSTEMS
CODE: D22CPAM103
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Learning by the students of the theoretical and instrumental methods, means and procedures for the optimization of mobile mechanical systems.
COURSE CONTENTS: Kinematic and dynamics modelling by computational methods of mobile mechanical systems; General Aspects of Optimizing Problems; Numerical methods to solve minimal and maximum problems; Topological optimization (constructive) by the finite element method of mechanical structures; Solving optimization problems with and without constraints (restriction functions); Theoretical aspects on multiple objective optimization problems; Theoretical aspects regarding the stability of dynamic systems (Lyapunov stability of systems); System optimization issues; Theoretical aspects regarding the use of software for the optimization of mobile mechanical systems (ADAMS, ANSYS); Application study on the optimization of a mobile mechanical system by parametric methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED ELEMENTS OF ROAD VEHICLE DYNAMICS
CODE: D22CPAM104
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of theoretical concepts and practical concepts of kinematic and dynamic theories that define vehicle motion, advanced knowledge in the field of dynamical systems, vehicle dynamics, chaotic movements and the use of specialized computer programs or simulation of vehicle movement.
COURSE CONTENTS: Dynamical systems theory; Stability of dynamical systems; Chaotic movements: Methods of study; Shape optimization of vehicle by vehicle-air interaction study; Vehicle stability; Mathematical models used; Vehicle stability analysis; Maniable vehicles: study of maniability, criteria for assessing maniability; Using mathematical analysis software stability and

maniable vehicles; Study of maniability stability and computational simulation of vehicles through their movement.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MODERN SYSTEMS FOR MAINTENANCE OF THE ROAD VEHICLE

CODE: D22CPAM105
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts regarding training of original thinking in the field of the energies engineering, used as heat source.
COURSE CONTENTS: Interdependence Quality – Reliability; Reliability of products; Maintainability and availability of elements and technical systems; Predictive evaluation and optimization methods of maintainability; Maintenance strategy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NOT INCLUDING MOTOR VEHICLE DIAGNOSTICS

CODE: D22CPAM106
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course provides the students with the specific notions of this discipline aiming further at their application in the design of vehicle's structural components and explaining moreover advanced methods and techniques and advanced on-board and laboratory diagnostics.
COURSE CONTENTS: General principles of diagnosis vehicles; General diagnosis of motor vehicles; Main vehicle diagnostics systems; Modern diagnostic elements; Self-diagnosis and diagnosis of board (on board diagnose) – Equipment and method; Laboratory diagnosis – service (off board diagnose) - Equipment and method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RESEARCH BASICS

CODE: D22CPAM107
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the basic principles of the various methods and means of measuring the quantities that characterize the technological processes.
COURSE CONTENTS: Measurement basics; Measuring systems; Parametric and Generators transducers; Electrical Tensometry; Foto-elasticimetria; Experimental Measurement of stress and deformations; Circuits for the transducers connecting; Statistical processing of experimental data; Methods of measuring displacements; Speed measurement methods; Methods of measuring forces, moments, power, temperature, pressure; Methods and principles for measuring surface roughness; Vibration measurement methods in mechanical systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ETHICS AND ACADEMICS INTEGRITY

CODE: D22CPAM108
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22CPAM109
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Developing specific study program abilities by identifying the fundamental and documentary elements related to the analysis of technical norms and research in the field.
COURSE CONTENTS: Scientific research: defining the theoretical, applied, experimental and analytical elements; Classical and modern bibliographic research techniques on a given theme; Drawing up a bibliography; references and footnotes; Choosing the field of research and proposing a theme; Establish the main objective within the activity; Documentation on the fundamentals of the research-design field chosen; Search engines specific to scientific research; Identifying important achievements, defining the proposed themes; Scientific report resulting from bibliographic research on a given topic; summary and keywords that characterize the theme; Content of ideas, critical analysis, personal opinions, conclusions; Presentation of scientific articles: elaboration of the presentation of the article; estimating the length of the presentation according to the time limits; designing the presentation form; preparation of the presentation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: UNCONVENTIONAL SOURCES OF ENERGY

ECTS CREDITS: 5
TYPE OF COURSE: fundamental, domain
COURSE OBJECTIVE(S): The course offers students theoretical and practical concepts regarding training of original thinking in the field of the energies engineering, used as heat source.
COURSE CONTENTS: General concepts of thermodynamics; Classical and modern propulsion solutions; Use of hydrogen into internal combustion engines; Use of biofuel; Solar energy.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ADVANCED DESIGN OF SUPPORT BEARING STRUCTURES FOR ROAD VEHICLES

CODE: D22CPAM210
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge of computing elements and aspects of design and Structures vehicle bodies; Defining the fundamental structural and constructive elementary surfaces supporting structure; Correlating static and dynamic load bearing structure analysis using special programs.
COURSE CONTENTS: Economic and technical analysis of modern automobiles constructive solutions; Interior design, optimize volumes and establish fundamental structural lines; Technical design and aerodynamic shape of a car; Solution Structures and structural elements of the body; Elements of calculating the bearing structure; Getting elasticity theory to calculate bearing structures by finite element method; Assessment of impact behaviour of automotive structures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN TESTING AND CALIBRATION OF ROAD VEHICLES

CODE: D22CPAM211
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): This course provides the students with the specific knowledge and the appropriate use of specific fundamental concepts of the discipline, and explaining moreover specific methods and techniques as well as advanced calibration tests upon vehicles, aiming thus at acquiring advanced knowledge in the field of vehicle testing.
COURSE CONTENTS: Qualitative evaluation experiments and calculation errors; Electronic measuring of non-electrical quantities; Choosing and preparing vehicles for testing; Attempting vehicle handling and stability; Sources of vibration in a vehicle; Indices for assessing the quality automotive suspension; Trying sealing body; Considerations on the calibration concept vehicle; Engine calibration; Fuel calibration; Establishing specific calibration methodology vehicles; Calibration equipment necessary for vehicles.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN TECHNOLOGIES TO MANUFACTURE AND REPAIR OF ROAD VEHICLES

CODE: D22CPAM212
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Deepening modern to manufacture and repair methodologies of the vehicle.
COURSE CONTENTS: Generalities about the repair process; Determination of the necessary elements to reach the technological repair processes; Advanced materials for repair process; Actual tendencies for materials and their manufacture; Ni based super alloys; Multifunctional materials with low density; Metallic materials, „Metallic foam", type, extremely light, multiple uses; Structural and functional materials, Bio-metals (Ni-based implants); Abrasive materials; Modern methods for reconditioning of the vehicle components; Advanced technologies for shaft, bushing, pistons etc. reconditioning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CONSTRUCTIVE AND FUNCTIONAL OPTIMIZATION OF VEHICLE ENGINES

CODE: D22CPAM213
ECTS CREDITS: 7
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Assimilation by learners of: notions specific to components and internal combustion engines operation; notions specific to the thermal processes and internal combustion engines characteristics; Formation of the aptitudes necessary to determinate parameters and indices which characterize thermal processes and interpretation of engines characteristics; Formation of skills concerning engines design in terms of thermal processes and characteristics.
COURSE CONTENTS: Considerations regarding experimental research in internal combustion engines field; Modern elements of investigation, modelling and validation of thermal motors real processes; Fuel consumption reduction strategies; Modern methods of mixture formation and combustion; Variable distribution; M.A.S. modernization – courses of action; Compressing ignition engine modernization; Considerations regarding systems theory in control applications of engines intelligent management and engines control by fuzzy logic; Propulsion alternative solutions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22CPAM214
ECTS CREDITS: 7
TYPE OF COURSE: mandatory

COURSE TITLE: PRODUCT DEVELOPMENT

ECTS CREDITS: 6
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Acquiring knowledge and methods necessary for effective management of integrated product development.
COURSE CONTENTS: Products, design products, design methods; Functional analysis: objectives, implementation stages, tools; Determination of elements, methods and functions of an environmental product; Lifecycle product modelling; Product development: concepts, directions, methods, interaction time, as, medium; Development of integrated products: para-llelization, standardization, integration and integrated development methods (DFM, DFA, DFQ, DFE, DFC, DFCO); Innovative concepts TRIZ methods; Rapid product development: building the numerical model, rapid prototyping; Integrated product policy: new product features, development strategies, methods of information/ promotion.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMPUTATIONAL METHODS FOR CALCULATING INTERNAL COMBUSTION ENGINES

ECTS CREDITS: 4
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): Deepening computing and construction of internal combustion engines concepts using various computational methods of analysis real phenomena that occur in certain conditions on this type of engine.
COURSE CONTENTS: Introduction on computational solutions utilized internal combustion engines study; Mechanical stresses in the study of internal combustion engines components; Thermic stresses in the study of internal combustion engines components; Numerical and variational methods in the study of thermal, structural and harmonic components of internal combustion engines; Analysis of working conditions of internal combustion engines dynamic components; Numerical analysis for stationary processes developed in the motor mechanism; Numerical analysis for transient processes developed in the motor mechanism.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: DESIGN OPTIMIZATION OF VEHICLE'S SYSTEMS

ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Increasing knowledge on modern vehicles systems required in design and research, acquiring calculation methods, modelling and design optimization for vehicle's systems elements.
COURSE CONTENTS: Modern solutions and design optimization for axles and suspension systems, steering systems and brake systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: CONSTRUCTIVE OPTIMIZATION OF THE TRANSMISSIONS AND VEHICLES SYSTEMS

CODE: D22CPAM321
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Increasing knowledge on modern vehicles transmissions required in design and research, acquiring calculation methods, modelling and design optimization for transmission vehicle's elements.
COURSE CONTENTS: Introduction to optimization theory; Classical methods for optimum determination (problems with and without restrictions); Direct search methods for the optimal solution; Programming methods; Topological optimisation; Constructive optimisation for the mechanical clutch, mechanical gearbox, planetary shaft, suspension system, steering system and brake system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MODERN ELECTRIC AND ELECTRONICS SYSTEMS FOR ROAD VEHICLES

CODE: D22CPAM322
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Student training in the field of modern electronic systems for road vehicles.
COURSE CONTENTS: Devices and electronic circuits used in road vehicles; Electronic equipment for engine control: Spark ignition engine control; Diesel engine control; Electronic equipment for transmission control; Control of automatic transmission; Suspension control; Steering system control with servomotor; Electronic equipment for control and measurement of the system control: Complex electronic measuring system; Electronic equipment for control of auxiliary systems: door lock control; Windscreen wiper control.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: QUALITY ENGINEERING
CODE: D22CPAM323
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: ANALYSIS OF VEHICLE VIBRATION
CODE: D22CPAM324
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: THE ERGONOMICS OF THE DRIVER-VEHICLE SYSTEM
CODE: D22CPAM325
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Acquiring basic notions about noise and vibrations occurring in motor vehicles, forming general skills to use information provided by noise for technical defects. The discipline aims to get students familiarized with basic concepts of ergonomics and with specific design and ergonomic organization of vehicles and their effects on the automobile driver.
COURSE CONTENTS: Characteristics of noise and vibration; Definitions, classifications; Sound level, decibel; Effects of wind and temperature on noise propagation; Reflection, refraction and diffraction of sound; Physiological features of sound; Effects of noise and vibrations on the body and human activity; Hearing and extra-auditory effects; Vibration assessment criteria; Definition and principles of ergonomics; Organizing of the interior of the vehicle; Additional systems that enhance driving position ergonomics; Mathematical models for vehicle vibration study; Linear links; Model with one degree of freedom to study vehicle vibration; Vibrations of the suspended mass produced by the harmonics of the tread; Sound-absorbing and sound-absorbing materials; Porous absorbers with rigid or flexible skeleton; Simple and grouped resonators absorbents type; Vibrating membranes; Compound structures; Vibration reduction methods for motor vehicles; Metallic sprigs; Vibro-insulating rubber parts; Vibro-isolation elements of hard polyurethane; Vibro-insulating elements of wire mesh; Vibro-insulating pneumatic elements; Vibration measurement transducers; Parametric transducers (capacitive, electromagnetic, resistive); Noise transducers; Piezoelectric microphones; Condenser microphones; Ergonomic design of vehicles; Ergonomic organization of vehicle cabin.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ANALYSIS AND RECONSTRUCTION OF THE TRAFFIC ACCIDENT
CODE: D22CPAM326
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Learning by students of the elements specific to the road traffic accident analysis; Developing the skills required to reconstruct a traffic accident.
COURSE CONTENTS: Basic problems of the traffic accident reconstruction; Identification and taking of the traces for traffic accident expertise; Ways to reconstruction of the Kinematics and dynamics sizes of the vehicles involve in traffic accidents; Human factor and traffic accident; Pedestrian accident expertise; Modelling and simulation in the reconstruction of traffic accidents.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE
CODE: D22CPAM327
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding training of original thinking in the field of the energies engineering, used as heat source.
COURSE CONTENTS: General concepts of thermodynamics; Classical and modern propulsion solutions; Use of hydrogen into internal combustion engines; Use of biofuel; Solar energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH
CODE: D22CPAM428
ECTS CREDITS: 10
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course offers the students theoretical and practical concepts regarding training of original thinking in the field of the energies engineering, used as heat source.
COURSE CONTENTS: General concepts of thermodynamics; Classical and modern propulsion solutions; Use of hydrogen into internal combustion engines; Use of biofuel; Solar energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE FOR DISSERTATION PREPARATION

CODE: D22CPAM429
ECTS CREDITS: 20
TYPE OF COURSE: mandatory

COURSE TITLE: PRESENTATION OF DISSERTATION THESIS

CODE: D22CPAM430
ECTS CREDITS: 10
TYPE OF COURSE: mandatory

FIELD: INDUSTRIAL ENGINEERING
PROGRAMME TITLE: OPTIMISATION OF TECHNOLOGICAL PROCESSES AND EQUIPMENT
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED TECHNIQUES FOR MATERIALS INVESTIGATING

CODE: D22OPEM101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge of the main materials analysis techniques, metallic and advanced, with the help of which their properties are highlighted. The manufacturing technologies, properties, structure, defects and characteristic transformations of materials are analysed.
COURSE CONTENTS: Properties and Material Testing; Advanced techniques for obtaining metallic samples; Modern techniques for measuring the temperature of metallic materials; Modern techniques for studying the phases and metallographic constituents; Spectrometric analysis; X-ray diffraction analysis; Modern optical microscopy; Quantitative metallographic determinations; Techniques of investigation by electronic microscopy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROCESSES FOR JOINING OF ADVANCED MATERIALS

CODE: D22OPEM102
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The presentation of the terminology specific to the modern joining processes and the materials used; Understanding the notions of weldability of materials and principles underlying each joining process.
COURSE CONTENTS: Classification of advanced materials; Classification of joining procedures (EN, AWS); The physical model of melt welding; The physical model of the bonding process; Modern processes for joining of the advanced materials; Particularities regarding the joining of advanced materials; Quality assurance for joining of advanced materials.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROGRAMMING OF THE PRODUCTION SYSTEMS WITH NUMERICAL CONTROL

CODE: D22OPETM103
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical basics to programming CN production systems, respectively knowing the G-code programming language ISO.
COURSE CONTENTS: Introduction; Definitions; Activities performed before encoding information; Types of phrases; The format of a phrase; References Systems; Axes and movements of MUCN; Functions G04 and G09, respectively G00, G01, G02, G03; Description; Format phrase; Examples; Application to machining centres by milling and turning; Group 02 functions (XY, XZ, YZ work plan selection): G17, G18 and G19; Group 03 functions: Absolute/ incremental machining (G90/ G91); Group 07 functions: G40, G41 and G42; Canned cycles: Drilling: G73, G81, G82, G83; Threading: G74 and G84; Bore cycles: G85, G86, G87, G88, G89; G80 cancellation function; Cycles for frontal grooving and drilling and chips breaking, Function G74; Repetitive Turning Cycles, Functions G71, G72 and G73; Finishing Cycle, Function G70; Functions M35; G84 and M35 – G88 functions for rigid threading; M98 and M99 functions; Activate/ deactivate axis C; Functions M10-M11 (M19-M20); Interpolation in Polar Coordinates, X-C, Turning, Functions G112 and G113; Z-C axis cylindrical interpolation in turning, Machining using B axis, Functions M91 and M92 – deactivation and activation of the B axis; Functions M61, M62; Functions M64 and M65.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: RESEARCH BASICS

CODE: D22OPEM104
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the basic principles of the various methods and means of measuring the quantities that characterize the technological processes.
COURSE CONTENTS: Measurement basics; Measuring systems; Parametric and Generators transducers; Electrical Tensometry; Foto-elasticimetria; Experimental Measurement of stress and deformations; Circuits for the transducers connecting; Statistical processing of experimental data; Methods of measuring displacements; Speed measurement methods; Methods of measuring forces, moments, power, temperature, pressure; Methods and principles for measuring surface roughness; Vibration measurement methods in mechanical systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ETHICS AND ACADEMICS INTEGRITY

CODE: D22OPEM105
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22OPEM106
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowing the terminology specific to the research activity, how to make a complex technical documentation and how to draw up and draft a research project.
COURSE CONTENTS: Introduction; Basic concepts of scientific research; Terminology; National and European legislation; The general model of a research project; Thematic orientations in European research; European platforms, priority axes; Management of the research project; The ways to capitalize on research results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22OPEM212
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowing the terminology specific to the research activity, how to make a complex technical documentation and how to draw up and draft a research project.
COURSE CONTENTS: Introduction; Basic concepts of scientific research; Terminology; National and European legislation; The general model of a research project; Thematic orientations in European research; European platforms, priority axes; Management of the research project; The ways to capitalize on research results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTEGRATED DESIGN OF THE CUTTING TOOLS

CODE: D22OPEM107
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To transfer to the students the practical and theoretical knowledge about the storage, manipulation and pre-setting the tolling systems for CNC machining centres. For this purpose the tolling systems are defined, classified, and, then, aspects regarding the design are presented.
COURSE CONTENTS: Special tools for CNC machining centres; Tolling systems for CNC machining centre (for CNC lathes machines, for VMC); Methods and systems for the tool pre-setting; Tolls storages systems; Tool codification.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED TECHNOLOGIES IN POWDER METALLURGY

CODE: D22OPEM208
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts on technology development of powder metallurgy parts.
COURSE CONTENTS: Methods of making metal powders; physical, chemical, mechanical and technological properties of powders; methods of compaction of powders; sintering the compacted raw products; operations after sintering; powder metallurgy parts: bearings, filters, brushes, magnets, electrical contacts, dental implants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: QUALITY ENGINEERING

ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical concepts for the formation of advanced knowledge and practical skills to use modern methods of quality control. The aim of the course is to acquire contemporary computer technology for quality control and analysis of manufacturing processes, and, also, theoretical and practical skills training using modern methods of statistical quality control.
COURSE CONTENTS: Indices of quality; Measurement methods of quality indicators; Statistical Methods of Quality Control; Fundamentals of Statistics: Concepts, Sightings, structuring and presenting of statistical series; Statistical methods of quality control; Statistical Methods for regulating processes; Key Aspects of Control Processes; Methods for calculating reliability indices based on test trials; Current quality control; Statistical Process Control – SPC; Aspects about Process Quality Control – PQC; Methods for Solving of Quality Troubleshooting; Process Capability; Performance and Improvement.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LOGISTICS

CODE: D22OPEM211
CREDIT POINTS: 5
TYPE OF DISCIPLINE: optional
COURSE OBJECTIVE(S): The main objective of this course is making an analysis in a coherent approach of the logistic system of a factory, the material fluxes, the delivery circuits and storage networks, together with the study of network locations.
COURSE CONTENTS: Logistic system; Activities, structure and functions; Elaborating the manipulation, storage and intern transport technologies; Concepts of designing the disposal of logistic system components; Forming of the packed load units; Design elements; Forming the pallet loadings units, containerized and trans-containerized; Storages, deposit systems and technical organisational activities; Functions of logistic storage subsystem; The coordination of logistic storage subsystems with working subsystems; Mechanization, automation and robotisation of internal transport processes; Mechanical and automated conveyor; Special transport equipment; Road transportation systems; Road, railway maritime and fluvial transportation systems; Optimizing transport itineraries; Time of manufacturing cycle; Aspects of synchronising operations; The distribution of material fluxes within the logistic system; Location problem inside the internal logistic system.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: EXPERIMENTS PROGRAMMING AND EXPERIMENTAL DATA ANALYSIS

ECTS CREDITS: 8
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The main purpose of the course is the assimilation of the MA students of the knowledge and the skill required for the experiments planning, obtaining, processing and analysis of the experimental data, but also the presentation of the research results.
COURSE CONTENTS: Concepts specific to experimental strategy; Elements of statistics and probability for experimental data analysis; The mathematics basics of ANOVA method; Mathematical elements of empirical modelling; Integer factorial experimental programs at two factorials levels; Central, compounded, spinning experimental programs; Factorial experiments of higher order made after the Latin, Greek-Latin squares method and for factors with different number of levels; Optimization methods for the results obtained in a factorial experiment; Measuring data analysis; Empirical formulas choosing and parameters estimation; The presentation of the research results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SIMULATION OF THE INTEGRATED PRODUCTION SYSTEMS

CODE: D22OPEM319
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims to familiarize students with the components, devices, systems control and programming of robots, automated storage, automated guided vehicle systems integrated manufacturing systems. It presents modelling and simulation software organization and operation of integrated interoperable logistics flows in advanced manufacturing systems.
COURSE CONTENTS: Notions of systems theory; Artificial intelligence elements used in integrated production systems; CIM Hyper-system; Concept design and technology aided integrated manufacturing systems; Flexible manufacturing systems; Automatic deposits of integrated production systems; Robot integrated manufacturing systems; Automated guided vehicle systems integrated manufacturing systems; Quality assurance and testing of computer aided; Interoperable logistics applications integrated production systems; Modelling and simulation of computer-aided manufacturing; Modelling and simulation of a flexible manufacturing system using computer modelling systems; POST principles CIM; Notions of systems theory; Artificial intelligence elements used in integrated production systems; Simulation of integrated manufacturing systems and interoperable logistics flows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZATION OF THE TECHNOLOGICAL PROCESSES

CODE: D22OPEM320
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Acquiring the necessary knowledge to optimize the technological process.
COURSE CONTENTS: Methods of assessing the machinability by cutting the materials in order to optimize the technological processes; Methodology of determining the necessary restrictive relationships for optimization; Optimization of different machining processes; Criteria for optimizing the cutting parameters; Methods for solving linear and nonlinear optimization problems; Methods of determining the optimal technological process.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZATION METHODS OF TECHNOLOGICAL PROCESSES

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialised
COURSE OBJECTIVE(S): The course teaches students theoretical and practical knowledge regarding the technological manufacturing processes optimization.
COURSE CONTENTS: Optimization directions of technological processes; Formulas used at technological processes optimization; Optimization methods; Optimization problems specific to manufacturing technological processes design; Optimization problems specific to technological processes research; Adaptive optimization of the manufacturing technological processes; The most optimal manufacturing technological process determination.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THE OPTIMISATION OF RECONDITIONING PROCESS

CODE: D22OPEM321
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The course presents the ways of reconditioning and recycling of reusable materials with direct implication in technology's design and equipment for obtaining basic materials, from waste.
COURSE CONTENTS: Reconditioning and recycling metallic waste from machine industry; Specific technological process; Recycling of foundry compounds and caste iron and steel waste; Recycling of grinding cuttings; Reconditioning and recycling for textile and glass fibres; Reconditioning and recycling for waste paper; Reconditioning and recycling of plastics and polymers from rubber tyre; Reconditioning and recycling of garbage; Parts' recycling by restoring, disturbance of pieces type: shaft, bushing, gab, gear pinion; Reconditioning of pieces type carcass using HELI-COIL and METALOCK methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INJECTION MOULDING TECHNOLOGIES

CODE: D22OPEM322
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To provide the students all the knowledge of designing injection moulds for plastic parts, as well as those needed to model the flow in these moulds.
COURSE CONTENTS: Injection system, roll and component of the mould and injection machine; Appropriate design of parts to be made by plastic injection; Choosing the material; Determining process parameters and the feeding system; Establishing the separation plan, treating internal voids, determining the cavity and core volumetry; Simulation of the flow process in the mould, quality parameters; Determining the ejection of the piece; Design of auxiliary mechanisms; Calculation of the cooling system, and strength calculation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: OPTIMIZATION OF MOBILE MECHANICAL SYSTEMS

CODE: D22OPEM324
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Learning by the students of the theoretical and instrumental methods, means and procedures for the optimization of mobile mechanical systems.
COURSE CONTENTS: Kinematic and dynamics modelling by computational methods of mobile mechanical systems; General Aspects of Optimizing Problems; Numerical methods to solve minimal and maximum problems; Topological optimization (constructive) by the finite element method of mechanical structures; Solving optimization problems with and without constraints (restriction functions); Theoretical aspects on multiple objective optimization problems; Theoretical aspects regarding the stability of dynamic systems (Lyapunov stability of systems); System optimization issues; Theoretical aspects regarding the use of software for the optimization of mobile mechanical systems (ADAMS, ANSYS); Application study on the optimization of a mobile mechanical system by parametric methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22OPEM325
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowing the terminology specific to the research activity, how to make a complex technical documentation and how to draw up and draft a research project.
COURSE CONTENTS: Introduction; Basic concepts of scientific research; Terminology; National and European legislation; The general model of a research project; Thematic orientations in European research; European platforms, priority axes; Management of the research project; The ways to capitalize on research results.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH

CODE: D22OPEM426
ECTS CREDITS: 10
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE FOR DISSERTATION PREPARATION

CODE: D22OPEM427
ECTS CREDITS: 20
TYPE OF COURSE: mandatory

FIELD: ENGINEERING AND MANAGEMENT
PROGRAMME TITLE: PRODUCTION AND LOGISTICS MANAGEMENT
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: RESEARCH BASICS

CODE: D22MPLM101
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the basic principles of the various methods and means of measuring the quantities that characterize the technological processes.
COURSE CONTENTS: Measurement basics; Measuring systems; Parametric and Generators transducers; Electrical Tensometry; Foto-elasticimetria; Experimental Measurement of stress and deformations; Circuits for the transducers connecting; Statistical processing of experimental data; Methods of measuring displacements; Speed measurement methods; Methods of measuring forces, moments, power, temperature, pressure; Methods and principles for measuring surface roughness; Vibration measurement methods in mechanical systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PROGRAMMING OF THE PRODUCTION SYSTEMS WITH NUMERICAL CONTROL

CODE: D22MPLM102
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course provides students with theoretical and practical basics to programming CN production systems, respectively knowing the G-code programming language ISO.
COURSE CONTENTS: Introduction; Definitions; Activities performed before encoding information; Types of phrases; The format of a phrase; References Systems; Axes and movements of MUCN; Functions G04 and G09, respectively G00, G01, G02, G03; Description; Format phrase; Examples; Application to machining centres by milling and turning; Group 02 functions (XY, XZ, YZ work plan selection): G17, G18 and G19; Group 03 functions: Absolute/ incremental machining (G90 / G91); Group 07 functions: G40, G41 and G42; Canned cycles: Drilling: G73, G81, G82, G83; Threading : G74 and G84; Bore cycles: G85, G86, G87, G88, G89; G80 cancellation function; Cycles for frontal grooving and drilling and chips breaking, Function G74; Repetitive Turning Cycles, Functions G71, G72 and G73; Finishing Cycle, Function G70; Functions M35; G84 and M35 – G88 functions for rigid threading; M98 and M99 functions; Activate/ deactivate axis C; Functions M10-M11 (M19-M20); Interpolation in Polar Coordinates, X-C, Turning, Functions G112 and G113; Z-C axis cylindrical interpolation in turning; Machining using B axis, Functions M91 and M92 – deactivation and activation of the B axis; Functions M61, M62; Functions M64 and M65.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED TECHNIQUES FOR MATERIALS INVESTIGATING

CODE: D22MPLM104
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge of the main materials analysis techniques, metallic and advanced, with the help of which their properties are highlighted. The manufacturing technologies, properties, structure, defects and characteristic transformations of materials are analysed.
COURSE CONTENTS: Properties and Material Testing; Advanced techniques for obtaining metallic samples; Modern techniques for measuring the temperature of metallic materials; Modern techniques for studying the phases and metalo-graphic constituents; Spectrometric analysis; X-ray diffraction analysis; Modern optical microscopy; Quantitative metallographic determinations; Techniques of investigation by electronic microscopy.
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ETHICS AND ACADEMICS INTEGRITY

CODE: D22MPLM105
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22MPLM106
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowing the terminology specific to the research activity, how to make a complex technical documentation and how to draw up and draft a research project.
COURSE CONTENTS: Introduction; Basic concepts of scientific research; Terminology; National and European legislation; The general model of a research project; Thematic orientations in European research; European platforms, priority axes; Management of the research project; The ways to capitalize on research results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

1ST YEAR, 1ST SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22MPLM213
ECTS CREDITS: 7-2nd semester
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowing the terminology specific to the research activity, how to make a complex technical documentation and how to draw up and draft a research project.
COURSE CONTENTS: Introduction; Basic concepts of scientific research; Terminology; National and European legislation; The general model of a research project; Thematic orientations in European research; European platforms, priority axes; Management of the research project; The ways to capitalize on research results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRODUCTION MANAGEMENT

CODE: D22MPLM207
ECTS CREDITS: 4
TYPE OF COURSE: mandatory

COURSE TITLE: QUALITY ENGINEERING

CODE: D22MPLM208
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Students' understanding of the concepts, principles, techniques and quality tools for the continuous improvement of the activity of an organization in order to fulfil the policy and objectives.
COURSE CONTENTS: Introduction in theory and quality management; Managerial techniques – quality management systems; (ISO 9000 model; Total Quality Management; Six Sigma; Lean Manufacturing); Traditional technical techniques of quality (Histogram; Pareto diagram, Fishbone diagram etc.); Modern techniques of quality management; Other quality improvement techniques.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: LOGISTICS

CODE: D22MPLM209
CREDIT POINTS: 5
TYPE OF DISCIPLINE: mandatory
COURSE OBJECTIVE(S): The main objective of this course is making an analysis in a coherent approach of the logistic system of a factory, the material fluxes, the delivery circuits and storage networks, together with the study of network locations.
CONTAINT: Logistic system; Activities, structure and functions; Elaborating the manipulation, storage and intern transport technologies; Concepts of designing the disposal of logistic system components; Forming of the packed load units; Design elements; Forming the pallet loadings units, containerized and trans-containerized; Storages, deposit systems and technical organisational activities; Functions of logistic storage subsystem; The coordination of logistic storage subsystems with working subsystems; Mechanization, automation and robotisation of internal transport processes; Mechanical and automated conveyor; Special transport equipment; Road transportation systems; Road, railway maritime and fluvial transportation systems; Optimizing transport itineraries; Time of manufacturing cycle; Aspects of synchronising operations; The distribution of material fluxes within the logistic system; Location problem inside the internal logistic system.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: METHODS AND ALGORITHMS FOR OPTIMIZATION OF ECONOMICAL PROCESSES IN INDUSTRY

CODE: D22MPLM210
ECTS CREDITS: 5
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers students and graduate students the theoretical and practical basis for modelling, simulation and optimization of the economic processes and their results. The course focuses on: initiating students into decision and strategic management; emphasising the role of product shape to promote sales, knowledge about right concepts regarding free market, creative thinking.
COURSE CONTENTS: The mechanism of decision; Decision steps; Methods for adopting decision in risk and uncertainty conditions; Original and cardinal methods; Algorithms for approving invoices for payment; Planning and prognosis methods; Algorithms and methods for transportation problems; Linear programming method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: COMMERCIAL MANAGEMENT

CODE: D22MPLM212
ECTS CREDITS: 4
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The course explains the relevant concepts of commercial management. It also presents some fundamental categories specific to commercial management and launches proposals for debate and comments on ideas and statements.

COURSE CONTENTS: Conceptual aspects of the commercial field; The Impact of New Influential Factors of Global Trade Evolution on Commercial Management; The dimensions of the concept of commercial management; Principles and functions of commercial management; Demand and supply of goods; Delivery of the goods; Management of commercial services; Consumer satisfaction – a fundamental objective of commercial management; Methods and tools for assuring the quality of products and services within commercial companies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: PRODUCT DEVELOPMENT
CODE: D22MPLM320
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Acquiring knowledge and methods necessary for effective management of integrated product development.
COURSE CONTENTS: Products, design products, design methods; Functional analysis: objectives, implementation stages, tools; Determination of elements, methods and functions of an environmental product; Lifecycle product modelling; Product development: concepts, directions, methods, interaction time, as, medium; Development of integrated products: parallelization, standardization, integration and integrated development methods (DFM, DFA, DFQ, DFE, DFC, DFCO); Innovative concepts TRIZ methods; Rapid product development: building the numerical model, rapid prototyping; Integrated product policy: new product features, development strategies, methods of information/ promotion.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SIMULATION OF THE INTEGRATED PRODUCTION SYSTEMS
CODE: D22MPLM321
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course aims at helping students get familiar with the components, devices, systems control and programming of robots, automated storage, and automated guided vehicle systems integrated manufacturing systems. It presents modelling and simulation software organization and operation of integrated interoperable logistics flows in advanced manufacturing systems.
COURSE CONTENTS: Notions of systems theory; Artificial intelligence elements used in integrated production systems; CIM Hyper-systems; Concept design and technology aided integrated manufacturing systems; Flexible manufacturing systems; Automatic deposits of integrated production systems; Robot integrated manufacturing systems; Automated guided vehicle systems integrated manufacturing systems; Quality assurance and testing of computer aided; Interoperable logistics applications integrated production systems; Modelling and simulation of computer-aided manufacturing; Modelling and simulation of a flexible manufacturing system using computer modelling systems; POST principles CIM; Notions of systems theory; Artificial intelligence elements used in integrated production systems; Simulation of integrated manufacturing systems and interoperable logistics flows.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZATION OF THE TECHNOLOGICAL PROCESSES
CODE: D22MPLM322
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Acquiring the necessary knowledge to optimize the technological process.
COURSE CONTENTS: Methods of assessing the machinability by cutting the materials in order to optimize the technological processes; Methodology of determining the necessary restrictive relationships for optimization; Optimization of different machining processes; Criteria for optimizing the cutting parameters; Methods for solving linear and nonlinear optimization problems; Methods of determining the optimal technological process.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MANAGEMENT OF INDUSTRIAL PROJECTS
CODE: D22MPLM323
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course teaches students about the principles, rules, methods and techniques of project management. The students will develop the skills needed for design and implementation of industrial projects.
COURSE CONTENTS: Introduction to project management; Types of project management organisation; Steps and processes of the project; Project planning; Concepts used in project planning; Human resources needed for the project; Project risk management; Project quality management; Invention management in research and development projects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZATION OF MOBILE MECHANICAL SYSTEMS

CODE: D22MPLM324
ECTS CREDITS: 6
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Learning by the students of the theoretical and instrumental methods, means and procedures for the optimization of mobile mechanical systems.
COURSE CONTENTS: Kinematic and dynamics modelling by computational methods of mobile mechanical systems; General Aspects of Optimizing Problems; Numerical methods to solve minimal and maximum problems; Topological optimization (constructive) by the finite element method of mechanical structures; Solving optimization problems with and without constraints (restriction functions); Theoretical aspects on multiple objective optimization problems; Theoretical aspects regarding the stability of dynamic systems (Lyapunov stability of systems); System optimization issues; Theoretical aspects regarding the use of software for the optimization of mobile mechanical systems (ADAMS, ANSYS); Application study on the optimization of a mobile mechanical system by parametric methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): written/ oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: D22MPLM326
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowing the terminology specific to the research activity, how to make a complex technical documentation and how to draw up and draft a research project
COURSE CONTENTS: Introduction; Basic concepts of scientific research; Terminology; National and European legislation; The general model of a research project; Thematic orientations in European research; European platforms, priority axes; Management of a research project; The ways to capitalize on research results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH

CODE: D22MPLM427
ECTS CREDITS: 10
TYPE OF COURSE: mandatory
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: PRACTICAL STAGE FOR DISSERTATION PREPARATION

CODE: D22MPLM428
ECTS CREDITS: 20
TYPE OF COURSE: mandatory

FIELD: MECHANICAL ENGINEERING
PROGRAMME TITLE: MODELLING AND SIMULATION IN MECHANICAL ENGINEERING
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ETHICS AND ACADEMICS INTEGRITY

CODE: D23MSIM101
ECTS CREDITS: 4
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Learning by the students of concepts, theories, criteria and principles regarding the general and fundamental notions of academic integrity.
COURSE CONTENTS: Ethics and morality in scientific research and creation; Misconduct in science; Intellectual property and copyright; European and international regulations; The Bern Convention of 1886 and subsequent regulations; EU legislation on intellectual property; Romanian Legislation in the Field of Intellectual Progression; Pecuniary and criminal penalties; General Code of Ethics in Scientific Research.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FINITE ELEMENT ANALYSIS I

CODE: D23MSIM102
ECTS CREDITS: 8
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objective is the acquisition by the Master students of the theoretical methods, means and methods of analysis with finite elements of the mechanical structures and of the mobile mechanical systems.
COURSE CONTENTS: Numerical methods in computational mechanics; Computer design elements in AUTOCAD and Mechanical Desktop; General procedures in the finite element method; Polynomial Interpolation; Matrix of stiffness; Modelling with finite elements in static regime of the elastic structures; Theoretical aspects; Modelling with finite elements in dynamic regime of the elastic structures; Theoretical aspects; The finite element in dynamic modal analysis; Theoretical aspects regarding the use of software for the optimization of mobile mechanical systems (ADAMS, ANSYS); Application study on the optimization of a mobile mechanical system by parametric methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: CAD/ CAM SYSTEMS. APPLICATIONS IN MECHANICAL ENGINEERING

CODE: D22CPAM103
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course allows the accumulation of useful knowledge regarding the use of integrated CAD/ CAM systems.
COURSE CONTENTS: Introduction; Definitions; Integrating industrial activities with computer in the current context; The life cycle; Linear and simultaneous approach; Computer aided design; Evolution of design systems; CAD/ CAPP/ CAM concepts; The place and role of computer aided design and manufacturing in the production of goods; Design in the current context The structure and components of a CAD/ CAPP/ CAM system; Types of decisions; Types of actions; Integration of design and manufacturing; Computer-aided design of the technological processes; Introduction; Stages in applying the CAPP concept; Methods of conception of the machining process; Variants and generative methods; Types of entities in product modelling; Model of the manufacturing process; Representation of the parts based on the form technological elements; Group technology; Coding and classification.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FUNDAMENTALS OF BIOMEDICAL ENGINEERING

CODE: D23MSIM104
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the main features of the equipment used in medical bioengineering, assistive equipment and the techniques and processes of adaptive design of assistive equipment based on measured anthropometric and cinematic data.
COURSE CONTENTS: Elements of functional anatomy and articular physiology; Elements of kinematics of human motion; Methods and techniques for measuring the parameters of human motion; Assistive devices: Classification; Characteristics; Methods and techniques and equipment for measuring electrical activity in the muscle; Modelling human motion using experimentally measured data; Custom design elements for an assistive device.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FUNCTIONING OF THERMAL SYSTEMS WITH SLIDING PARAMETERS

CODE: D23MSIM105
ECTS CREDITS: 6
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): Knowledge by the students of the thermodynamics processes.
COURSE CONTENTS: General methods for thermodynamics analysis of the thermal processes; thermodynamics of the real gas; entropy and

exergy; Gas dynamics, flowing through nozzles; steam thermal machines; the vaporization process; the condensation process; vapour thermodynamic diagrams; steam generators; steam machines; thermodynamic cycles; Heat exchangers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: -
ECTS CREDITS: -
TYPE OF COURSE: -

1ST YEAR, 2ND SEMESTER

COURSE TITLE: FINITE ELEMENT ANALYSIS II

CODE: D23MSIM207
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The main objective is the acquisition by Master's Degree students of the theoretical methods, means and methods of analysis with finite elements of the mechanical structures and of the mobile mechanical systems.
COURSE CONTENTS: Finite element modelling of mobile mechanical systems; Finite element method in modal - dynamic analysis; Finite element method in thermal transfer analysis; Finite element method in fluid mechanics; Finite element method in structural optimization.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: COMPUTATIONAL METHODS IN MECHANISMS THEORY

CODE: D23MSIM208
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Students will develop an attitude of analysis, interpretation and choice of the possibilities to modelling the mechanical systems, as well as solving the problems arising in the industrial practice, from a holistic perspective.
COURSE CONTENTS: Introduction to computational modelling of mechanical systems; Ways to obtain descriptive mathematical models for different mobile mechanical systems – Newton formalism; Ways to obtain descriptive mathematical models for various mobile mechanical systems – Lagrange formalism; Numerical algorithms and methods with applicability in solving mathematical models attached to mobile mechanical systems; Use of finite element method in the dynamic modelling of mechanical systems; Special problems of mechanics – computational modelling (collisions, shocks, deformable elements, contact, composite structures, biomechanical structures, etc.).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MODELLING OF SPECIAL MECHANICAL TRANSMISSIONS

CODE: D23MSIM209
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge by the students of aspects specific to numerical computation with applicability to the study of kinematics and dynamics of mechanical transmissions; the use of software packages applicable in the field (numerical analysis programs, finite element programs).
COURSE CONTENTS: Concepts of structure and topology of mechanical transmissions; Kinematic analysis of mechanical transmissions Transfer functions; algorithms for kinematic analysis of mechanical transmissions; Mechanical transmission kinematics optimization: Mechanical transmission kinematics sources Algorithms for optimizing kinematic synthesis of mechanical transmissions; Kinetostatic modelling of mechanical transmissions: Mechanical transmission yield: Algorithms to optimize mechanical transmission efficiency; Experimental analysis of mechanical transmissions: Using results from the experimental analysis of mechanical transmissions to optimize them.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MODELLING AND SIMULATION OF PRODUCTION PROCESSES

CODE: D23MSIM210
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Integrating of the engineering knowledge to develop and implement advanced production strategies, design, model and simulate production systems.
COURSE CONTENTS: Production systems; Types of production systems; Flexible manufacturing systems; Lean manufacturing; Toyota's just-in-time production system, Kanban; Problems of modelling of production systems; Conception; Classification; The issue of simulation of production systems: Characteristics and concepts; Optimization of production systems; Surface response method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PROJECT MANAGEMENT IN MECHANICAL ENGINEERING

CODE: D23MSIM211
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): To provide specific information for the preparation by the students a proper management of projects.
COURSE CONTENTS: Fundamental notions about project; Project management; Project manager;

Triple constraint in project management; Typology, classification, project particularities; Project management phases: Life cycle, project objectives, project entities, organization structure; Project initialisation; Requirement report; Project proposal; The responsibility allocation matrix; Project planning; Risk management; Risk identification; Risk analysis and mitigation; Presentation of the general budget on the chapters of papers; Technical documentation, technical design, execution details.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: -
ECTS CREDITS: -
Type of Course: -

2ND YEAR, 1ST SEMESTER

COURSE TITLE: MODELLING AND SIMULATION IN BIOMECHANICS

CODE: D23MSIM315
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Presentation of the biological constitutive structures of the human musculoskeletal system, presentation of the analytical, numerical and experimental methods of kinematic and dynamics analysis for the motion of the human body and for the analysis of structures and biomechanical systems used in the rehabilitation of human motions.
COURSE CONTENTS: Introduction to biomechanics; Biomechanics of hard tissue and joints of the human musculoskeletal system; Numerical modelling and simulations of the biomechanical behaviour of the human joints; Structural and kinematic modelling and simulations of the kinematic chains of the human osteo-articular system; Experimental methods, acquisition and processing systems used for human biomechanical assessments; Modelling and simulations of the prosthetic and orthotic systems used for the rehabilitation of human joints motions; Modelling and simulation of implants used for fracture osteo-synthesis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: DESIGN AND OPTIMISATION IN RAPID PROTOTYPING

CODE: D23MSIM316
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Introduction into the processing by 3D printing technologies of metal or plastic parts and the realization of the specific constructive design.
COURSE CONTENTS: Introduction to Rapid Prototyping of Plastic Parts; Introduction to Rapid Prototyping of Metal Parts; Designing parts for rapid prototyping; Topological optimization; Introduction to the use of TOSCA software for topological optimization; Case study: Design and optimization of a plastic piece; Case study: Design and optimization of a metallic part.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: NUMERICAL MODELLING OF HEAT TRANSFER PHENOMENA

CODE: D23MSIM317
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The objective of the discipline is to convey to the students all the necessary knowledge for modelling and simulation of heat transfer phenomena in thermal equipment and installations.
COURSE CONTENTS: Numerical modelling of thermal constitutive laws; Obtaining and expressing thermal constitutive laws; Numerical approximation methods by interpolation; Lagrange polynomials, Newton and Newton – Gregory polynomials; Numerical integration methods; The Newton – Cotes and Gauss – Legendre method; Numerical methods for solving nonlinear and transcendent equations; Numerical Applications – Modelling the variation of water density in a thermal field; Numeric Applications – Numerical integration of the thermal conductivity of a nuclear fuel; Numerical Applications – Determination of friction coefficient when flowing through pipelines; Numerical modelling of thermal radiation processes in outbreaks; Basic elements and working hypotheses in the study of heat transfer by radiation; Modelling with finite volumes of heat transfer through radiation; Numerical and graphical methods for the calculation of transient thermal conduction; Graf-analytical methods; Numerical methods for solving the transient thermal conduction; Finite element method in heat transfer.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: ADVANCED SYSTEMS IN ROAD VEHICLES AND TRANSPORT ENGINEERING

CODE: D23MSIM 318
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S) Developing scientific and professional skills in the field of Mechanical Engineering from the perspectives of the design and

integration of road vehicles in modern transport systems.

COURSE CONTENTS: Advanced systems in the field; Development, conceptual-functional particularities; Trends of evolution; Engines for motor vehicles; Highlights of constructive-functional optimizations; Engines for motor vehicles; Principles of optimization of thermoelectric systems; Engines for motor vehicles; Modelling techniques based on numerical computing programs; Simulation of processes in thermo-technical systems; Investigation techniques for modelling validation; Requirements and design criteria imposed on propulsion systems of cars derived from functional conditions; Criteria for optimizing and modelling the behaviour of propulsion systems of cars; Simulations associated with optimization criteria defined in propulsion systems; The virtual model and functional model of the propulsion system; Research methodology at the level of propulsion systems; Issues of urban mobility in transport systems; Modelling at microscopic level in traffic flows; Vehicle Tracking Models; Models of vehicle arrival; Models of intervals between vehicles; Modelling, Simulation, and Assessment for Road Flows; Research methods and equipment used in transport engineering and traffic engineering.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MECHANICS OF COMPOSITE MATERIALS

CODE: D23MSIM 319

ECTS CREDITS: 5

TYPE OF COURSE: optional

COURSE OBJECTIVE(S): To teach students the main mechanical characteristics of the composite materials; To promote the use of these advanced materials in various fields of activity.

COURSE CONTENTS: Composite materials: definitions and types; Mechanical behaviour; Some elastic characteristics of composite bars; Determination of modulus of elasticity based on modal analysis of composite materials with random distribution of reinforcement; Using the spectral decomposition of the elastic matrix to calculate the elastic properties of a composite bar; Theoretical mathematical models for the determination of breaking strength and modulus of elasticity for composite plates with random distribution of the reinforcement; Nonlinearities in the mechanical behaviour of composite materials; Vibration study for composite bars that are in a flat motion.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SCIENTIFIC RESEARCH/ PRACTICE

CODE: -

ECTS CREDITS: -

TYPE OF COURSE: -

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SCIENTIFIC RESEARCH

CODE: D23MSIM421

ECTS CREDITS: 6

TYPE OF COURSE: mandatory

COURSE TITLE: PRESENTATION OF DISSERTATION PROJECT

CODE: D23MSIM422

ECTS CREDITS: 24

TYPE OF COURSE: mandatory

FIELD: ENGINEERING AND MANAGEMENT
PROGRAMME TITLE: ENGINEERING AND QUALITY MANAGEMENT (CENTRE OF DROBETA-TURNU SEVERIN)
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: QUALITY MANAGEMENT SYSTEMS

CODE: D24IMCL102
ECTS CREDITS: 8
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The familiarization of the students with quality concepts and the standards used in quality field.
COURSE CONTENTS: Concept of the management system; Implementing of a quality management system SMQ; Presenting the ISO 9001:2000 standard: the principles of the quality management; relations between principles-policies-processes; modeling of a quality management system based on process; Planning the quality management system:; responsibility and authority; internal communication; Management of the resources;
Planning the product manufacturing: determining the requirements regarding the product; analisys of the requirements regarding the product; communication with the client; Measurement, analyis and improvement; Monitoring and measurement; Data analisys; Improvement.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: INFORMATIZATION AND OPTIMIZATION OF CONTROL PROCESSES

CODE: D24IMCL103
ECTS CREDITS: 8
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course provides students with basic theoretical and practical concepts related to the main techniques of quality assessment, analysis, improvement and control with emphasis on processes and activities optimization techniques.
COURSE CONTENTS: Computerization process and its impact; Evolution of the quality concept and of quality control process; The role of computers in automatic control; Informatics systems in processes control; Probabilistic methods and models used in quality control; Techniques and tools for analyzing, evaluating, controlling and improving quality; Elements of optimization; Process optimization in terms of dynamic programming.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: SYSTEMS OF STANDARDS IN THE QUALITY FIELD

CODE: D24IMCL101
ECTS CREDITS: 8
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course offers the students theoretical concepts concerning the quality and the quality standards.
COURSE CONTENTS: Historic of the quality concept; ISO and standardization; Standard SR EN ISO 9000; Standard SR EN ISO 14000, Standard ISO 17025, OHSAS, SIX Sigma concept.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THE BASES OF RESEARCH I

CODE: D24MMEDL105
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Application of the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of fundamental scientific research, applied scientific research and technological development. Correct use of quantitative and qualitative research methods - acquiring analytical and integrative skills in defining and solving problems.
COURSE CONTENTS: Types of research activities; Methodology of research; Running the research; Formulation of the problem to be researched; Hypotheses; Running the research; Data collection; Methods of processing experimental data; Similarities and differences between research and development activities and industrial activities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: TOTAL QUALITY MANAGEMENT

CODE: D24IMCL210
ECTS CREDITS: 6
TYPE OF COURSE: thorough discipline
COURSE OBJECTIVE(S): Learning key requirements, principles, methods and techniques related to quality assurance; Implementation of total quality management in the company; Possibilities of implementing an integrated management environment.
COURSE CONTENTS: The concept of quality; Evolution of quality management; Total Quality Management: philosophy and concepts; Basic concepts of total quality management; TQM principles; Implementing TQM in the organization; Human Resources in TQM; Structures and management strategies for implementing TQM;

Quantification of TQM criteria; National and international standardization in the field of TQM.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THE BASES OF RESEARCH II
CODE: D24MMEDL206
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Application of the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of fundamental scientific research, applied scientific research and technological development.
COURSE CONTENTS: The concept of innovation; Categories of innovation activities; Conceiving, drafting and anti-plagiarism protection of the results of scientific research presented in a scientific paper; Conceiving, writing and presenting the results of the scientific research presented in a dissertation; Conceiving, writing and presenting the results of scientific research presented in a doctoral thesis; National and international research funding at doctoral level; Post-doctoral research carried out through scholarships with national and international funding.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: ENERGETIC RESOURCES MANAGEMENT
CODE: D24IMCL208
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Training and improvement of specialists in the multi-disciplinary field of energy resource management, namely developing document-tation, design, research, investigation to balance the consumption, cost and environmental impact; Appropriate use of the notions specific to the discipline of energy resource management; Using, explaining and interpreting the content of some EU standards, EU directives in the field of energy; Interpretation of the theoretical and practical content of the subject; Empowering optimization methods for reducing energy consumption.
COURSE CONTENTS: Energy and human activity; Energy resources; Improving energy efficiency and promoting renewable energy sources; Energy Conservation Management; Energy audit; Legislative, regulatory and institutional framework for energy; Energy market; European energy market policy; Impact of energy systems on the environment; Classical power transformation and transport installations; Management of Sustainable Development of Energy Systems; Waste management in the field of energy, Energy security.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: COMPUTATIONAL MEASUREMENT SYSTEMS
CODE: D24IMCL207
ECTS CREDITS: 8
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The objectives of the course consist in providing the speciality information in the field of the computatinal measurement systems.
COURSE CONTENTS: Electrical and non-electrical measurement; Measurement principles; Issues regarding electronic measurement in industrial processes; Sensors: sensors types, sensor liniarization; Traductors: types, liniarization; Technical and functional characteristics of the computational measurement systems; Choosing criteria of the computational measurement for industrial process monitoring; Signals emitted by the sensors systems; Capturing the electrical/ non-electrical signals; Conversion of the electrical/ non-electrical signals in unified signals; Unified signals and digital conversions; Serial port and communication protocol; Software apps for measured signals; Virual platforms for computational measurement tools; Software design principles and virtual tools development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination

COURSE TITLE: EVALUATION OF CONFORMITY OF PRODUCTS
CODE: D24IMCL209
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Knowledge, under-standing of concepts, theories and basic methods in the field of quality, the development of communication skills and the formation of a creative attitude; Developing the skills to apply the accumulated knowledge on the quality of products and services by applying the quality standards; Developing skills and attitudes to act independently in the context of analyzing advanced ideas and applications as well as being able to propose improvements and to estimate their implications; Developing managerial, communication skills, professional ethics and field-specific legislation; Responsible execution of professional tasks; Team work ability.
COURSE CONTENTS: 1. Conformity and conformity assessment: Definitions; Interna-tional context (market modernization, European single market); WTO-TBT Treaty; Single European market, free movement of products, regulated fields; Harmonization Directives; 2. Conformity

assessment bodies: Types of organisms and definitions; CABs involved in product conformity assessment; Certification bodies; Quality management system certification bodies; Test laboratories; Calibration laboratories; Inspection bodies; CABs involved in the conformity assessment of products in the regulated areas; Notified Bodies; 3. Evidence of conformity: Supplier's Declaration of Conformity; Testing/ Analysis Reports; Inspection reports; Brands, labels; CE Marking; 4. Certification of products: References for use in product certification; Certification systems; Components and features cf. ISO / IEC Guide 67; Modules A ... H1; Certification of organic products; Certification marks; CE Marking; 5. Specific standards for conformity assessment bodies: Presentation; Presentation of SR EN ISO/ CEI 17025; SR EN ISO/ CEI 17020; SR EN ISO/ CEI 17021; SR EN 45011; 6. The stages of the product certification process: Initiating certification Selection; determination; Analysis and attestation; Supervision; 7. Accreditation of conformity assessment bodies: Definitions; International and national context; International organizations (ILAC, IAF), European (EA) and national accreditation. Mutual Recognition Agreements: ILAC-MRA; IAF-MLA; EA-MLA RENAR – the accreditation body in Romania; Legislative framework: EC Regulation no. 765/2008; OG 23/2009.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: OPTIMIZING MATERIAL SELECTION
CODE: D24IMCL104
ECTS CREDITS: 7
TYPE OF COURSE: deepening (A)
COURSE OBJECTIVE(S): Training and improvement of engineering and management specialists, namely the development of documentation, design, research, investigation to balance consumption and cost.
COURSE CONTENTS: Metallic materials; Symbolization of metallic materials; Metallic material properties; General considerations on the selection of metallic materials - methods of selection of metallic materials - the steps of selecting a material for the manufacture of the parts; Multi-Criteria Selection of Materials; Design stages in material choice; Formulation of optimization problems; Classification of optimization issues; Matrix differential calculus elements; Conditions of optimality; Conditions of Extreme; Eco-selecting and eco-design of products; Eco-design of products; Optimal design in mechanical engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification during the semester

COURSE TITLE: REHABILITATION AND RECYCLING OF MATERIALS AND PRODUCTS
CODE: D24IMCL314
ECTS CREDITS: 8
TYPE OF COURSE:
COURSE OBJECTIVE(S): Initiating students graduate in the field of reuse through recovery and remediation of disused or recovering materials components; raising awareness in terms of the role played by reusing all waste resulting from human activities; the formation of correct concepts on the market economy; the formation of a creative way of thinking regarding the production and maintenance of the ecological conditions of the environment.
COURSE CONTENTS: Efficient management of waste resulting from its removal from use of products; Recovery and recycling of rubber tyres; Recovery and reuse of machinery parts by reconditioning; Recycling of vehicles (end-of life vehicles – ELV).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT
CODE: D24IMCL312
ECTS CREDITS: 8
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims at initiating students on environmental protection and sustainable development and operation of national and international organizations for environmental protection. Emphasis is put on the knowledge and enforcement of environmental protection and sustainable development The main objective of the course is to provide a knowledge base, systematized and updated master needed to guide young researchers in the field of environmental quality and to help them: develop the capacity to analyze the overall activities of the organization in order to manage and modernize manufacturing processes in harmony with the environment; to acquire knowledge in the taking, characterization and study of environmental.
COURSE CONTENTS: Environmental pollution – definition, historical and causes; Pollutants Factors air, water, soil; The impact of air pollution on the environment and ways to reduce; The impact of water pollution on the environmental and ways to reduce; The impact of Soil pollution on the environmental and ways to reduce; The concept of sustainable development; Sustainable use of the prime materials; Sustainable use of the energy resources; Waste and recycling – sustainable development objective; Biodiversity conservation

and sustainable development; Environmental protection legislation; National programs for sustainable development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: AUDIT AND CERTIFICATION OF MANAGEMENT SYSTEMS

CODE: D24IMCL313
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge, under-standing of basic concepts, theories and methods in the field of auditing and certification of management systems, development of communication skills and creative attitude; Developing the skills to apply in practice the accumulated knowledge of the audit and certification of management systems according to the quality standards; Developing skills and attitudes to act independently in the context of analyzing advanced ideas and applications as well as being able to propose improvements and to be able to predict their implications; Developing managerial, communication skills, professional ethics and field-specific legislation; Responsible execution of professional tasks; Team work ability.
COURSE CONTENTS: Standard presentation ISO 9001: 2008; Definition, importance and functions of ISO 9000 standards; Process approach, Compatibility with other management systems; Application; The principles of quality management systems ISO 9001/2000 requirements, Documentation requirements; Standard presentation ISO 19011: 2002, "guide for auditing quality and/ or environmental systems"; Auditing/ audit processing principles, audit program management, Objectives and contents of the audit program; Responsibilities, resources and procedures for the audit program, Implementation of the audit program; Audit activities, Initiating the audit, Performing document analysis, Preparation for on-site audit activities; Performing on-site audit activities, Preparation, approval and dissemination of the audit report; Concluding the audit; Performing follow-up audit, Competence and evaluation of auditors 10.1. Personal qualities; Knowledge and skills, Education, work experience, auditor training and audit experience; Maintaining and improving competence; Auditor's assessment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: QUALITY AND ENVIRONMENTAL MANAGEMENT

CODE: D24IMCL311
ECTS CREDITS: 8
TYPE OF COURSE:
COURSE OBJECTIVE(S): The course enables students to develop the skills to appreciate the quality of the environment in which their organizations work and to ensure compliance with international standards.
COURSE CONTENTS: Quality characteristics of air, water and soil. Integrated monitoring of the environment; Environmental management systems; Legal and economic approach to environmental management.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

FIELD: ENGINEERING AND MANAGEMENT
PROGRAMME TITLE: LOGISTICS SYSTEMS MANAGEMENT (CENTRE OF DROBETA-TURNU SEVERIN)
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MANAGEMENT OF LOGISTICAL SYSTEMS
CODE: D24MSLL101
ECTS CREDITS: 6
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course offers the students theoretical concepts concerning the governance of the logistic activity, operational and strategic planning of logistics, existent logistic systems, connection of logistics with other sectors in an organization.
COURSE CONTENTS: Logistics management, principles and functions of the logistic management, logistic information system, connection of logistics with other sectors, transport, storage of merchandise, trend of the logistic activities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INDUSTRIAL LOGISTICS
CODE: D24MSLL102
ECTS CREDITS: 4
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): Dissemination of information regarding the configuration of the logistic chain for industry and distribution and the factors that influence the logistic chain is the main objective.
COURSE CONTENTS: Importance of logistics in economic entities; Storage; Acquisition; Introduction in industrial logistics; Planning the commercial logistics of companies; Logistics heading the production; Logistics of distribution; Informational system of logistics activity; Logistics and marketing; Logistical services.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Elaboration of projects and written examination

COURSE TITLE: THE BASES OF RESEARCH I
CODE: D24MMEDL105
ECTS CREDITS: 4
COURSE OBJECTIVE(S): Application of the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of fundamental scientific research, applied scientific research and technological development. Correct use of quantitative and qualitative research methods - acquiring analytical and integrative skills in defining and solving problems.
COURSE CONTENTS: Types of research activities; Methodology of research; Running the research; Formulation of the problem to be researched; Hypotheses; Running the research; Data collection; Methods of processing experimental data; Similarities and differences between research and development activities and industrial activities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: OPTIMIZING MATERIAL SELECTION
CODE: D24MMEDL312
ECTS CREDITS: 7
TYPE OF COURSE: deepening (A)
COURSE OBJECTIVE(S): Training and improvement of engineering and management specialists, namely the development of documentation, design, research, investigation to balance consumption and cost.
COURSE CONTENTS: Metallic materials; Symbolization of metallic materials; Metallic material properties; General considerations on the selection of metallic materials - methods of selection of metallic materials - the steps of selecting a material for the manufacture of the parts; Multi-Criteria Selection of Materials; Design stages in material choice; Formulation of optimization problems; Classification of optimization issues; Matrix differential calculus elements; Conditions of optimality; Conditions of Extreme; Eco-selecting and eco-design of products; Eco-design of products; Optimal design in mechanical engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification during the semester

1ST YEAR, 2ND SEMESTER

COURSE TITLE: THE BASES OF RESEARCH II
CODE: D24MMEDL206
ECTS CREDITS: 3
TYPE OF COURSE: mandatory
COURSE CONTENTS: COURSE OBJECTIVE(S): Application of the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of fundamental scientific research, applied scientific research and technological development.
COURSE CONTENTS: The concept of innovation; Categories of innovation activities; Conceiving, drafting and anti-plagiarism protection of the results of scientific research presented in a scientific paper; Conceiving, writing and presenting the results of the scientific research presented in a dissertation; Conceiving, writing and presenting

the results of scientific research presented in a doctoral thesis; National and international research funding at doctoral level; Post-doctoral research carried out through scholarships with national and international funding.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: TOTAL QUALITY MANAGEMENT
CODE: D24MSLL209
ECTS CREDITS: 6
TYPE OF COURSE: thorough discipline
COURSE OBJECTIVE(S): Learning key requirements, principles, methods and techniques related to quality assurance; Implementation of total quality management in the company; Possibilities of implementing an integrated management environment.
COURSE CONTENTS: The concept of quality; Evolution of quality management; Total Quality Management: philosophy and concepts; Basic concepts of total quality management; TQM principles; Implementing TQM in the organization; Human Resources in TQM; Structures and management strategies for implementing TQM; Quantification of TQM criteria; National and international standardization in the field of TQM.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: COMPUTATIONAL MEASUREMENT SYSTEMS
CODE: D24IMCL208
ECTS CREDITS: 8
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The objectives of the course consist in providing the speciality information in the field of the computatinal measurement systems.
COURSE CONTENTS: Electrical and non-electrical measurement; Measurement principles; Issues regarding electronic measurement in industrial processes; Sensors: sensors types, sensor liniarization; Traductors: types, liniarization; Technical and functional characteristics of the computational measurement systems; Choosing criteria of the computational measurement for industrial process monitoring; Signals emitted by the sensors systems; Capturing the electrical/ non-electrical signals; Conversion of the electrical/ non-electrical signals in unified signals; Unified signals and digital conversions; Serial port and communication protocol; Software apps for measured signals; Virual platforms for computational measurement tools; Software design principles and virtual tools development;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination

COURSE TITLE: EVALUATION OF CONFORMITY OF PRODUCTS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: domain
COURSE OBJECTIVE(S): Knowledge, under-standing of concepts, theories and basic methods in the field of quality, the development of communication skills and the formation of a creative attitude; Developing the skills to apply the accumulated knowledge on the quality of products and services by applying the quality standards; Developing skills and attitudes to act independently in the context of analyzing advanced ideas and applications as well as being able to propose improvements and to estimate their implications; Developing managerial, communication skills, professional ethics and field-specific legislation; Responsible execution of professional tasks; Team work ability.
COURSE CONTENTS: 1. Conformity and conformity assessment: Definitions; Interna-tional context (market modernization, European single market); WTO-TBT Treaty; Single European market, free movement of products, regulated fields; Harmonization Directives; 2. Conformity assessment bodies: Types of organisms and definitions; CABs involved in product conformity assessment; Certification bodies; Quality management system certification bodies; Test laboratories; Calibration laboratories; Inspection bodies; CABs involved in the conformity assessment of products in the regulated areas; Notified Bodies; 3. Evidence of conformity: Supplier's Declaration of Conformity; Testing/ Analysis Reports; Inspection reports; Brands, labels; CE Marking; 4. Certification of products: References for use in product certification; Certification systems; Components and features cf. ISO / IEC Guide 67; Modules A ... H1; Certification of organic products; Certification marks; CE Marking; 5. Specific standards for conformity assessment bodies: Presentation; Presentation of SR EN ISO/ CEI 17025; SR EN ISO/ CEI 17020; SR EN ISO/ CEI 17021; SR EN 45011; 6. The stages of the product certification process: Initiating certification Selection; determination; Analysis and attestation; Supervision; 7. Accreditation of conformity assessment bodies: Definitions; International and national context; International organizations (ILAC, IAF), European (EA) and national accreditation. Mutual Recognition Agreements: ILAC-MRA; IAF-MLA; EA-MLA RENAR – the accreditation body in Romania; Legislative framework: EC Regulation no. 765/2008; OG 23/2009.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTEGRATED MATERIAL MANAGEMENT SYSTEMS

CODE: D24MSLL207
ECTS CREDITS: 6
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Training and improvement of engineering and management specialists, namely development of document-tation, design, research, investigation to balance management, consumption and cost; Appropriate use of the theoretical notions of the discipline of information systems for materials management; Use of European Union content standards – EURONORM; Interpretation of the theoretical and practical content of the subject; Employing working methods on material management.
COURSE CONTENTS: 1. Computerized production systems: necessities, role, evolution; Integrated management systems; Main features; Advantages of implementing an integrated management system; 2. Software tools for integrating information into a single platform – ERP systems; Elements of an ERP system; Components and features; 3. Methods of analysis and optimization of distribution/ supply networks; Problem of localization and sizing; Using graph theory elements in optimization issues; 4. Flows in transport networks; The Ford Fulkerson algorithm; Optimal roads in a graph; The Dijkstra algorithm, Bellman-Kalaba; 5. Resource Planning Method (MRP); The Just In Time (JIT) method; 6. Organization-assisted organization of materials and manufacturing accessories; Automatic identification by bar codes; Control and inventory in materials management; Inventory policies; 7. Elements of stock theory; Factors of influence; Deterministic patterns of stock management; Random demand inventory; Predictive methods; Analysis of time-dependent series.
LANGUAGE: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: TRANSPORT AND STORAGE OF SPECIAL SUBSTANCES

CODE: D24MSLL311
ECTS CREDITS: 8
TYPE OF COURSE: study
COURSE OBJECTIVE(S): The course is designed to help students deepen their knowledge on the complex activity of transport to special segment particularly problematic in the context of globalization of trade and the promotion of the principle of free movement of goods.
COURSE CONTENTS: Systems of transports; The modal and intermodal transports; The special goods; Special deposits for goods; Loading/ unloading and stacking special chemicals; Standardized means for transportation of special loads; Conventions, international and national rules and regulations on the transport of specific substances; Special units specialized transportation; Documents accompanying the shipment and special merchandise; Specific rules for transit; Rules for the prevention and protection of human life and material goods against pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTELLIGENT TRANSPORT SYSTEMS AND TRANSPORT FLOW OPTIMIZATION

CODE: D24MSLL312
ECTS CREDITS: 8
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): The course offers the students basic concepts of the intelligent transportation systems, a knowledge of the intelligent transport systems architecture and the traffic control algorithms, as well as the advanced technologies.
COURSE CONTENTS: Concepts of the intelligent transportation systems; Intelligent transport systems architecture; Functions of intelligent transportation system components; Control algorithms used in intelligent transport systems; Technologies used in developing of intelligent transport systems; Advanced Traffic Management System; Advanced Traveler Information Systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: MAINTENANCE OF THE LOGISTIC SYSTEMS

CODE: D24MSLL313
ECTS CREDITS: 6
TYPE OF COURSE: speciality
COURSE OBJECTIVE(S): The course aims to create the basis knowledge about the maintenance and reliability of the technical systems; Also, knowledge about the management techniques of the maintenance activity are presented.
COURSE CONTENTS: Maintenance; Definition; Classification; Reliability systems; Mathematical approach of reliability; Failure of the technical systems; Total Productive Maintenance; Management methods of the maintenance activity; Modern methods for maintenance: Thermography; Vibration diagnosis of the technical systems.
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: AUDIT AND CERTIFICATION OF MANAGEMENT SYSTEMS

CODE: D24MSLL314
ECTS CREDITS: 6
TYPE OF COURSE: mandatory

COURSE OBJECTIVE(S): Knowledge, understanding of basic concepts, theories and methods in the field of auditing and certification of management systems, development of communication skills and creative attitude; Developing the skills to apply in practice the accumulated knowledge of the audit and certification of management systems according to the quality standards; Developing skills and attitudes to act independently in the context of analyzing advanced ideas and applications as well as being able to propose improvements and to be able to predict their implications; Developing managerial, communication skills, professional ethics and field-specific legislation; Responsible execution of professional tasks; Team work ability.
COURSE CONTENTS: Standard presentation ISO 9001: 2008; Definition, importance and functions of ISO 9000 standards; Process approach, Compatibility with other management systems; Application; The principles of quality management systems ISO 9001/2000 requirements, Documentation requirements; Standard presentation ISO 19011: 2002, "guide for auditing quality and/ or environmental systems"; Auditing/ audit processing principles, audit program management, Objectives and contents of the audit program; Responsibilities, resources and procedures for the audit program, Implementation of the audit program; Audit activities, Initiating the audit, Performing document analysis, Preparation for on-site audit activities; Performing on-site audit activities, Preparation, approval and dissemination of the audit report; Concluding the audit; Performing follow-up audit, Competence and evaluation of auditors 10.1. Personal qualities; Knowledge and skills, Education, work experience, auditor training and audit experience; Maintaining and improving competence; Auditor's assessment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

FIELD: ENVIRONMENTAL MANAGEMENT
PROGRAMME TITLE: ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE ENERGY (CENTRE OF DROBETA-TURNU SEVERIN)
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT

CODE: D24MMEDL101
ECTS CREDITS: 7
TYPE OF COURSE: thorough discipline
COURSE OBJECTIVE(S): The course aims at initiating students on environmental protection and sustainable development and operation of national and international organizations for environmental protection. Emphasis is put on the knowledge and enforcement of environmental protection and sustainable development. The main objective of the course is to provide a knowledge base, systematized and updated master needed to guide young researchers in the field of environmental quality. It also focuses on developing students' capacity to analyze the overall activities of the organization in order to manage and modernize manufacturing processes in harmony with the environment and to help them gain knowledge in the taking, characterization and study of the environment.
COURSE CONTENTS: Environmental pollution – definition, historical and causes; Pollutants Factors air, water, soil; The impact of air pollution on the environment and ways to reduce; The impact of water pollution on the environmental and ways to reduce; The impact of Soil pollution on the environmental and ways to reduce; The concept of sustainable development; Sustainable use of the prime materials; Sustainable use of the energy resources; Waste and recycling – sustainable development objective; Biodiversity conservation and sustainable development; Environmental protection legislation; National programs for sustainable development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: QUALITY AND ENVIRONMENTAL MANAGEMENT

CODE: D24MMEDL102
ECTS CREDITS: 7
TYPE OF COURSE: thorough discipline
COURSE OBJECTIVE(S): The course enables students to develop the skills to appreciate the quality of the environment in which their organizations work and to ensure compliance with international standards.
COURSE CONTENTS: Quality characteristics of air, water and soil; Integrated monitoring of the environment; Environmental management systems; Legal and economic approach to environmental management.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: INFORMATISATION AND OPTIMIZATION OF CONTROL PROCESSES

CODE: D24MMEDL104
ECTS CREDITS: 8
TYPE OF COURSE: thorough discipline
COURSE OBJECTIVE(S): The course provides students with basic theoretical and practical concepts related to the main techniques of quality assessment, analysis, improvement and control with emphasis on processes and activities optimization techniques.
COURSE CONTENTS: Computerization process and its impact; Evolution of the quality concept and of quality control process; The role of computers in automatic control; Informatics systems in processes control; Probabilistic methods and models used in quality control; Techniques and tools for analyzing, evaluating, controlling and improving quality; Elements of optimization; Process optimization in terms of dynamic programming.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: THE BASES OF RESEARCH I

CODE: D24MMEDL105
ECTS CREDITS: 4
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Application of the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of fundamental scientific research, applied scientific research and technological development. Correct use of quantitative and qualitative research methods - acquiring analytical and integrative skills in defining and solving problems
COURSE CONTENTS: Types of research activities; Methodology of research; Running the research; Formulation of the problem to be researched; Hypotheses; Running the research; Data collection; Methods of processing experimental data; Similarities and differences between research and development activities and industrial activities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

1ST YEAR, 2ND SEMESTER

COURSE TITLE: THE BASES OF RESEARCH II

CODE: D24MMEDL206
ECTS CREDITS: 3
TYPE OF COURSE: mandatory

COURSE OBJECTIVE(S): Application of the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of fundamental scientific research, applied scientific research and technological development.
COURSE CONTENTS: The concept of innovation; Categories of innovation activities; Conceiving, drafting and anti-plagiarism protection of the results of scientific research presented in a scientific paper; Conceiving, writing and presenting the results of the scientific research presented in a dissertation; Conceiving, writing and presenting the results of scientific research presented in a doctoral thesis; National and international research funding at doctoral level; Post-doctoral research carried out through scholarships with national and international funding.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification

COURSE TITLE: SUSTAINABLE INDUSTRIAL PRODUCTION

ECTS CREDITS: 8
CODE: D24MMEDL207
TYPE OF COURSE:
COURSE OBJECTIVE(S): Environmental quality control, risk assessment and development of low-impact technology variants in line with BAT/ BREF requirements.
COURSE CONTENTS: Environmental legislation on sustainable industrial production; The concept of clean production; Benefits of implementing clean production; Applying clean production; Management system for clean production The concept of Sustainable Development; Evolution from clean production to sustainable development; Eco-efficiency and industrial ecology; Stages of sustainable development; Principles of sustainable development management Changes imposed by sustainable development; Programs to support sustainable industrial production; Program to increase energy efficiency in homes; National Strategy on Sustainable Industrial Development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

COURSE TITLE: INTEGRATED POLLUTION PREVENTION AND CONTROL

CODE: D24MMEDL208
ECTS CREDITS: 4
TYPE OF COURSE: fundamental
COURSE OBJECTIVE(S): Environmental quality control, risk assessment and development of low-impact technology variants in line with BAT/ BREF requirements.
COURSE CONTENTS: Environmental legislation on sustainable industrial production; The concept of clean production; Benefits of implementing clean production; Applying clean production; Management system for clean production The concept of Sustainable Development; Evolution from clean production to sustainable development; Eco-efficiency and industrial ecology; Stages of sustainable development; Principles of sustainable development management Changes imposed by sustainable development; Programs to support sustainable industrial production; Program to increase energy efficiency in homes; National Strategy on Sustainable Industrial Development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification during the semester

COURSE TITLE: PRODUCT LIFE CYCLE. ECO-DESIGN

CODE: D24MMEDL209
ECTS CREDITS: 7
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): The course aims to assimilate multidisciplinary knowledge by forming a correct concept on pollution prevention, reduction and control. The discipline emphasizes the knowledge already acquired by students in some fundamental disciplines by applying them in the field of high actuality and practical importance, environmental pollution (due in particular to human activities – through the development of the industrial society)
COURSE CONTENTS: The IPPC Directive; Best Techniques Available for Large Combustion Plants; Best Available Techniques in the Field of Oil and Gas Refinery; Best Practices Applied to Residual Water and Residual Gas Treatment/ Chemical Management Systems IPPC-Non-Ferrous Materials Industry Directive; IPPC-Ferrous Materials Industry Directive; IPPC-organic chemicals industry; ICCP-Inorganic Chemical Industry Directive; IPPC Directive on Industrial Emissions (VOC); SEVECO Directive.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ENERGY RESOURCE MANAGEMENT

CODE: D24MMEDL210
ECTS CREDITS: 7
TYPE OF COURSE: knowledge
COURSE OBJECTIVE(S): Training and improvement of specialists in the multidisciplinary field of energy resource management, namely development of documentation, design, research, investigation to balance the consumption, the cost and the impact on the environment.
COURSE CONTENTS: Energy and human activity; Energy resources; Improving energy efficiency and promoting renewable energy sources; Energy conservation management; Energy audit;

Legislative, regulatory and institutional framework for energy; The energy market; European energy market policy; Impact of energy systems on the environment; Classical power transformation and transport installations; Management of Sustainable Development of Energy Systems; Waste management in the field of energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: AUDIT AND CERTIFICATION OF MANAGEMENT SYSTEMS

CODE: D24MMEDL103
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Knowledge, understanding of basic concepts, theories and methods in the field of auditing and certification of management systems, development of communication skills and creative attitude; Developing the skills to apply in practice the accumulated knowledge of the audit and certification of management systems according to the quality standards; Developing skills and attitudes to act independently in the context of analyzing advanced ideas and applications as well as being able to propose improvements and to be able to predict their implications; Developing managerial, communication skills, professional ethics and field-specific legislation; Responsible execution of professional tasks; Team work ability.
COURSE CONTENTS: Standard presentation ISO 9001: 2008, Definition, importance and functions of ISO 9000 standards; Process approach, Compatibility with other management systems; Application; The principles of quality management systems ISO 9001/2000 requirements, Documentation requirements; Standard presentation ISO 19011: 2002, "guide for auditing quality and/ or environmental systems"; Auditing/ audit processing principles, audit program management, objectives and content of the audit program; Responsibilities, resources and procedures for the audit program, Implementation of the audit program; Audit activities, Initiating the audit, Performing document analysis, Preparation for on-site audit activities; Performing on-site audit activities, Preparation, approval and dissemination of the audit report; Concluding the audit; Performing follow-up audit, Competence and evaluation of auditors 10.1. Personal qualities; Knowledge and skills, Education, work experience, auditor training and audit experience; Maintaining and improving competence; Auditor's assessment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written and oral examination

2ND YEAR, 1ST SEMESTER

COURSE TITLE: TECHNOLOGIES AND RENEWABLE ENERGY SOURCES

CODE: D24MMEDL311
ECTS CREDITS: 8
TYPE OF COURSE: deepening(A)
COURSE OBJECTIVE(S): Technologies and Renewable energy sources aims to assimilate multidisciplinary knowledge through the development of a correct concept of renewable energy technologies. The discipline highlights the knowledge already acquired by students in some fundamental disciplines by applying them in the field of high actuality and practical importance, of the renewable energies and the technologies for obtaining them.
COURSE CONTENTS: Renewable energies; Renewable energy; General; Energy map Renewable energy sources; Classification of renewable energy sources; Integrating Renewable Energy Sources into an Energy System Solar Energy Recovery Technologies; Photo-thermal conversion; Photovoltaic conversion; Technologies for the use of wind energy; Technologies for the exploitation of geothermal energy; Technologies for the capitalization of hydraulic energy; Renewable energies and heating of buildings The impact of renewable energy systems; The impact of renewable energy systems on the environment; The impact of renewable energy systems on the economy; Recycling of renewable energy systems; Trends in future development of conversion technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPTIMIZING MATERIAL SELECTION

CODE: D24MMEDL312
ECTS CREDITS: 7
TYPE OF COURSE: of deepening (A)
COURSE OBJECTIVE(S): Training and improvement of engineering and management specialists, namely the development of documentation, design, research, investigation to balance consumption and cost.
COURSE CONTENTS: Metallic materials; Symbolization of metallic materials; Metallic material properties; General considerations on the selection of metallic materials – methods of selection of metallic materials – the steps of selecting a material for the manufacture of the parts; Multi-Criteria Selection of Materials; Design stages in material choice; Formulation of optimization problems; Classification of optimization issues; Matrix differential calculus elements; Conditions of optimality; Conditions of Extreme; Eco-selecting and eco-design of products;

Eco-design of products; Optimal design in mechanical engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification during the semester

COURSE TITLE: ENVIRONMENTAL PROJECTS MANAGEMENT

CODE: D24MMEDL313
ECTS CREDITS: 8
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Developing the student's ability to understand correctly and efficiently the basic concepts of Project Management. The objective of the discipline is to know the fundamental principles necessary for a process of planning, organizing and controlling the phases and resources of an environmentally applicable project in order to meet a well-defined objective that usually has time, resource and cost constraints.
COURSE CONTENTS: Conceptual Clarifications; Management: management system characterization, management relations, modernization of the management system, project management; Project Management; Concept; Planning; Implementation of projects; Fundraising; Organizational structure and fundraising; Classification of funding sources; Fundraising campaign; Methods of attracting funds; Management of material resources management within a project; Risk management of the project; Project quality management.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: QUALITY MANAGEMENT SYSTEM

CODE: D24MMEDL314
ECTS CREDITS: 7
TYPE OF COURSE: A
COURSE OBJECTIVE(S): The familiarization of the students with quality concepts and the standards used in quality field.
COURSE CONTENTS: Concept of the management system; Implementing of a quality management system SMQ; Presenting the ISO 9001:2000 standard: the principles of the quality management; relations between principles-policies-processes; modeling of a quality management system based on process; Planning the quality management system responsibility and authority; internal communication; Management of the resources; Planning the product manufacturing: determining the requirements regarding the product; analisys of the requirements regarding the product; communication with the client; Measurement, analyis and improvement; Monitoring and measurement; Data analisys; Improvement.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: Scientific research

CODE: D24MMEDL415
ECTS CREDITS: 10
TYPE OF COURSE: S
COURSE OBJECTIVE(S): Applying the principles of inter-disciplinarity and trans-disciplinarity in the integration of scientific, technical and socio-economic information in the directions of sustainable development of society through the use of sustainable energy and continuous improvement of environmental management systems.
COURSE CONTENTS: Labor protection in scientific research laboratories; Presentation of the theoretical elements, laboratory experiments, explanation, problem, development of the analytical spirit; Criteria and methods of selection of the research topic; Examining research topics previously done; SWOT Analysis; Analyzing previous research through personal preferences, building the "Tree of Ideas"; Methods of formulating the purpose and objectives of the research; Delimiting the object and plotting the boundaries of the research; Elaboration of the scientific research plan; Effective documentation; Critical analysis of selected bibliographic sources; Choosing methodological research strategies; Ways of collecting data; Qualitative and Quantitative Data Analysis; Qualitative and quantitative analysis of phenomena.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification during the semester

Faculty of Horticulture

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Bachelor's Degree

Duration: 3 years
No. of credit points: 180

Field: *Biology*
Programme title: Biology

Duration: 4 years
No. of credit points: 240

Field: *Horticulture*
Programme title:
Horticulture
Landscape Studies

Field: *Environmental Engineering*
Programme title: Environmental Engineering and Conservation in Agriculture

Field: *Food Products Engineering*
Programme title: Agricultural Products Processing Technology

Master's Degree

Duration: 2 years
No. of credit points: 120

Field: Food Products Engineering
Programme title: Food Security and Consumer Protection

Field: *Horticulture*
Programme title:
Management and Consulting Services in Horticulture and Rural Development
Expertise in Viticulture and Oenology

Field: *Environmental Engineering*
Programme title: Management of Ecological and Natural Resources

Field: *Biology*
Programme title: Biodiversity and Ecosystem Conservation

FIELD: HORTICULTURE
PROGRAMME TITLE: HORTICULTURE
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: INFORMATICS
CODE: D29HCL101
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring the knowledge and skills necessary to use the computer as a working tool;Creating skills in using program packages dedicated to specific tasks: word processing, tables, charts, databases;Ability to solve problems specific to the specialization by using dedicated IT packages;Creating computer models for solving horticultural problems.
COURSE CONTENTS: Windows operating systems - overviewMicrosoft WORD:Create/save/open /close file; Page Setup: page margins, page sizes, page orientation header and footer options View Print Preview; Move/copy/paste; Select text; Search and replace, move to document; View Document; Header and footer preview - header and footer creation, ruler, toolbars;Insert to file: page numbers; Page breaks/section breaks; Footnotes; Insert and edit a drawing, diagram, object, text box;Text formatting - specifying all formatting attributes;Create lists numbered/ with bullets/hierarchies; Application borders and shadows; Formatting text in columns, specifying TAB positions and leader characters; Insert table, work with tables.Creating drawings: Drawing toolbar; Inserting equations in the document.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: BOTANY I
CODE: D29HCL102
ECTS CREDITS: 6
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Ability to understand the morphological and structural characteristics of vascular plants, knowledge that will underpin the study of horticultural plants studied at the specializations of the following years of study. The ability to correlate the morphological and structural notions of horticultural plants in the technological process, in order to achieve productive performance results.
COURSE CONTENTS: Objective and methods of investigation. Botanical subdivisions. Development of botany in the world and in Romania. Plant cytology. Plant histology. Organography. The plant organs. Vegetative and reproductive organs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: PEDOLOGY
CODE: D29HCL103
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowing of natural factors of soil genesis, the way of evolution and the main features of soil;The characterization of soil types in Romania and the establishing of suitability for several crops and ways of cropping; Laboratory determinations of main features of soils.
COURSE CONTENTS: The object and the role of Pedology, its importance for agricultural production development. Pedogenesis factors and their role in soil genesis. The genesis and composition of mineral part of the soil. The genesis and composition organic part of the soil. The genesis and composition of soil profile. The physical and physical – size features of soil. The hydric – physical, air and thermic features of soil. The chemical features of soil. The classification and description of soils from Romania. The mapping and quality evaluation of agricultural lands.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: THE ENERGY BASE AND HORTICULTURAL MACHINES
CODE: D29HCL104
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the construction and operation of horticultural machinery and equipment and also the complex influences that are established between their working organs, with soil and plants; knowledge the optimization of the working parameters of the formed aggregates and their role in establishing differentiated technologies; establishing the machine system according to the biological features of the cultivated plants, the values of the ecological factors and the environment protection.
COURSE CONTENTS: Presenting some notions regarding: mechanization technologies; soil working machines; machines for preparing the germinating bed; sowing machines; planting machines; machinery and equipment for the application of fertilizers and amendments; plant protection machinery; horticultural crop maintenance machines; horticultural crops harvesting machines; vegetable harvesting machines; fruit and grape harvesting machines; machinery for conditioning and preserving horticultural products; operation of horticultural machines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answers to Laboratory works 40%).

COURSE TITLE: AGROCHEMISTRY

CODE: D29HCL105
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the chemical composition of plants in order to establish the necessary elements nutritive for their nutrition and doses of chemical fertilizers and organic. Knowledge of the agrochemical soil in order to harmonize existing soil nutrients in crop plants and filling requirements deficit by fertilizers.Knowledge of the acids soil, alkaline and those anthropogenic degraded to establish measures to improve their agrochemical and fertilization.
COURSE CONTENTS: Purpose and development of agrochemistry, agrochemicals, Fundamentals of fertility in relation to horticultural plant biology, The soil as a source of nutrients for horticultural plants, Ionic composition improvement and raising the productive potential of acids soils, saline and alkaline, Fertilizers as a means to increase horticultural production and maintenance of soil fertility, Control of soil fertility status for horticultural plants by agrochemical methods, Principles and methods of rational use of fertilizers in fruit growing, viticulture and vegetables.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%)

COURSE TITLE: INTRODUCTION TO HORTICULTURE

CODE: D29HCL106
ECTS CREDITS: 4
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Introduction to the science of horticultural plant cultivation. Understanding the fundamental principles of plant physiology and botany combined with skills and intuition in the use of these scientific principle
COURSE CONTENTS: Getting Started. Plant Structure. Classification of horticultural plants. Plant growth. Reproductive development. Vegetative development of horticultural plants. Multiplication of horticultural plants
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%, referrals, themes 10%).

COURSE TITLE: PHYSICAL EDUCATION

CODE: D29HCL117
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: school elements of jumping and running; Application paths combined with treadmills; Application paths combined with jumping elements; Application paths combined with equilibrium, escalation, climbing, etc.: Sports games: volleyball, badminton; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

COURSE TITLE: ENGLISH LANGUAGE

CODE: D29HCL215
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English, using a reference material especially designed for students of the Faculty of Horticulture, but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think.Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Focus on language: Present Tense Simple/ Continuous, Vocabulary: Horticulture is the branch of agriculture that deals with the art, science, technology, and business of growing plants. It also is the study of plants. It includes the cultivation of medicinal plants, fruits, vegetables, nuts, seeds, herbs, sprouts, mushrooms, algae, flowers, seaweeds and non-food crops such as grass and ornamental trees and plants.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: FRENCH LANGUAGE

CODE: D29HCL215
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French, using a reference material

especially designed for students of the Faculty of Horticulture, Horticulture Specialization, but also for those who want to learn vocabulary in context. Practice of important Horticulture vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Focus on language, Vocabulary: Landscape. Scale and heterogeneity (incorporating composition, structure, and function). Patch and mosaic. Boundary and edge. Ecotones, ecoclines, and ecotopes. Disturbance and fragmentation. Theory. Application. Research directions.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICS
CODE: D29HCL208
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Determination of lengths, areas and volumes of geometric objects. Solving specific problems of linear programming, such as crop distribution, setting feed ration for animal feed and working technology, based on matrix computing techniques. Knowledge of the fundamental concepts of probability theory, probabilistic computation rules, the main probability schemes, the notion of random variable.Knowledge of the main classical distribution laws.Statistical analysis of the phenomenon.Graphical representation of a statistical series.The distribution of statistical data and graphical representation, the synthesis of data with an indicator representing them, the determination of statistical indicators of populations and samples (for example, indi-cators of the variations and moments).
COURSE CONTENTS: Measurement of lengths, areas and volumes. Linear programming. The calculus of probabilities. Elements of mathematical statistics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to works and homework 30%).

COURSE TITLE: BOTANY II
CODE: D29HCL209
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Studying and recognizing the main vascular plants, assimilating the main methods of plant investigation; Recognition of the main groups of the studied organisms; Differentiation between the main groups of the studied organisms; Knowledge of the ecology of the analyzed species and the presentation of the practical and scientific importance of plants.
COURSE CONTENTS: Introduction: Definition and object of study; Research methods; Systematic units (taxa); Plant nomenclature; Short history; Classification systems. Regnum Plantae sensu lato: What are plants (Plantae); Taxonomic considerations; The diversity of green plants sensu stricto; Phylogeny; Green algae: Charophyta. General characters; The importance of green algae. Regnum Plantae sensu strictissimo: Diversity and classification; Bryophytes - Non-vascular plants; Tracheophytes (Cormobionta, Tracheobionta) - Plantae vasculares: The origin and meaning of tracheophytes evolution; General characters; Systematic. Phyl. Pteridophyta (Ferigi) and Spermatophyta (gimnosperm and angiosperms); General characters, scientific and practical importance. Representatives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers to practical laboratory work 10%, periodic testing by practical control exercises 10%, 5% continuous testing, activities like topics/essays/translations/projects, etc.).

COURSE TITLE: THE ENERGY BASE AND HORTICULTURAL MACHINES
CODE: D29HCL210
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the construction and operation of horticultural machinery and equipment and also the complex influences that are established between their working organs, with soil and plants; knowledge the optimization of the working parameters of the formed aggregates and their role in establishing differentiated technologies; establishing the machine system according to the biological features of the cultivated plants, the values of the ecological factors and the environment protection.
COURSE CONTENTS: Presenting some notions regarding: mechanization technologies; soil

working machines; machines for preparing the germinating bed; sowing machines; planting machines; machinery and equipment for the application of fertilizers and amendments; plant protection machinery; horticultural crop maintenance machines; horticultural crops harvesting machines; vegetable harvesting machines; fruit and grape harvesting machines; machinery for conditioning and preserving horticultural products; operation of horticultural machines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answers to Laboratory works 40%).

COURSE TITLE: TOPOGRAPHY AND CADASTRE
CODE: D29HCL211
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Elaborate a long-term or short-term action plan for the landscaping of a space; Executing distance and surface measurements; Preparation of topographical plans; Use of topographic devices; Rebuilding plans and maps; Measuring level differences and calculating points altitudes; Elaboration of quoted plans and drawing of level curves; Explanation of calculation formulas specific to trace and control work;Choosing the best solutions, depending on the concrete situation in the field, for the design and control of the engineering works; Design and construction of support networks for topographic surveys, cadastral surveys and other engineering works. Making topographical surveys specific to topographic and themed plans and maps.
COURSE CONTENTS: General notions of topography; Units of measurement in topography; The topographic circle and trigonometric functions; Orientations and coordinate axes; Errors in topography; Marking and signaling points; The measurement of the angles and distances; Closed planimetric traverse method; Planimetric traverse method supported over known points; Picking up the details; Intersection and retrointersection;Drawing up plans; Calculation and detachment of surfaces; Leveling survey; Methods of geometric leveling; Trigonometric leveling; Leveling of the surfaces; Representation of relief.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, periodical assessment through practical tests 20%, continuous assessment throughout semester 30%).

COURSE TITLE: CHEMISTRY
CODE: D29HCL212
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Familiarization with notions related to the structure of atom and classification of elements; Understanding the electronic configuration of elements, and their atomicity. Acquiring the necessary knowledge in order to understand the different types of chemical bonds.
COURSE CONTENTS: Atoms. Atomic structure. Classification of elements. Molecules. Chemical bonds. Chemical thermodynamics. Chemical equilibriums. Solutions. Ionic equilibriums. Notions of chemical kinetics. Catalysis. Colloid status of matter. Oxidation and reduction.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 30%).

COURSE TITLE: BIOPHYSICS AND AGROMETEOROLOGY
CODE: D29HC213
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of specific applications living and research equipement with importance in biophysics and agricultural meteorology; explain the phenomena, the processes, applications and devices according to the main meteorological parameters, environmental characteristics; interpret the evolution of the system based on changes in environmental factors.
COURSE CONTENTS: Matter organisation. Elements of spectroscopy. Contact phenomena between liquid and solid. Molecular transport phenomena. Diffusion and osmosis. Introduction in biological thermodinamoics. The physical structure of the atmosphere. Solar radiation in the atmosphere and the ground. Thermal regime of the soil and air. Condensation and water vapor condensation products. Rain fall. The climate of Romania and of Eorope.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60 %, periodic answers to practical work 20 %, results to periodic control works 20 %).

COURSE TITLE: PRACTICE
CODE: D29HCL214
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): The purpose of practical training is to form skills and abilities appropriate to the specific activities of horticulture. Acquiring the applied skills of the knowledge obtained at the specialized courses regarding the field identification of the horticultural species, cultivating, harvesting and preserving them, the recognition and description of the soil profile, the field study of some soil properties, the identification of the plant nutrition disorders horticulture, knowledge of the equipment used in surveying, how to work with

them and the execution of measurements of distances and surfaces.
COURSE CONTENTS: Methods of collecting and preserving vascular plants to achieve herbaceous plants. Identification of the main morphological types of roots, stems, leaves, flowers and fruits. Identification of different plants encountered on the ground by means of dicotomic keys. Soil analysis on the ground: location of the soil profile; Orientation of the soil profile; Execution of the soil profile; The description of the soil profile determining morphological properties: (number, sequence and thickness of horizons, color, texture and structure of horizons, porosity, compactness, neoformations and soil inclusions, appreciation of soil humidity, appreciation of humus content, characterization of plant nutrition status Fertilization of plants grown on nutrient substrates Presentation of the equipment used in surveying and how to work with them Surveying of distances and surfaces measurements Practical knowledge of the fields of activity in horticulture, floricultural plants, fruit trees, leguminous plants and vine under Morphological, structural, multiplication and lifecycle, and training of practical skills.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (the practice book and the exam answers 100 %).

COURSE TITLE: ENGLISH LANGUAGE
CODE: D29HCL216
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English; using a reference material especially designed for students of the Faculty of Horticulture, but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Plant conservation, landscape restoration, landscape and garden design, construction, and maintenance, and arboriculture. Inside agriculture, horticulture contrasts with extensive field farming as well as animal husbandry.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam answers 80%, theoretical and practical checks 20%

COURSE TITLE: FRENCH LANGUAGE
CODE: D29HCL216
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French; using a reference material especially designed for students of the Faculty of Horticulture, Horticulture Specialization, but also for those who want to learn vocabulary in context. Practice of important Horticulture vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Topological ecology Organism-centred. Analysis of social-ecological systems using the natural and social sciences and humanities. Ecology guided by cultural meanings of lifeworldly landscapes.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D29HCL218
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Gymnastics Aerobics / Fitness; Application trails combined with treadmills; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports game: football; Bilateral games under similar competition conditions.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ECOLOGY AND ENVIRONMENT PROTECTION

CODE: D29HCL317
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of the structure, functions and relations of natural and anthropic ecosystems, knowledge of the impact of anthropogenic activities on the environment, knowledge of environmental protection.
COURSE CONTENTS: Laws and ecological principles, ecosystem (structure, functions, dynamics), environmental degradation, nature protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination answers 50 %, final answers for workshops 50%).

COURSE TITLE: MICROBIOLOGY

CODE: D29HCL318
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Learning morphological, metabolic and reproduction features of important microorganisms in agriculture.
COURSE CONTENTS: Learning morphological, metabolic and reproduction features of important microorganisms in agriculture.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (questionnaire 10%, final written assessment - in the exams session - 35%, active participation in seminars 10%).

COURSE TITLE: PLANT PHYSIOLOGY

CODE: D29HCL319
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge and interpretation of the physiological processes of plants and acquiring practical skills for the experimental demonstration of the main vital plant manifestations.
COURSE CONTENTS: Plant cell physiology. Water exchange between the plant cell and the external environment. Plant water regime (Absorption, transport and elimination of water by plants). Mineral Nutrition. Photosynthesis. Synthesis, transport and storage of organic substances in plants. Aerobic respiration and anaerobic respiration. Plant growth and plant development. Plant orientation and growth movements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70 % and answers to Laboratory works 30 %).

COURSE TITLE: COMMUNITY AGRICULTURAL POLICIES

CODE: D29HCL320
ECTS CREDITS: 4
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Knowledge of the objectives, premises and tools for implementing agricultural policies, knowledge of institutions involved in the implementation of agricultural policies
COURSE CONTENTS: Stages of European construction. Institutions of the U.E. involved in the promotion and implementation of common agricultural policies. Types of European Policies: Common Agricultural Policy Current measures to support Romanian agriculture
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination answers 50 %, final answers for workshops 50%).

COURSE TITLE: GENERAL FLORICULTURE

CODE: D29HCL321
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Aim of the discipline is to provides students with specialized knowledge regarding the biologic and ecologic features of floral plants, classification of floral plants, the bond between the origin and the needs of plants regarding the environmental factors, propagation methods, production technologies, harvesting, preserving and selling of ornamental plants.
COURSE CONTENTS: Definition, object of study, history and importance. The present state of ornamental plants' cultivation. Morphological and biological features. Classification of floral plants. The needs of floral plants towards ecologic factors and the reciprocal relationships that take place in the development of biologic cycle. Propagation of floral plants (generative and vegetative). Growing technology of ornamental plants in the field and in protected spaces. Harvesting, conditioning, preserving and selling of ornamental plants (cut flowers and pots).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%; test results for practical course 40 %).

COURSE TITLE: EXPERIMENTAL DESIGN

CODE: D29HCL322
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the role, importance and particularities of design of experiments in horticultural research. Defining research objectives, methodologies and tehniques, set up experiments, data collection and inference. Capitalization of experimental results.

COURSE CONTENTS: Role, importance, objectives and particularities of experimental design in horticultural research. Design of experiments and methodology in horticultural research. Extraction of samples for analysis. Measurement errors in field experiments. Methods of setting up monofactorial and polyfactorial trials (randomized blocks, Latin square, Latin rectangle, balanced square lattice). Parameters and estimators in statistics (variance, standard deviation, coefficient of variation, correlation, regression). Statistical hypothesis testing, F, *t* and Duncan tests. Analysis of variance, interpretation and use of experimental results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (70% of the final grade represent the response to the written theoretical questions and 30% of the final grade the answers to laboratory tests).

COURSE TITLE: AGROPHYTOTECHNY

CODE: D29HCL425
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Relations between factors of vegetation, soil and cultivated plants as well as agrotechnic methods to control these factors, conventional and unconventional systems of tillage with different tools and agricultural machinery (plow, harrow, baking, leveling, combined cultivator, rotary, roller, chisel, parapolw etc), presents weeds and agrophytotechnical, physical, biological and chemical methods that combat them; particularly through the rational use of herbicides , crop rotation, differentiated agrotechnique, agricultural systems etc., to know the importance, systematic and soils for each cultivated plant, biological requirements regarding the climate and soil and crop technology for private and organised agriculture as associations or companies.
COURSE CONTENTS: The study of plant lives' factors, determinig methods by which they can be directed, learning the requirements of various species of cultivated plants and establishing the means for statisying these requirements in order to obtain productions as big as possible as well as of superior quality.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers at the exam 60 %, final answers at practical laboratory works 40 %).

COURSE TITLE: GENERAL ENTOMOLOGY

CODE: D29HCL426
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Learning and accumulating knowledge on some aspects of systematics, morphology, anatomy, biology, ecology, attack mode, host plants, control as well as the recognition of major pests of horticultural plants.
COURSE CONTENTS: Introductive notions, External morphology of insects, Insects anatomy and physiology, Insects biology, Insects ecology, Insects systematics, General features of mites, crustaceans, nematodes, molluscs and damaging vertebrate, Prevention methods of control against animal pests of horticultural plants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers at the exam 70%, Testing practical skills along the semester 10%, final answers at practical laboratory works 20%).

COURSE TITLE: GENERAL PHYTOPATHOLOGY

CODE: D29HCL427
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Learning and accumulating knowledge on some aspects of biological characteristics of the main types of pathogens, the role of interaction parasite- plant , host-environment in the pathogenesis process, mechanisms of plant resistance to diseases and protection means for plants in the context of integrated control.
COURSE CONTENTS: General notions about diseases (disease classification, interface of plant host –parasite and successive phases of disease), Changes in the plants during the pathogenesis process (biochemical, physiological and anatomical- morphological). Parasitism from its origins to the present and its consequences; Parasitic traits of pathogens, Pathogen agents epidemology, conservation and transmission of infectious inoculum, Plant resistance to diseases (before the infection, after the infection). General characteristics of phytopathogenic viruses, mycoplasmas and phytopathogenic bacteria, of phytopathogenic fungi. General prevention technologies and intergated control of horticultural plant diseases, Protection measures of the agro-ecosystem and the prevention of poisoning in phyto-sanitary works.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers at the exam 70 %, final answers at practical laboratory works 30 %).

COURSE TITLE: SPECIAL FLORICULTURE

CODE: D29HCL428
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of flower species cultivated in the field and greenhouses. Factors that influence the productivity and quality of flower plants. Knowledge of the establishment and maintenance works of floral crops. Ways of use in outdoor and indoor spaces, according to ecological

requirements, growth particularities and decorative features.
COURSE CONTENTS: Annual, biennial, perennial hemicryptophyte and geophyte flower species used in different floral compositions in green spaces. Crops in greenhouses. Species grown in the soil of the greenhouse for the production of cut flowers. Species decorative through flowers, leaves, fruits, cultivated in pots (biological particularities, morphological and decorative features, ecological requirements, culture technology, use).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, final answers to practical works 40%)

COURSE TITLE: GENETICS

CODE: D29HCL429
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Understanding the genetic phenomenon characteristic of the horticultural species for deepening the concepts of genes, chromosomes, heredity, variability and possible use for practical purposes. Understanding mechanisms of the transmitting hereditary information and genetic recombination as a source of variability to plants. Knowledge, through scientifically substantiated information, of the structure and function of genetic material at the horticultural species.
COURSE CONTENTS: The development of genetics as a science. Methods of research in genetics. Mendelian laws of heredity and their practical importance. The components of the cell with role in heredity of plants. The division of the cell, the manifestation of heredity and variability in the development of mitosis and meiosis at horticultural species. Genetic mechanisms of horticultural plant propagation. Nucleic acids and their role in heredity of plants. Genetic code and protein synthesis. Mutations and mutagenesis, source of variability in horticultural species. Improvement of horticultural species through the creation of transgenic organisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: MICROPROPAGATION

CODE: D29HCL430
ECTS CREDITS: 4
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Acquiring the knowledge required to apply *in vitro* techniques in plant breeding programs. Knowledge of *in vitro* techniques applications for plant cloning, germplasm conservation and for producing secondary metabolites.
COURSE CONTENTS: Cultures of *in vitro* plant tissues (definition, history, fields of application). Tissue culture Laboratory. Operational phases in micropropagation techniques and morpho-physiological processes. Regeneration of plants from vegetative structures. Somatic embryogenesis. Creating and using variability. *In vitro* preservation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% periodic evaluation).

COURSE TITLE: TROPICAL HORTICULTURE

CODE: D29HCL324
ECTS CREDITS: 3
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Acquiring knowledge about tropical and subtropical plant culture, requirements for environmental factors, plant biology, culture technology and economic importance.
COURSE CONTENTS: Climatic and edaphic features of the tropical and subtropical area; Relationships with environmental factors and culture technology in Citrus sp., Olea europaea, Actinidia sp., Ficus sp., Pistacia vera, Phonix dactylifera, Punica granatum, Ziziphus sp., Ananas sativus, Musa paradisiaca, Carica papaya, Mangifera indica , Macadamia integrifolia, Carya illinoensis, Theobroma cacao, Coffea arabica, Camellia sinensis, Cocos nucifera and Artocarpus altilis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: PRACTICE

CODE: D29HCL431
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): The purpose of practical training is to develop skills and competences appropriate to the activities of the horticulture field. Acquiring the applied skills of the knowledge obtained at the specialized courses, regarding the identification of the horticultural species, their cultivation, the recognition and control of diseases and pests, the soil microbiology, the harvesting and the preservation of the production.
COURSE CONTENTS: Identification and control of the main diseases specific to horticultural plants; Identification and pest control of horticultural plants; Soil microbiological analysis; Biological features and culture technology of some floral species; Horticultural crop culture in vitro; Practical knowledge of the fields of activity in horticulture, floricultural plants, fruit trees, vegetables and vine under morphological, structural, multiplication and lifecycle, and practical skills training.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (the practice book and the exam answers 100 %).

COURSE TITLE: PHYSICAL EDUCATION

CODE: D29HCL432
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Fitness - optimization of physical condition; utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL VEGETABLES GROWING I

CODE: D29HCL533
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of vegetable species, their food and economic importance and the development and use of conventional vegetable production technologies; The current state of the organization of vegetable growing in our country and in the world, as well as the way of utilization of the vegetable production.
COURSE CONTENTS: Elements specific to the classic vegetable cultivation system, the current situation and the prospects for the development of vegetable growing. Biological and ecological characteristics of vegetable species. Knowledge of vegetable plants, grouping them according to the practical importance and the way of multiplication for their cultivation. Knowledge of the relations of vegetable plants with vegetation factors, in order to establish practical and applicative elements of classical culture technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to examination 75%, control paper 25%).

COURSE TITLE: FRUIT GROWING I

CODE: D29HCL534
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the particularities of the fruit tree ecosystem, of the relationships of the fruit species with the environmental factors and the other components of biocenosis. Assimilation of the technology for producing the fruit propagation material. Assimilation of technology for the setting-up and maintenance of different types and systems of fruit tree plantations.
COURSE CONTENTS: Definition, object, terminology, importance, history. Classification of fruit tree species. Morphology, anatomy and physiology of fruit tree plants. The individual life cycle of the fruit tree plants. Annual cyclem of fruit tree plants. Initial and final pheno-phases of vegetative organs and fruit organs.
Relationship between growth and fruit-setting in the individual and annual cycle of fruit tree plants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% periodic evaluation).

COURSE TITLE: GENERAL VITICULTURE I

CODE: D29HCL535
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Acknowledging the importance, the current and future status of viticulture both as science and practical business; Awareness of the morphological, anatomical and physiological traits of grapevines for the understanding of the mechanisms leading to the grapevine growth and ripening; Awareness of grapevine requirements under given climate factors with the purpose of establishing grapevine cultivating areas and production guidelines, which are required for the development of quality and efficient viticulture; Learning about climate categories in viticulture with view to linking climate factors with growth, ripening and maturation phases of grapevines.
COURSE CONTENTS: Definitions, importance, particularities, History and development of the viticulture; Morphological and anatomical vine particularities; Biological and physiological vine particularities; Ecological particularities; Viticultural climatology; Establisment of varieties cultivation areas and production directions
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (80% written examination, 20% periodic evaluation).

COURSE TITLE: ORNAMENTAL ARBORICULTURE AND LANDSCAPE ARHITECTURE I

CODE: D29HCL536
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the importance of growing ornamental trees and bushes. Knowledge of the main biological, ecological, ornamental and technological features of ornamental trees and bushes in the sense of familiarizing with the possibilities of using in green areas.
COURSE CONTENTS: The biological bases of ornamental arboriculture. The technological bases

of ornamental arboriculture. Production of planting material for ornamental species. The presentation of morphologic and landscape characters, ecology and ways of using ornamental wood species in green areas.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70 % of the exam answers, 30 % of the final answers to workshops).

COURSE TITLE: SPECIAL ENTOMOLOGY
CODE: D29HCL537
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of systematics, morphology, anatomy, biology, ecology, and pest control in major horticultural crops. Recognizing the main pests of horticultural plants and the damage they produce. Knowing appropriate plans for phytosanitary measures and remedies recommended in the prophylaxis and fight against the main pests of horticultural plants in conjunction with reducing environmental pollution in carrying out chemical treatments against pests.
COURSE CONTENTS: Biology, ecology, systematic and control of the polyphagous pests, Biology, ecology, systematic and control of the cereals pest, Biology, ecology, systematic and control of the legumes pests, Biology, ecology, systematic and control of the technical plants pests, Biology, ecology, systematic and control of the vegetable pests, , Biology, ecology, systematic and control of the fruits trees pests, Biology, ecology, systematic and control of the vines pests, Biology, ecology, systematic and control of the flowering and ornamental plants pests, Biology, ecology, systematic and control of the forest trees, Biology, ecology, systematic and control of the agri-food products stored pests, Harmful and useful vertebrates for agriculture.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 80%, periodical assessment through practical tests 20%).

COURSE TITLE: SPECIAL PHYTOPATOLOGY
CODE: D29HCL538
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of economically important diseases, taxonomy, ecology, epidemiology, prophylaxis and therapy of pathogens in the main horticultural plant.
COURSE CONTENTS: Vegetable plant diseases (tomatoes); Vegetable plant diseases (peppers, eggplants, onions); Vegetable plant diseases (brasicaeae and cucurbitaceae); Vegetable plant diseases (peas and beans); Plant diseases of seedlings; Apple tree diseases; Plum tree diseases; Fruit tree diseases (peach, apricot); Fruit tree diseases (cherry and sour cherry); Walnut diseases, fruit shrub diseases (gooseberries, currant, raspberry and strawberry); Vine diseases; Floral diseases, Ornamental plants diseases - economic significance, spreading area, symptoms, aetiology, disease ecology, prophylactic and curative measures with little impact on the environment and on consumers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers at the exam 70 %, testing practical skills along the semester 10%, final answers at practical laboratory works 20 %).

3RD YEAR, 2ND SEMESTER

COURSE TITLE: GENERAL VEGETABLES GROWING II
CODE: D29HCL641
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of vegetable species, their food and economic importance and the development and use of conventional vegetable production technologies; The current state of the organization of vegetable growing in our country and in the world, as well as the way of utilization of the vegetable production.
COURSE CONTENTS: The technology of producing vegetable seedlings; Establishment of vegetable crops in free field, protected and forced; Methods and epochs for the establishment of vegetable crops; General and special maintenance of vegetable species in the three crop systems; Harvesting and harvesting of vegetable production.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to examination 75%, control paper 25%).

COURSE TITLE: FRUIT GROWING II
CODE: D29HCL642
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the particularities of the fruit tree ecosystem, of the relationships of the fruit species with the environmental factors and the other components of biocenosis. Assimilation of the technology for producing the fruit propagation material. Assimilation of technology for the setting-up and maintenance of different types and systems of fruit tree plantations.
COURSE CONTENTS: Ecology of fruit trees and fruit shrubs. Production of fruit propagating material. Land organization and planting of fruit trees. Maintenance of fruit tree plantations. Harvesting and capitalisation of fruit production.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% periodic evaluation).

COURSE TITLE: GENERAL VITICULTURE II

CODE: D29HCL643
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Awareness of grapevine multiplying means and cultivation technologies with the purpose of promoting technologies aligned with durable development principles; Use of knowledge for accurate implementation of vineyard setup and maintenance works during early years through ripening; Learning about vineyard maintenance technology after ripening time.
COURSE CONTENTS: Propagation of grapevines, Technological bases of fruit viticultural plantations setting up, Maintenance of young viticultural plantations; Care and exploitation of fruit viticultural plantations, Correction of trophic resources; Phitosanitary protection of viticultural plantations; Harvesting table grapes, Harvesting wine grapes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: ORNAMENTAL ARBORICULTURE AND LANDSCAPE ARCHITECTURE II

CODE: D29HCL644
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the specialized terminology and the principles regarding the decoration of green areas. Knowledge of the main types of green areas and their features. Acquire the fundamental notions regarding the theory, art and technique of landscape. The general presentation of the notions regarding the projection, decoration and maintenance of green areas.
COURSE CONTENTS: The importance and functions of green spaces. Evolution and styles in landscape architecture. Classification of green spaces. Composition principles used in Landscape Architecture. Structural elements of green spaces. General concepts for designing green spaces. General notions about green spaces arrangement and maintenance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70 % of exam answers, 30% of final answers to workshops).

COURSE TITLE: LAND IMPROVEMENTS

CODE: D29HCL645
ECTS CREDITS: 5
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge and understanding of the importance of land improvement works; Knowledge and understanding of the phenomena related to the drainage and drainage of agricultural lands, the arrangement of accumulation basins and irrigation systems, dams, etc. Knowledge of methods of design, execution and maintenance of land improvement works.
COURSE CONTENTS: Object of discipline. The importance and features of land improvement works. Brief history of land improvement improvements. Soil erosion. Definitions, importance and spread of the erosion process in the world and in Romania. Mechanism of water erosion process.Determinants of soil erosion. Damage caused by soil erosion. Studies necessary for the preparation of soil erosion control projects. Mapping and research of soil erosion.Preventing and combating soil erosion on sloping arable land. Prevention and control of soil erosion in vineyards. Preventing and combating soil erosion in fruit plantations. Preventing and combating deep erosion. Insect erosion formations, their development and work to combat deep erosion.Preventing and combating wind erosion.Land landslides. Measures to prevent and combat them.Storage tanks for agriculture. Classification of storage basins. Components of an accumulation. Studies necessary for the design of storage basins Conditions for the location of accumulation basins. Determining the water volume of the storage tank.Dam. Classification of dams. Main issues to solve when designing dams made of soil. Studies needed to prepare irrigation projects. Water consumption of agricultural crops.Watering methods. Irrigation systems - types of irrigation facilities. Water sources for irrigation. Irrigation water quality. Operation and maintenance of irrigation systems.Landfilling of agricultural land. Draining through open channels.Drainage drainage. Special drainage methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, final answers for workshops 30%, periodical assessment through practical tests 20%).

COURSE TITLE: HORTICULTURAL PLANT BREEDING II

CODE: D29HCL646
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the role, importance and need for genetic improvement of horticultural plants in ensuring food safety and sustainable human society. The role and importance of horticultural genetic resources for use in plant breeding. Establishment of specific breeding objectives and horticultural plant genetic improvement. Conventional and modern methods of transformation and selection of new genotypes and their implications.
COURSE CONTENTS: Importance and role of plant breeding. Current situation and future national and global trends. Cytogenetic bases, ontogenetic and reproduction of horticultural plant breeding. General and specific objectives of horticultural plant

breeding. Horticultural genetic resources - role and importance; collection, evaluation, conservation and use of genetic resources. Conventional methods used in horticultural plant breeding (selection, hybridization, selfing, mutagenesis, poliploidy). Modern methods used in horticultural plant breeding. Genetic engineering.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to practical laboratory questions).

COURSE TITLE: PRACTICE
CODE: D29HCL647
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): The practical training aims to apply the theoretical knowledge acquired in specialized courses in the field of horticulture; Recognition of species and varieties in order to apply you hnologiilor field;Application of technological sequences depending on species or variety particularities.
COURSE CONTENTS: Cuts training, maintenance and fruiting species horticultural seeds; Training, maintenance and fructifying groves in stormy horticultural species; Cuts training, maintenance and fruiting shrubs and trees from nuts; Training, maintenance and fructification in vineyards; Applying green operations to horticultural species (vegetables, vines, fruit trees, dendrological plants, flowers, etc.); Working on seasonal horticultural species (seeding, planting, transplanting, pinching, books in it, grafted, etc.).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination practice - 90% and the drawing - completing the specification of the practice - 10%).

COURSE TITLE: FLORAL ART
CODE: D29HCL539
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of the history of floral art; the materials used in the creation of floral arrangements; the styles, principles and ways of arranging flowers.
COURSE CONTENTS: The art of arranging flowers in different historical epochs. The vegetal material used in floral arrangements. Harvesting, maintenance and processing of fresh or dry vegetal material. Pots, materials, accessories and techniques used in floral art design. Western floral art. – the principles of floral composition and the used styles. Eastern floral art. – basic principles of Ikebana arrangements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (50% of answers to exam; 20% of involvement in practical activities, 30% of drawing up a project).

4TH YEAR, 1ST SEMESTER

COURSE TITLE: SPECIAL VEGETABLE GROWING I
CODE: D29HCL748
ECTS CREDITS: 5
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of vegetable species and cultivation in order to develop and use production technologies in different crop systems (unprotected field, protected and fortified crop) for a sustainable horticulture. Knowledge of aspects regarding seed production technologies and biological material for cultivation of vegetable species.
COURSE CONTENTS: Knowledge and deepening of botanical and biological particularities, as well as the ecological requirements of vegetable species, in relation to cultivation technologies. Establishing differentiated technologies according to botanical and biological particularities of vegetable species, ecological factor values, and cultivation systems. Botanical and biology features, ecological requirements, crop technology and seed production of tuberous roots and tubers vegetable species, vegetable species of the onion group, the vegetable species from which the leaves are used, the vegetable species of cabbage, and the vegetable species from which they are consumed use the pods, capsules and seeds (leguminous species).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers of test for practical laboratory work 30%).

COURSE TITLE: POMOLOGY I
CODE: D29HCL749
ECTS CREDITS: 5
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Study of trees organographies, as identifier element of varieties and their behavior in the growth and fruiting process. The requirements of different species of fruit to biotype factors in order of their enviromentally and zoning. Knowledge of particularities and intensity of physiological processes in conection with varieties of enviromental factors and methods to optimize their relationship through differentiated technologies of cultivated species in areas with temperate climate in order to obtain maximum yields of good quality fruits at the minimum prices. Study of fruit rootstocks, behavior of varieties on different rootstocks, compatibility and force – of rootstock-variety combination. Highlighting the qualities and faults of varieties of fruit tree.
COURSE CONTENTS: The variety and assortment – determinant factors in production area. Research methods used in the study of varieties and the effects of differentiated technologies; Importance, current situation and perspective on the world and

national pome species (apple, pear, quince, etc.). Biological and technological peculiarities of pome species (apple, pear, quince, etc.).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam - 80%, final answears to practical laboratory work - 20%).

COURSE TITLE: AMPELOGRAPHY I
CODE: D29HCL750
ECTS CREDITS: 5
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of *Vitis* varieties and species in order to develop and use sustainable viticulture technologies; Knowledge of vineyard areas and production directions of varieties for the development of a quality viticulture and economic efficiency.
COURSE CONTENTS: Ampelography as a science (definitions, terminology, history , objectives, links of ampelography with other sciences); The variety with its genetic, agrobiological, productive and quality attributes; Biotype, clone, vineyard assortment; Methodologies for description, recognizing and identifying of *Vitis* varieties and species, in accordance with OIV (International Office of the Vine and Wine), U.P.O.V. (International Union for the Protection of New Varieties of Plants) and I.P.G.R.I. (International Plant Genetic Resources Institute); Types of ampelographic descriptors; Zoning of the Romanian viticultural area according to the ecological offer.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam -70 %, analysis of student products and interventions in laboratory activities - 10 %, participate in making and presenting the portfolio - reports/homework/projects - 20 %).

COURSE TITLE: HORTICULTURAL PLANT BREEDING II
CODE: D29HCL751
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the most important breeding results of major horticultural crops cultivated in Romania and abroad. Knowledge and learning the peculiarities of the production of horticultural seed and planting material of superior biological categories according to the Romanian legislation and EU directives.
COURSE CONTENTS: Organization and management of breeding works in horticultural crops. Breeding of vinegrapes, apples, plums, tomatoes, peppers, cabbage, onions, roses, carnations - current national and international requirements, guidelines and trends in improving the vinegrapes, apples, plums, tomatoes, peppers, cabbage, onions, roses and carnations cultivars. Biological basis and breeding objectives, cytology, germplasm resources. Production of seed and planting material of superior biological categories. Protection of plant breeding rights.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to practical laboratory questions).

COURSE TITLE: MANAGEMENT
CODE: D29HCL752
ECTS CREDITS: 3
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the notions of the economic agent in terms of its organization, its functionality, the way of implementation of the modern management techniques and methods.
COURSE CONTENTS: The role of the food industry in the production of food for human consumption, Introductory management, Running management in modern management, Production capacity and optimal ways of use in the food industry, Creation and development of technical-material basis in the food industry, Organization and management of production Nutrition, Organization of food industry production by types of enterprises, Technical and economic forecasting in the food industry, Human resource management in the food industry, Labor normalization in the food industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to seminars 30%).

COURSE TITLE: OENOLOGY I
CODE: D29HCL753
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of the biological, biochemical and technological bases of modern winemaking.
COURSE CONTENTS: The raw material used in the wine industry; The technical and material basis of the winery industry; The grape processing technology and the production of must; The chemical and biochemical composition of the grape must; The microflora specific to the wine industry; Antiseptic and antioxidant substances used in the wine industry; Biochemical and biophysical nature phenomena that occur in the conversion of must to wine; The chemical composition of wines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: TECHNOLOGY OF HORTICULTURAL PRODUCTS (fruits and vegetables) I
CODE: D29HCL754
ECTS CREDITS: 4

TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of the main directions of the fresh preservation of the horticultural products.
COURSE CONTENTS: Characterization of horticultural production. The main properties of the fruits and vegetables. Metabolic processes occurring in fruits and vegetables after harvesting. The quality of the fruits and vegetables. Methods for determining the quality of the fruits and vegetables. Knowledge of the technological flow of fresh preservation of the fruits and vegetables by species. Develop an action plan and implement it in relation to the tasks defined by the job description.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

4TH YEAR, 2ND SEMESTER

COURSE TITLE: SPECIAL VEGETABLE GROWING II

CODE: D29HCL855
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of vegetable species and cultivation in order to develop and use production technologies in different crop systems (unprotected field, solariums and greenhousee) for a sustainable horticulture. Knowledge of aspects regarding seed production technologies and biological material for cultivation of vegetable species.
COURSE CONTENTS: Botanical and biological particularities, ecological requirements, the technology of cultivation and seeds production of the Solanaceae Family of vegetable species from which fruits are consumed. Botanical and biology features, ecological requirements, crop technology and seed production of Cucurbitaceae family of vegetable. Cultivation of vegetable species used for flavoring and seasoning. Cultivation of perennial vegetable species.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, final answers of test for practical laboratory work and activities such as projects 40%).

COURSE TITLE: POMOLOGY II

CODE: D29HCL856
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Study of trees organographies, as identifier element of varieties and their behavior in the growth and fruiting process. The requirements of different species of fruit to biotype factors in order of their enviromentally and zoning. Knowledge of particularities and intensity of physiological processes in conection with varieties of enviromental factors and methods to optimize their relationship through differentiated technologies of cultivated species in areas with temperate climate in order to obtain maximum yields of good quality fruits at the minimum prices. Study of fruit rootstocks, behavior of varieties on different rootstocks, compatibility and force – of rootstock-variety combination. Highlighting the qualities and faults of varieties of fruit tree.
COURSE CONTENTS: The importance, the current and future situation in the world and in our country, biological and technological features of stone species (plum, apricot, peach, sweet cherry and sour cherry). The importance, the current and future situation in the world and in our country, biological and technological features of nuts (walnut, hazelnut, chestnut, almond). The importance, the current and future situation in the world and in our country, biological and technological features of forest fruits (strawberry, raspberry, blackberry, currant, gooseberry, blueberry, seabuckthorn, elderberry, roses for petals). The importance, the current and future situation in the world and in our country, biological and technological features of subtropical species (fig, lemon, orange).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam - 80%, final answears to practical laboratory work - 20%).

COURSE TITLE: AMPELOGRAPHY II

CODE: D29HCL857
ECTS CREDITS: 4
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Description and knowledge of varieties of vines cultivated in Romania; Knowledge of differentiated crop technologies according to the biological characteristics and ecological requirements of vine varieties, as well as the ecological offer of different wine areas in Romania.
COURSE CONTENTS: Taxonomic classification of family *Vitaceae*; Table grapes varieties cultivated in Romania and their crop specificities (morphological characteristics, description of characteristics relating to adjustment to climate, resistance to parasites and physiological accidents, the agricultural and technological characteristics and quality of products); Seedless grapes cultivated in Romania; Grape varieties for white wines cultivated in Romania; Grape varieties for rosé and red wines cultivated in Romania; Grape varieties for aromatic wines cultivated in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam -70 %, analysis of student products and interventions in laboratory activities - 15 %, participate in making and presenting the portfolio (Reports/homework/projects) - 15 %).

COURSE TITLE: OENOLOGY II

CODE: D29HCL858
ECTS CREDITS: 3
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of stricto-sensu wine making technologies, special wines and grape, must and wine products. Knowledge of the care operations applied to the wine during the evolution and of the conditioning and conditioning procedures. Knowledge of diseases and defects of wine.
COURSE CONTENTS: The technologies for the elaboration of the wines themselves or "Stricto-sensu; The technologies for the elaboration of the special wines and the distillates in the wine; The technological processes of wine care during the conservation; The evolution and the phases of the wine development; The disorders, accidents and defects in Wines; Clarification and Stabilization of Wine
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: TECHNOLOGY OF HORTICULTURAL PRODUCTS (fruits and vegetables) II

CODE: D29HCL859
ECTS CREDITS: 3
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge of the main technological flows of the fruits and vegetables processing.
COURSE CONTENTS: Knowledge of the materials and auxiliaries used in the canning industry; Knowledge of theoretical processes for the fruits and vegetables processing; Knowledge of packaging used in the canning industry of vegetables and fruits; Knowledge of fruit and vegetable processing methods: preservation by sterilization and pasteurization, concentration, freezing, antiseptic preservation, acidification preservation, lactic fermentation, alcoholic fermentation; Develop an action plan and implement it in relation to the tasks defined by the job description.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: MARKETING

CODE: D29HCL860
ECTS CREDITS: 2
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Planning, organizing and coordinating agro-food marketing activities; Interpretation of legislation in the food industry as well as basic notions of food; Marketing, strict adherence to the principles of human nutrition and current regulations on food additives; Using basic knowledge to interpret marketing projects; Applying the principles of human nutrition and involvement in the selection of information necessary for the creation and completion of databases in the food industry; Objective evaluation of how to develop and implement the marketing strategy; Developing a marketing project with application in the food industry.
COURSE CONTENTS: Introductory Marketing, Organizing Marketing Services, Agribusiness Market, Elements of Consumer Psychology, Segmentation of Markets, Marketing Forecast, Marketing Mix, Market Making of the Economic Agent - An Integral Part of Marketing Strategy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: ACADEMIC PRACTICE FOR PREPARATION OF GRADUATION THESIS

CODE: D29HCL861
ECTS CREDITS: 10
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Performance of scientific multidisciplinary / interdisciplinary research projects using innovative methods with significant impact on the development of viticulture and wine sector; Ability of drawing conclusions and suggesting solutions / recommendations for academic research and practice in viticulture and wine sectors, based on the research studies performed.
COURSE CONTENTS: Finalisation of Master's thesis plan and bibliography; Specialty literature reviews based on academic specialty resources recommended by the research supervisor or other sources considered as being relevant by the student; Finalisation and implementation of the research methodology intended for the achievement of objectives ; Preparation and drafting of the Master's thesis; Presentation of results and conclusions of the research studies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (thesis presentation and defense - 100%).

FIELD: HORTICULTURE
PROGRAMME TITLE: LANDSCAPE STUDIES
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: INFORMATICS
CODE: D29PEL101
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring the knowledge and skills necessary to use the computer as a working tool. Creating skills in using program packages dedicated to specific tasks: word processing, tables, charts, databases. Ability to solve problems specific to the specialization by using dedicated IT packages. Creating computer models for solving horticultural problems.
COURSE CONTENTS: Windows operating systems – overview. Microsoft WORD: Create/save/open /close file. Page Setup: page margins, page sizes, page orientation, header and footer options View Print Preview. Move/copy/paste; Select text; Search and replace, move to document. View Document; Header and footer preview - header and footer creation, ruler, toolbars. Insert to file: page numbers; Page breaks/section breaks; Footnotes; Insert and edit a drawing, diagram, object, text box. Text formatting - specifying all formatting attributes. Create lists numbered/ with bullets/hierarchies; Application borders and shadows. Formatting text in columns, specifying TAB positions and leader characters. Insert table, work with tables. Creating drawings: Drawing toolbar; Inserting equations in the document.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: BOTANY I
CODE: D29PEL102
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Ability to correlate the morphological and structural notions of plants with landscape value in the technological process, in order to obtain productive performance results. Understanding and acquiring knowledge of plant morphology and anatomy.
COURSE CONTENTS: Objective and methods of investigation. Botanical subdivisions. Development of botany in the world and in Romania. Structure of course. Plant cytology. The prokaryotic and eukaryotic cell. Eukaryotic plant cell. Cell division. Plant histology. Definition of tissues. Classification: meristematic and definitive tissues: protective, fundamental, conductive, mechanical, secretory and glandular. Organography. The plant organ. Vegetative and reproductive organs (morphology, anatomy and types).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: PEDOLOGY
CODE: D29PEL103
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of natural factors of earth formation, evolution way and main properties. Characterization of earth types in Romania and the establishment of their suitability for different cultures and use ways. Laboratory determination of main properties of soils.
COURSE CONTENTS: The object and role of Pedology and their importance in the development of agricultural production. Factors of pedogenesis and their role in the formation of soils. Formation and composition of mineral parts of soils. Formation and composition of organic parts of soils. Formation and composition of soil profile. Physical and physical-mechanical properties of soil. Hydro physical, aeration and thermic properties of soil. Chemical properties of soil. Classification and description of soils in Romania. Mapping and classification of agricultural fields.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 80%, final answers for workshops 20%).

COURSE TITLE: AGROCHEMISTRY
CODE: D29PEL104
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the chemical composition of plants in order to establish the necessary elements nutritive for their nutrition and doses of chemical fertilizers and organic Knowledge of the agrochemical soil in order to harmonize existing soil nutrients in crop plants and filling requirements deficit by fertilizers. Knowledge of the acids soil, alkaline and those anthropogenic degraded to establish measures to improve their agrochemical and fertilization
COURSE CONTENTS: Purpose and development of agrochemistry, agrochemicals, Fundamentals of fertility in relation to horticultural plant biology, The soil as a source of nutrients for horticultural plants, Ionic composition improvement and raising the productive potential of acids soils, saline and alkaline, Fertilizers as a means to increase horticultural production and maintenance of soil fertility, Control of soil fertility status for horticultural plants by agrochemical methods, Principles and methods of rational use of fertilizers in fruit growing, viticulture and vegetables.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: DRAWING AND GRAPHICS

CODE: D29PEL105
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge and understanding: the use of computer as a working instrument. Explanation and interpretation: informatics' modeling of some engineering processes; forming and developing the capacity of spatial thinking in modeling industrial shapes. The role of information nowadays. The approach, on different complexity levels, of graphic instruments necessary to a correct accomplishment of technical documentation; exemplification of interactions with other programs for the information included in the models created by AutoCAD.
COURSE CONTENTS: Concepts of computerized integration of industrial activities. AutoCAD interface. Representation types and techniques in engineering graphics. Editing models and selection sets. The main editing drives in two-dimensional space. Hachure and annotation models. Blocks and attributes. External references. Quotation of drawings. Display methods. Tri-dimensional representation. 3D editing. Modeling of solids. Interaction ways with other packets of programs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, workshop 30%).

COURSE TITLE: DESCRIPTIVE GEOMETRY AND PERSPECTIVES

CODE D29PEL106
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Ensuring the necessary knowledge concerning the involvement of landscape domain in the representation system of perspective and descriptive geometry. The acquisition of a professional language necessary to the interdisciplinary imposed working.
COURSE CONTENTS: Perspective geometry, draught, and double projection. The representation of point. The representation of axis. The plan. Methods of projecting transformations (methods of descriptive geometry). Representation of geometric solids. Visualizing a volume from different three-element reunion. Sectioning of geometric solids. Developing of geometric solids. Maximum inscribed volumes and tangent solids. Intersections of surfaces and geometric solids. Rotation of volumes. Perspectives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (final exam answers 70%, periodical assessment through tests 30%)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICS

CODE: D29PEL207
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of fundamental concepts of the theory of probabilities, of the rules of probability calculation, of the main probability schemes, of the notion of variates. The knowledge of the main notions of mathematical statistics, the analyzing of a phenomenon with the help of mathematical statistics (the statistical analysis of the phenomenon).
COURSE CONTENTS: Matrix calculation. Elements of linear programming. Events and probabilities. Variate. Basic notions of mathematical statistics. Characteristic values of some statistic series. Statistics indicators. Statistical processing of experimental data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, continuous assessment throughout semester 10%).

COURSE TITLE: BOTANY II

CODE: D29PEL208
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The ability to clearly decipher the diversity of the living world, to highlight both the transition from the lower to the higher (evolution) and the downward of some groups from others (phylogeny). The ability to identify the correlation between the characteristics and knowledge of the species of plants of landscape value studied in the specializations of the following years of study, their systematic classification in the higher taxonomic units.
COURSE CONTENTS: Introduction: Definition and object of study; Research methods; Systematic units (taxa); Plant nomenclature; Short history; Classification systems. Regnum Plantae sensu lato: What are plants (Plantae)?; Taxonomic considerations; The diversity of green plants sensu stricto; Phylogeny; Green algae: Charophyta. General characters; The importance of green algae. Regnum Plantae sensu strictissimo: Diversity and classification; Bryophytes - Non-vascular plants; Tracheophytes (Cormobionta, Tracheobionta) - Plantae vasculares: The origin and meaning of tracheophytes evolution; General characters; Systematic. Phyl. Pteridophyta (Ferns) and Spermatophyta (gimnosperm and angiosperms); General characters, scientific and practical importance. Representatives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: TOPOGRAPHY AND CADASTRE

CODE D29PEL209
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The elaboration of an action plan, on long or short term, of the landscape development of a space; Execution of measurements for distances and surfaces; Laying down topographic plans; The use of topographic machines; Updating plans and maps; The measurement of level differences and the calculation of height points; The forming of height plans and the indication of contours; The explanation of calculation formulae specific to tracing and control works; Choosing the best solutions according to the actual field situations, in order to trace and control the engineering works. Projecting and forming of support networks for topographic elevation, land register elevations and other engineering works. Topographic elevations necessary to the elaboration of topographic and thematic plans and maps.
COURSE CONTENTS: Basic general and topographic notions. Measurement units in topography. The topographic circle and the trigonometric functions; Orientations and neutral axes; Errors in topography; Marking and signalizing points; Measurement of angles and distances; The method of closed plan traversing; The method of supported plan traversing; Elevation of details; Intersection and retro-intersection; Establishing plans; Calculation and detachment of surfaces; Leveling; Methods of geometric leveling; Trigonometric leveling; Surfaces' leveling; Representation of relief.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final exam answers 50%, periodical assessment through tests 20%, continuous assessment throughout semester 30%).

COURSE TITLE: CHEMISTRY

CODE D29PEL210
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Familiarization with notions related to the structure of atom and classification of elements; Understanding the electronic configuration of elements, and their atomicity. Acquiring the necessary knowledge in order to understand the different types of chemical bonds.
COURSE CONTENTS: Atoms. Atomic structure. Classification of elements. Molecules. Chemical bonds. Chemical thermodynamics. Chemical equilibriums. Solutions. Ionic equilibriums. Notions of chemical kinetics. Catalysis. Colloid status of matter. Oxidation and reduction.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 30%).

COURSE TITLE: BIOPHYSICS AND AGROMETEOROLOGY

CODE: D29PEL211
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of specific applications living and research equipement with importance in biophysics and agricultural meteorology; explain the phenomena, the processes, applications and devices according to the main meteorological parameters, environmental characteristics; interpret the evolution of the system based on changes in environmental factors.
COURSE CONTENTS: Matter organisation. Elements of spectroscopy. Contact phenomena between liquid and solid. Molecular transport phenomena. Diffusion and osmosis. Introduction in biological thermodinamoics. The physical structure of the atmosphere. Solar radiation in the atmosphere and the ground. Thermal regime of the soil and air. Condensation and water vapor condensation products. Rain fall. The climate of Romania and of Europe.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, periodic answers to practical work 20%, results to periodic control works 20%).

COURSE TITLE: ART HISTORY OF PARKS AND GARDENS

CODE: D29PEL212
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of the evolution of concepts in the art of gardens, focusing on general compositional features of different styles, under the context of specific geographic, historic, economic, social and cultural conditions.
COURSE CONTENTS: The importance of studying the history of landscape architecture; a short presentation of the evolution of concepts in the art of gardens. Gardens of Antiquity: Mesopotamian Gardens; Gardens of Ancient Egypt; Persian Gardens; Ancient Greek Gardens; Ancient Roman gardens. The art of gardens in Middle Age (5^{th} – 11^{th} centuries): Byzantine Gardens; Medieval Gardens of Western Europe; Islamic Gardens; Spanish Arab Gardens. The Gardens of Middle East- Chinese Gardens; Japanese Gardens. The art of gardens during Renaissance and Baroque. Landscape gardens. Mixed style in the art of gardens. Contemporary views in the art of gardens. Gardens and parks in Romania.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (exam answers 50%; presentation seminar theme, participation during seminar talks 50 %).

COURSE TITLE: PRACTICE

CODE: D29PEL213
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): The purpose of the practical training is to form aptitudes and skills appropriate to the specific activities of horticulture and landscape. Acquiring the practical skills of the knowledge obtained at the specialized courses, regarding the field identification of the studied plant species, their harvesting and preservation, the recognition and description of the soil profile, the study of some soil properties on terrain, the identification of the nutrition disorders of the horticultural plants.
COURSE CONTENTS: Methods of collecting and preserving vascular plants to achieve herbaria. Identification of the main morphological types of roots, stems, leaves, flowers and fruits. Identification of different plants found in the field by means of dicotomic keys. Soil analysis on land (location, orientation and execution of the soil profile). Description of the soil profile determining the following morphological properties: number, sequence and horizon thickness; Color of horizons (defined by the three parameters: hue, value and chrome), using the Munssel determinant; Texture and structure of horizons; Porosity, compactness; Neoformations and inclusions of the soil; The appreciation of soil moisture; Appreciation of humus content; The qualitative determination of poorly soluble carbonates; The qualitative determination of the main soluble salts; Determination of pH value. Characterization of plant nutrition status. Fertilization of plants grown on nutrient substrates. Presentation of the topographic equipment and how to work with them. Executing distance and surface measurements. Knowledge of landscape patrimony, discovery of elements characteristic of urban landscape.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to the final evaluation 100%).

COURSE TITLE: ENGLISH LANGUAGE

CODE: D29PEL214
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English, using a reference material especially designed for students of the Faculty of Horticulture, but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think.
Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Focus on language: Present Tense Simple/ Continuous, Vocabulary: Landscape.Scale and heterogeneity (incorporating composition, structure, and function). Patch and mosaic. Boundary and edge. Ecotones, ecoclines and ecotopes. Disturbance and fragmentation. Theory. Application. Research directions.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: FRENCH LANGUAGE

CODE: D29PEL215
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French, using a reference material especially designed for students of the Faculty of Horticulture, Landscape Specialization, but also for those who wfant to learn vocabulary in context. Practice of important Landscape vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think.
Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Focus on language, Vocabulary: Landscape.Scale and heterogeneity (incorporating composition, structure, and function). Patch and mosaic. Boundary and edge. Ecotones, ecoclines, and ecotopes. Disturbance and

fragmentation. Theory. Application. Research directions.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D29PEL216
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: school elements of jumping and running; Application paths combined with treadmills; Application paths combined with jumping elements; Application paths combined with equilibrium, escalation, climbing, etc.: Sports games: volleyball, badminton; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ECOLOGY AND ENVIRONMENT PROTECTION
CODE: D29PEL317
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): the knowledge of the structure, functions and relationships in the natural and anthropological ecosystems, the knowledge of the impact of anthropological activities upon environment, the knowledge of environmental protection ways.
COURSE CONTENTS: laws and ecologic principles, the Ecosystem (structure, functions, dynamics), Environmental degradation, Protecting nature
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (exam answers 50 %, final answers in workshops 50%).

COURSE TITLE: PLANT PHYSIOLOGY
CODE: D29PEL318
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge and interpretation of the physiological processes of plants and acquiring practical skills for the experimental demonstration of the main vital plant manifestations.
COURSE CONTENTS: Plant cell physiology. Water exchange between the plant cell and the external environment. Plant water regime (Absorption, transport and elimination of water by plants). Mineral Nutrition. Photosynthesis. Synthesis, transport and storage of organic substances in plants. Aerobic respiration and anaerobic respiration. Plant growth and plant development. Plant orientation and growth movements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam course 70%; answers to laboratory works 30%).

COURSE TITLE: ORNAMENTAL ARBORICULTURE I
CODE: D29PEL319
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the importance of growing ornamental trees and bushes. Knowledge of the main biological, ecological, ornamental and technological features of ornamental trees and bushes in the sense of familiarizing with the possibilities of using in green areas.
COURSE CONTENTS: The biological bases of ornamental arboriculture. The technological bases of ornamental arboriculture. Production of planting material for ornamental species. The presentation of morphologic and landscape characters, ecology and ways of using ornamental wood species in green areas.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE INSTRUCTION: Exam (7 % of the exam answers, 30% of the final answers to workshops).

COURSE TITLE: BUILDING MATERIALS AND LANDSCAPE CONSTRUCTIONS
CODE D29PEL320
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of energy forms used in landscape, of the possibilities to obtain and transform them into mechanical energy. The understanding of objectives and of the importance of mechanization in landscape. The interpretation of phenomena taken place during the transformation of different types of energy into mechanical energy and versus. The advantages and disadvantages of their use. The use of some machines, stands, graphics, the reading and interpretation of data and the applying of their results in order to obtain some exploiting performances for agricultural machines.
COURSE CONTENTS: Types of energy used in agriculture. Obtaining mechanical energy. Materials used in the construction of B.E. Driving mechanism. The real cycle of transforming thermal (caloric) energy into mechanical energy. Driving mechanism and distribution mechanism. Role. Construction. Functioning. The circular diagram of gas distribution. Supplying of thermal engines.

Fuel-air mixture. Supplying installation of spark ignition engines. Construction. Functioning. Supplying installation of auto-spark ignition engines. Construction. Functioning. Construction and functioning of injection pumps and of injectors. Lubrication plant, cooling plant. Burning plant. Construction and running. Transmissions used in B.E. Clutches, banjoes, differentials. Working equipment used in the construction of B.E.P.A. Haulage feature. Course synthesis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final assessment answers 40%, final answers for workshops 5%, periodical assessment through tests 5%, continuous assessment throughout semester 10%, activities such as homework/essays/ papers/translations/projects etc. 15%).

COURSE TITLE: GENERAL FLORICULTURE
CODE D29PEL321
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Aim of the discipline is to provides students with specialized knowledge regarding the biologic and ecologic features of floral plants, classification of floral plants, the bond between the origin and the needs of plants regarding the environmental factors, propagation methods, production technologies, harvesting, preserving and selling of ornamental plants.
COURSE CONTENTS: Definition, object of study, history and importance. The present state of ornamental plants' cultivation. Morphological and biological features. Classification of floral plants. The needs of floral plants towards ecologic factors and the reciprocal relationships that take place in the development of biologic cycle. Propagation of floral plants (generative and vegetative). Growing technology of ornamental plants in the field and in protected spaces. Harvesting, conditioning, preserving and selling of ornamental plants (cut flowers and pots).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%; test results for practical course 40%).

COURSE TITLE: ENERGETIC BASE AND MACHINERY FOR GREEN AREAS
CODE D29PEL322
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of energy forms used in landscape, of the possibilities to obtain and transform them into mechanical energy. The understanding of objectives and of the importance of mechanization in landscape. The interpretation of phenomena taken place during the transformation of different types of energy into mechanical energy and versus. The advantages and disadvantages of their use. The use of some machines, stands, graphics, the reading and interpretation of data and the applying of their results in order to obtain some exploiting performances for agricultural machines.
COURSE CONTENTS: Types of energy used in agriculture. Obtaining mechanical energy. Materials used in the construction of B.E. Driving mechanism. The real cycle of transforming thermal (caloric) energy into mechanical energy. Driving mechanism and distribution mechanism. Role. Construction. Functioning. The circular diagram of gas distribution. Supplying of thermal engines. Fuel-air mixture. Supplying installation of spark ignition engines. Construction. Functioning. Supplying installation of auto-spark ignition engines. Construction. Functioning. Construction and functioning of injection pumps and of injectors. Lubrication plant, cooling plant. Burning plant. Construction and running. Transmissions used in B.E. Clutches, banjoes, differentials. Working equipment used in the construction of B.E.P.A. Haulage feature. Course synthesis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (final assessment answers 40%, final answers for workshops 5%, periodical assessment through tests 20%, continuous assessment throughout semester 10%, activities such as homework/essays/ papers/translations/projects etc. 15%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D29PEL430
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: Long jump technique; Utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: ORNAMENTAL ARBORICULTURE II
CODE: D29PEL423
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): The present subject is based on the study of ornamental wood plants (trees, bushes, sub-bushes) which are mainly

analyzed from the systematic, morphologic, areologic and ecological point of view also focusing on their decorating features.
COURSE CONTENTS: The presentation of morphologic and landscape characters, ecology and ways of using ornamental wood species in green areas. Species of resinous trees and bushes. Species of decorating deciduous trees through leaves and habitus. Species of decorating deciduous trees through flowers. Species of ornamental bushes and sub-bushes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of exam answers; 30% of the final check to workshops).

COURSE TITLE: GENERAL ENTOMOLOGY IS

CODE: D29PEL424
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge and thoroughness of some aspects concerning the systematic, morphology, anatomy, biology, ecology, attack ways, hosts, control and recognition of pests of floral and ornamental plants.
COURSE CONTENTS: Introductory notions, External morphology of insects, Anatomy and physiology of insects, Biology of insects, Ecology of insects, Systematic of insects, General features of acaroids, crustaceans, nematodes, mollusks and vermin vertebrata, Prevention methods to control animal vermin of horticultural plants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, practical abilities throughout semester 10%, final answers to workshop tests 20%).

COURSE TITLE: GENERAL PHYTOPATHOLOGY

CODE: D29PEL425
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Learning and accumulating knowledge on some aspects of biological characteristics of the main types of pathogens, the role of interaction parasite- plant, host-environment in the pathogenesis process, mechanisms of plant resistance to diseases and protection means for plants in the context of integrated control.
COURSE CONTENTS: General notions about diseases (disease classification, interface of plant host –parasite and successive phases of disease), Changes in the plants during the pathogenesis process (biochemical, physiological and anatomical- morphological). Parasitism from its origins to the present and its consequences; Parasitic traits of pathogens, Pathogen agents epidemology, conservation and transmission of infectious inoculum, Plant resistance to diseases (before the infection, after the infection). General characteristics of phytopathogenic viruses, mycoplasmas and phytopathogenic bacteria, of phytopathogenic fungi, General prevention technologies and intergated control of horticultural plant diseases, Protection measures of the agro-ecosystem and the prevention of poisoning in phyto-sanitary works.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers at the exam 70%, final answers at practical laboratory works 30%).

COURSE TITLE: ORNAMENTAL VEGETABLE GROWING

CODE: D29PEL426
ECTS CREDITS: 4
TYPE OF COURSE: domain
COURSE OBIECTIVES: Knowledge of crop species and cultivation of ornamental vegetables to develop and use sustainable horticultural production technologies. Determination of the cultivation areas of the ornamental vegetable species and of the production directions, prerequisites for the development of a quality vegetable growing, in conditions of economic efficiency
COURSE CONTENTS: Knowledge and deepening of botanical, biological and ecological particularities of vegetable species in relation to cultivation technologies. Acquiring organizational and decision-making capacity in designing, arranging and maintaining a "edible landscaping".
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 75%, Colloquium for submitting the project verification 25%).

COURSE TITLE: MICROPROPAGATION

CODE: D29PEL427
ECTS CREDITS: 4
TYPE OF COURSE: OPU
COURSE OBJECTIVE(S): Acquiring the knowledge required to apply *in vitro* techniques to plant breeding programs. Knowledge of the applications of *in vitro* techniques for plant cloning, germoplasm conservation and for the production of secondary metabolites.
COURSE CONTENTS: Cultures of *in vitro* plant tissues (definition, history, fields of application). Tissue culture Laboratory. Operational phases in micropropagation techniques and morpho-physiological processes. Regeneration of plants from vegetative structures. Somatic embryogenesis. Creating and using variability. *In vitro* preservation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% periodic evaluation).

COURSE TITLE: FLOWER PLANTS AND GRASS

CODE: D29PEL428
ECTS CREDITS: 4

TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the main flower and turf species, their biological features, ecological requirements and cultivation technologies. Knowledge the ways of flower species use in urban green spaces, in parks and gardens, in different floral compositions and in interior design.
COURSE CONTENTS: Annual, biennial, perennial hemicryptophyte and geophyte flower species used in green spaces. Flower species for mosaiculture. Flower species for alpine gardens, rockeries. Aquatic species used in landscaping. Species of ferns used in landscaping. Ornamental grasses used in landscaping. Grass species for lawn. Species decorative through flowers, leaves, fruits, grown in pots for decoration of interior spaces, terraces and balconies (biological, morphological and decorative features, ecological requirements, cultivation technology, use).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, final answers to practical works 40%).

COURSE TITLE: PRACTICE
CODE: D29PEL429
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): The purpose of the practical training is to form aptitudes and skills appropriate to the specific activities of horticulture and landscape. Acquiring the practical skills of the knowledge obtained at the specialized courses, regarding the production of planting material for ornamental species, current works for the establishment of floricultural and vegetable crops in the field, identification of the main pests and pathogens of the ornamental plants.
COURSE CONTENTS: Identification of tree species using visual features. Works performed in dendrological nursery. Preparation of the land for the establishment floral crops in the field. Preparation of different type of culture substrates. The seedlings production of annual flower plants. Establishment of floral crops in open field. Vegetable seedling production. Establishment of vegetable crops by planting and sowing. Identification of the main pests of ornamental plants grown in protected spaces. Identification of the main pests of ornamental shrub species. Identification of phytoparasites attack specific to flower plants grown in the field and greenhouses. Monitoring of pathogens attack on ornamental trees and shrubs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to the final evaluation 100%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D29PEL430
ECTS CREDITS: 1
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: Long jump technique; Utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: ORNAMENTAL FRUIT GROWING
CODE: D29PEL531
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Explanation and interpretation of the use of the various technological links and of the interrelations between the horticultural production systems and the environment. Identification and use of the methods, techniques and planning procedures of the landscape decoration. Elaboration of solutions to projects, decoration and durable exploitation of the landscape.
COURSE CONTENTS: Introductory notions. Classification and characterization of fruit growing species. Biological cycle of fruit growing species. Ecology of fruit growing species. Set up new fruit growing plantation. Guiding the growth and fruit yield by cutting. Preservation of fruit growing plantations. Species and types of fruit growing used in decorations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% of workshop activity).

COURSE TITLE: SPECIAL PHYTOPATHOLOGY
CODE: D29PEL532
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the diseases that are of economic importance, of taxonomy, ecology, epidemiology, prevention and of the therapy regarding the key pathogenic agents to the main flower and ornamental plants.
COURSE CONTENTS: Virosis, Mycoplasmosis and bacteria to flower plants. Diseases produced by mushrooms from the Oomycete and Ascomycete classes to some flower plants. Diseases produced by mushrooms from the Uredinomycetes and

Ustilaginomycetes classes to some flower plants. Diseases produced by anamorphic mushrooms to some flower plants. Bacterial virosis and the main mycosis of ornamental bushes. Vine diseases. Virosis, Bacteria and mycosis to some ornamental trees.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of exam answers, 30% of answers to workshops).

COURSE TITLE: SPECIAL ENTOMOLOGY
CODE: D29PEL533
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Recognition of the main animal pests of flower and ornamental plants and of the useful fauna. Knowledge of the main attack ways of animal pests on flower and ornamental plants. Knowledge and application of the complex of methods regarding the integrated control of animal pests to flower and ornamental plants.
COURSE CONTENTS: Presentation, attack ways and measures for the control of polyphagous pests to flower and ornamental plants. Presentation, attack ways and measures for the control of pests to annual and biennial flower and ornamental plants. Presentation, attack ways and measures for the control of pests to flower and ornamental plants that present bulbs, tubers and rhizome.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (80% of answers to exams, 20% of final answers to practical courses).

COURSE TITLE: LANDSCAPE DESIGN AND URBAN PLANNING I
CODE: D29PEL534
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): The course has as its purpose the presentation to students of the main thinking trends and approaches in the territorial and urban planning throughout time and nowadays. There will be studied various perspectives and intervention modalities upon territories, the organization of urban spaces, the way space evolves together with the society that produces it. The second chapter is represented by the knowledge of urbanism rules and the design of present spaces, by the current laws that frame the planning activity in Romania, as well as by a comparison of these laws to the international legislation under the context of forming one unique European territory.
COURSE CONTENTS: General notions, concepts and theoretical models. The historical evolution of theoretical thinking and of practical approaches in space planning. Legislation for landscape and urban planning. Case studies and comparative analysis of planning mechanisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 20%; results of workshop tests 40%, paper 40%).

COURSE TITLE: EMBANKMENTS AND ROADS
CODE: D29PEL535
ECTS CREDITS: 5
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Students' initiation in the embankments and roads of populated centers. Knowledge of legislation regarding communication ways. Knowledge of infrastructure. Knowledge of superstructure. Knowledge of specific communication ways.
COURSE CONTENTS: Introductory notions. Geometrical elements of communication ways. Infrastructure elements. Superstructure elements. Specific ways of communication.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of exam answers; 30% of the final check from workshops).
ASSESSMENT TYPE: exam
3RD YEAR, 2ND SEMESTER

COURSE TITLE: LANDSCAPE DESIGN AND URBAN PLANNING II
CODE D29PEL638
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Theoretical and practical training of students in the specific field by:
general knowledge of basic elements of urban science; analysis of cities and territories with their morphological elements; developing the capacity to read and represent urban and territorial information.
COURSE CONTENTS: 1. Urbanism science. Features and purpose. Main objectives. 2. Urban design. 3. Landscape design - Features. Purpose and objectives of the built environment. 4. Landscaping and urbanization projects - definitions, purpose, framework content. 5. Projects - Urban documentation. 6. Projects - landscaping documentation. 7. Legislation for landscape and urban planning. 8. Conservation and protection of the environment. Protection of natural and built monuments. 9. Landscaping - The Relationship between Urbanism and Landscape Design. 10. Sustainable urban landscape. Case studies and comparative analysis of planning mechanisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 20%; results of workshop tests 40%, paper 40%).

COURSE TITLE: LAND IMPROVEMENT
CODE: D29PEL639
ECTS CREDITS: 4
TYPE OF COURSE: Domain

COURSE OBJECTIVE(S): Prevention and control of soil erosion to slope land (arable land, vine, fruit trees). Prevention and control of wind erosion. Humidity excess removal both to the surface and to the interior of the soil. Works of projection, construction, exploitation and maintenance of drainage basins.

COURSE CONTENTS: Hydraulic notions. Notions of hydrology, hydrography, hydrometrics, hydrogeology. Soil erosion. Prevention and control of soil erosion. Control of deep erosion. Prevention and control of wind erosion. Landslip. Agricultural land draining. Irrigation.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (70% of exam answers; 30% of the final check to workshops).

ASSESSMENT TYPE: exam

COURSE TITLE: MANAGEMENT OF LANDSCAPE ARRANGEMENT

CODE: D29PEL640

ECTS CREDITS: 4

TYPE OF COURSE: Speciality

COURSE OBJECTIVE(S): An elaborated study on the organization of landscape activities in Romania, on the exploitation of landscape decoration and on the management of projected landscape. The setting of the technologies necessary in the maintenance of plantations, installations and the constructions from the green areas. The administration of landscape decoration.

COURSE CONTENTS: The administrative organization of landscape activities in Romania. The exploitation of landscape decoration. The management of projected landscape. The characteristics of maintaining green areas. The maintenance of inactive constructions, installations, objectives and decorations. Micro-landscape corrections. The erosion and setting of slopes. The maintenance of plantations, grassing areas, decorating bushes, quickset hedges. Possibilities of creating flower decoration, plantation programming, combination of decorating plants.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Checking (70% of exam answers; 30% of the final check to workshops).

COURSE TITLE: URBAN NETWORKS

CODE: D29PEL641

ECTS CREDITS: 4

TYPE OF COURSE: Speciality

COURSE OBJECTIVE(S): Students' initiation in the urbanistic networks of populated centers. Knowledge of the laws of hydrostatics, hydrodynamics and hydrokinematics. Knowledge of the water quality and quantity necessary in inhabited places. Knowledge of water supplying works and water distribution. Knowledge of sewerage works, sewerage schemes and systems.

COURSE CONTENTS: Introductory notions. Hydrostatics. Hydrokinematics. Hydrodynamics. Water flowing through porous areas. The quantity and quality of the water needed in inhabited places. Water collection. Water transport. Constructions for water storage. Water distribution. Improvement of water quality. Sewerage works. Sewerage schemes and systems. Sewerage networks. The cleaning of used water.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Checking (70% of exam answers; 30% of the final check to workshops).

COURSE TITLE: LANDSCAPE ARCHITECTURE

CODE: D29PEL642

ECTS CREDITS: 5

TYPE OF COURSE: Speciality

COURSE OBJECTIVE(S): Knowledge of the specialized terminology and the principles regarding the decoration of green areas. Knowledge of the main types of green areas and their features. Acquire the fundamental notions regarding the theory, art and technique of landscape. The general presentation of the notions regarding the projection, decoration and maintenance of green areas.

COURSE CONTENTS: The importance and functions of green spaces. Evolution and styles in landscape architecture. Classification of green spaces. Composition principles used in Landscape Architecture. Structural elements of green spaces. General concepts for designing green spaces. General notions about green spaces arrangement and maintenance.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (70% of exam answers, 30% of final answers to workshops).

COURSE TITLE: ORNAMENTAL VITICULTURE

CODE: D29PEL643

ECTS CREDITS: 5

TYPE OF COURSE: Domain

COURSE OBJECTIVE(S): Knowledge of the main morphological, biological, ecological and technological features of vine in the sense of familiarizing with the possibilities of ornamental culture

COURSE CONTENTS: The biological bases of ornamental viticulture. The technological bases of ornamental viticulture. The production of vine seed material. The main types of vines and their agribiological and technological features.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (50% of exam answers, 50% of final answers to workshops).

COURSE TITLE: PRACTICE

CODE: D29PEL644

ECTS CREDITS: 4

TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): The purpose of the practical training is to form aptitudes and skills appropriate to the specific activities of horticulture and landscape. Acquiring the practical skills of the knowledge obtained at the specialized courses, regarding the planting and the specific maintenance works of the flower and woody species in the green spaces, pruning shrubs, fruit trees and grape vines.
COURSE CONTENTS: Fructification pruning of fruit trees and shrubs. Maintenance works of floral crops in open field. Pruning of roses in the spring time. Formative pruning of ornamental shrubs. Knowledge of the support structures, types of pruning and ways to direct the grape vine for ornamental purposes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to the final evaluation 100%).

COURSE TITLE: EXPERIMENTAL DESIGN
CODE: D29PEL537
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the role, importance and particularities of biostatistics and research in ecology. Research objectives, the design and organization of research in ecology. Fundamental elements of trials, methods and techniques used in ecology research. Statistical parameters and methods of calculus and analysis.
COURSE CONTENTS: Role, importance and particularities of biostatistics, biometry and ecology research
Research objectives in ecology. Design and organization of research in ecology Extraction of samples for analysis. Measurement errors in environmental field experiences. Design of different types of trials. Methods of setting up monofactorial and polyfactorial trials (randomized blocks, Latin square, Latin rectangle, and balanced square lattice).
Parameters and estimators in statistics (variance, standard deviation, coefficient of variation, correlation, regression). Statistical hypothesis testing, F, t and Duncan tests. Analysis of variance Interpretation and exploitation of results in experiments in ecology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to laboratory tests).

4TH YEAR, 1ST SEMESTER

COURSE TITLE: COMPUTER ASSISTED PROJECTION IN LANDSCAPING I
CODE: D29PEL745
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Using the AutoCAD Graphics Environment. To create students the necessary skills to generate two-dimensional (three-dimensional) models for the correct transposition of space objects on the drawing
COURSE CONTENTS: Basic Elements. Presentation of AutoCAD interface. Configuration and use of drawing tools. Coordinate systems; Specifying distances by coordinates; Interpreting cursor modes and explaining prompts. Setting up a desktop; Use AutoCAD modes as drawing tools. Selection of objects; Editing using control points. Draw Draw Drawing Drawing Drawing Drawing Commands. Modify graphical menu - editing commands. Hatching; Adding text; Listing the drawings. Organization of objects with blocks and groups. Managing Layers and Blocks. Modeling and creating 3D images
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: CONSERVATION OF BIODIVERSITY
CODE: D29PEL746
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the role and importance of biodiversity for the present and future of mankind. Getting familiar with biodiversity structural elements and factors of influence. Knowledge of genetic centers of plant diversity. Knowledge of methods and techniques for conservation of plant and animal genetic resources, improvement of the conservation activities and utilization of horticultural plants biodiversity.
COURSE CONTENTS: Concept, importance and strategies used in protection and conservation of biodiversity. Structural elements and influence factors of biodiversity. Genetic centers of plant diversity. Management of biodiversity and collection of genetic resources. *In situ* conservation (protected and non-protected areas). Ex *situ* conservation (gene banks, botanical gardens, field conservation - collections). Protection and conservation of animal genetic resources. Plant and animal biodiversity conservation in Romania. Plant genetic resources used in landscaping and breeding.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to laboratory tests).

COURSE TITLE: GREEN AREAS DESIGN
CODE: D29PEL747
ECTS CREDITS: 5
TYPE OF COURSE: Speciality

COURSE OBJECTIVE(S): Improving knowledge regarding the landscape projection based on the deep interdisciplinary character. Presentation of the notions of landscape drawing necessary in the elaboration of projects. Setting of the solutions and techniques of projection for the main types of green areas in accordance with the specificity of the theme. The communication of the methods used in the drawing up of projects in accordance with the legislation in the field.
COURSE CONTENTS: Norms and notions regarding the content of the projects. The content of the projects concerning the architecture of green areas landscape and its basic elements. The projection of green spaces of general use. Designing limited access green spaces. Designing green areas with a specialized profile. Designing green spaces with protective functions. Methodologies used in the realization of the previous measurements, evaluations and the elaboration of work estimates.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the exam answers, 25% of the final answers to practical courses, 25% of other activities such as: themes, reports, essays, translations, projects, etc.).

COURSE TITLE: PRODUCTION OF DENDROLOGICAL MATERIAL
CODE: D29PEL748
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge and organization of the technological process in the dendrological seed bedding. The presentation of the methods used to obtain seedlings of various ornamental wood plants. The setting and description of different technologies used to obtain seedlings in accordance with the particular biological features of ornamental wood plants; recommended technique and the goal of using it in the landscape.
COURSE CONTENTS: Generative and vegetative propagation of dendrological species. Technologies used to obtain seedlings and to form the crown of dendrological plants in the dendrological seed bedding (different species and varieties of resinous and leafy trees and bushes, climbing bushes, bushes for hedges). Pull out the seedlings from the seed bedding, their maintenance, packing, transport and plantation in green areas.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (70% of exam answers, 30% of final answers to workshops).

COURSE TITLE: ECOLOGICAL MANAGEMENT
CODE: D29PEL749
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): to define the concepts of ecological management, durable development, natural capital, socio-economic systems, deterioration of natural capital, ecosystem management, the total economic value of ecological resources, ecological economics; to identify the goal and functions of ecological management and durable development; to discuss the mechanisms and instruments of ecological management; to be able to express the environmental policies and legislation, the institutional framework regarding environmental.
COURSE CONTENTS: The need of ecological thinking; the relation natural environment-economics. Ecosystems. The principles of ecological processes. Ecological factors: classification and action laws. The Environment and its durable development. The content and the significance of the concept: durable development. Strategies of achieving durable development. Techno centrism and ecocentrism in the approach of durable development. Sustained human development – an essential component of life quality. The ecological management of pollution. Pollution ecology. The ecology of atmosphere pollution. The ecology of water pollution. The ecology of soil pollution. The ecology of pollution in other situations. Waste management. Waste classification. Methods of waste recovery and elimination. The responsibility of producers and consumers in waste production. Evaluation and authorization of activities that have an impact on the environment. The system of evaluation and authorization of activities that influence the environment. The audit in the ecological management systems. The National System of Accounts and Environment. The integrated economic-ecological accounting. The environment in the National System of Accounts. Methodologies of environmental accounting. Expenses for the environment. The principles of environmental accounting. The costs of environmental deterioration. The system of ecological management. The specific requirements of a system of ecological management. The advantages of a system of ecological management. The principles of environmental management. Environmental monitoring. The concept of environmental monitoring. The components of the monitoring system. The environmental data necessary in the monitoring system. Quantitative indicators of natural environment. Environmental policy and legislation. The environmental legislation from the EU and Romania. International and Romanian institutions of environment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (80% of answers to exams, 20% of final answers to workshops).

4TH YEAR, 2ND SEMESTER

COURSE TITLE: COMPUTER ASSISTED PROJECTION IN LANDSCAPING II

CODE: D29PEL852
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Theoretical notions of computer-assisted design in landscaping. Acquiring the knowledge and skills required to design green spaces with the help of specific software applications.
COURSE CONTENTS: Presentation of landscape design programs: 3D Home Architect - Landscape Design, Instant Landscaping, Realtime Landscape Architect. Drawing in plan, adding specific objects (Building, Terrain, Landscape, Water Features, Swimming Pool, Utilities, Plan detail), knowing their properties and their components; Property setting, default properties. Editing Objects (select, move, rotate, scroll, mirror, delete, align, multiply). Structuring drawings, working with layers (layers); Editing Points. Plants - symbols, information, labels, properties, legend for plants. Views in plan and space; Adding plan to details
LANGUAGE OF INSTRUCTION: : Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: ENVIRONMENTAL LEGISLATION AND COMMUNITY POLICIES

CODE: D29PEL853
ECTS CREDITS: 3
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge and understanding of the premises concerning the appearance and application of environmental policies; the explanation of implementation methods and the supporting instruments; the promotion of performant and durable agriculture; the manifestation of a promotion attitude toward environmental policies.
COURSE CONTENTS: Introduction to the environmental policy in Romania and the European Union. Objectives and principles. The instruments of environmental policy. Strategies in environmental policy, institutions that have responsibilities in the domain, legislation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (80% of exam answers, 20% of final answers to workshops).

COURSE TITLE: ORNAMENTAL CROPS BREEDING

CODE: D29PEL854
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the role, importance and need for genetic improvement of horticultural plants for sustainable human society. The role and importance of horticultural genetic resources for use in plant breeding. Establishment of specific breeding objectives and horticultural plant genetic improvement. Conventional and modern methods of transformation and selection of new genotypes and their implications. Knowledge of the most important breeding results of major ornamental crops. Knowledge and learning the peculiarities of the production of horticultural seed and planting material according to the Romanian legislation and EU directives.
COURSE CONTENTS: Organization and management of breeding works in horticultural crops. Breeding of *Rosa, Dianthus, Tulipa, Gladiolus, Chrysantemum, Hippeastrum, Rhododendron, Syringa, Magnolia, Prunus, Malus, Thuja* - current requirements, guidelines and trends in improving the cultivars. Biological basis and breeding objectives, cytology, germplasm resources. Production of seed and planting material. Protection of plant breeding rights.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to practical laboratory questions).

COURSE TITLE: LANDSCAPING AND MAINTENANCE OF GREEN SPACES

CODE: D29PEL855
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the principles and techniques of landscaping. Knowing the ways of using and associating of dendrologic and flower species in the urban green spaces, in parks and gardens, in the realization of floral compositions. Acquiring the necessary knowledge to apply land preparation works, planting of dendrologic and flower species, establishment of the lawn and the specific green spaces maintenance works.
COURSE CONTENTS: The importance of green spaces arrangement. Stages and specific activities in green spaces arrangement. Making and maintenance of an alpine garden (rockery). Landscaping a sloped garden. Building and maintenance of ornamental ponds. Establishment and maintenance of the lawn. Planting and maintenance of ornamental woody species (trees and shrubs), used in green spaces. Ways of flower species arranging in green spaces. Planting and maintenance of flower species used in the green spaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, activities such as papers, projects 40%).

COURSE TITLE: MARKETING

CODE: D29PEL856
ECTS CREDITS: 2
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the market notions: product, price, distribution, advertising, etc; understanding the type of organizing specific activities of marketing from the organizational and technical point of view.
COURSE CONTENTS: Introductory notions of marketing. The market of food products. Prevision in marketing. Marketing mix. Negotiations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (70% of answers to exam, 30% of answers to workshops).

COURSE TITLE: PRACTICE FOR GRADUATION PROJECT

CODE: D29PEL857
ECTS CREDITS: 10
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Students ability to perform independent work of documentation and research, to generate data and original conclusions. The diploma project must certify the graduate's professional maturity and meet certain minimal requirements of content, form and scientific level. The ability to draw conclusions and propose solutions based on the results of the analyzes performed, in accordance with the field of interest.
COURSE CONTENTS: Establishing the structure and bibliography of the paper as a result of the study of the specialized literature. Finalizing the research methodology in order to achieve the proposed objectives. Editing of the paper. Preparing presentations to support the diploma project. Presentation of the study results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (presentation of the diploma project 100%).

COURSE TITLE: FLORAL COMPOSITIONS

CODE: D29PEL750
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the history of floral art; the materials used in the creation of floral arrangements; the styles, principles and ways of arranging flowers. The choice, association and placing of floral plants in order to use them in different types of floral decorations for interior or exterior design.
COURSE CONTENTS: The art of arranging flowers in different historical epochs. The vegetal material used in floral arrangements. Harvesting, maintenance and processing of fresh or dry vegetal material. Pots, materials, accessories and techniques used in floral art design. Western floral art. – the principles of floral composition and the used styles. Eastern floral art. – basic principles of arrangements. Ikebana. Interior plants, placement criteria, floral compositions of entire plants, container gardens. Ways of placement in exterior design (flower beds, curbstones, flower bands, mosaics, arabesques, etc). The type, the criteria of choice and association of the plants used in different floral compositions. The use of flower plants in the decoration of intermediary spaces-balconies, terraces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of answers to exam; 20% of involvement in practical activities, 30% of drawing up a project).

COURSE TITLE: MEDICINAL AND AROMATIC PLANTS GROWN

CODE: D29PEL858
ECTS CREDITS: 3
TYPE OF COURSE: Speciality
COURSE OBIECTIVES: Acquiring the knowledge about the biology and ecology of medicinal and aromatic plants and their cultivation technologies. Customizing the knowledge of plant growth and development, relationships with vegetation factors and elements of the cultivation technology of this group of plants.
COURSE CONTENTS: Importance, classification and protection of cultivated medicinal and aromatic plants. Establishing technology for the cultivation of medicinal and aromatic plants, methods of setting up the crop by sowing or planting and harvesting them. Storage and marketing of medicinal and aromatic plants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 80%, verification 20%).

FIELD: FOOD PRODUCTS ENGINEERING
PROGRAMME TITLE: AGRICULTURAL PRODUCTS PROCESSING TECHNOLOGY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICS AND STATISTICS

CODE:D29TPAL101
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Determination of lengths, areas and volumes of geometric objects. Solving specific problems of linear programming, such as crop distribution, setting feed ration for animal feed and working technology, based on matrix computing techniques. Knowledge of the fundamental concepts of probability theory, probabilistic computation rules, the main probability schemes, the notion of random variable. Knowledge of the main classical distribution laws. Statistical analysis of the phenomenon. Graphical representation of a statistical series. The distribution of statistical data and graphical representation, the synthesis of data with an indicator representing them, the determination of statistical indicators of populations and samples (for example, indi-cators of the variations and moments)
COURSE CONTENTS: Measurement of lengths, areas and volumes. Linear programming. The calculus of probabilities. Elements of mathematical statistics
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to works and homework 30%).

COURSE TITLE: ELEMENTS OF ELECTRICAL ENGINEERING

CODE: D29 TPAL102
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge some notions about of electrical and magnetic phenomena: electrostatics; stationary electric power; magnetic field of electric current; electromagnetic induction; alternating current; electric machines.
COURSE CONTENTS: The intensity of the electric field; electric potential; conductor isolated in electrostatic field, Capacity of the plane capacitor; the grouping of capacitors, Electric current in metallic conductors; electric circuit laws; energy and electrical power; Magnetic field, magnetic flux, The law of electromagnetic induction, AC Circuits, Electric machines: the electric transformer; DC machine; the synchronous machine; induction machine; electric actuators.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to laboratory works 20%).

COURSE TITLE: INORGANIC AND ANALYTICAL CHEMISTRY

CODE: D29TPAL103
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Familiarize with the concepts of atom structure and classification of elements; Understanding the electronic configuration of the elements, their valence; Acquiring knowledge to understand the types of chemical reactions.
COURSE CONTENTS: Atoms. Atomic structure. Classification of elements. Molecules. Chemical links. Chemical thermodynamics. Chemical equipment. Solutions. Ionic balancing. Chemical cinematics. Catalysis. Coloal status of material. Oxidation and reduction.The basic operations in the laboratory.Reactions and analytical reagents. Qualitative chemical analysis. Chemical quantitative analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, continuous assessment throughout semester 5%, activities such as homework/ essays/ papers/ translations/ projects 5%).

COURSE TITLE: PHYSICAL AND COLLOIDAL CHEMISTRY I

CODE: D29TPAL104
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Understanding and operating with basic notions of colloid chemistry and chemical thermodynamics; Deepening the fundamental notions regarding the principles of chemical thermodynamics and their applications in the study of physical and chemical processes; Understanding of thermodynamic properties corresponding to chemical reactions and other physical and chemical processes; Understanding the notions of chemical equilibrium, interphase equilibrium and operating with specific thermodynamic magnitudes; Understanding the mechanical, optical and electrical properties of colloids and their applications; Understanding of the surface phenomena and applications; Performing experiments, rigorous application of methods of analysis and interpretation of the results, observing the safety norms and working techniques in the laboratory; Developing IT skills with applications in physical chemistry: experimental data processing and interpretation.
COURSE CONTENTS: 1. CHEMICAL THERMODYNAMIC: Introduction. Thermodynamic system. State parameters and functions. Equations

of state. Thermodynamic processes; Steady state. Partial molar properties. Zero law of thermodynamics; First law of thermodynamics. Energy exchange between system and environment. Internal energy. Entalpia. Heat capacities. Applications of the First law to energetic exchange processes without phase transformations: isobar processes, isotherm, adiabatic and politrope transformations, Jules-Thomson effect; Second law of thermodynamics. Carnot cycle, entropy, natural processes spontaneity; Absolute temperature. Thermodynamics potentials. Free energy. Entalpia libera. Applications of principle II of thermodynamics; Third law of thermodynamics. Theorem of heat. Plank's postulate. The absolute entropy of substances; Physical equlibria. Equilibrium criteria. Homogenous system heterogeneous system, phase, independent component, degrees of freedom, equilibrium fundamental equation. Phase law. Clausius Clapeyron equation; Solutions. Ideal solutions, Real solutions, Vapor Pressure, Raoult's Law; 2. CHEMISTRY OF COLOIDS: Introduction. The object and importance of the study of colloid chemistry. Colloidal systems. Obtaining & purifying of colloidal systems; Kinetic-molecular and optical properties. Sedimentation, Stokes formula. Sedimentation in centrifugal field. The Brownian Movement. The Tyndall phenomenon. Light diffusion in colloidal systems; General superficial phenomena. Free energy of the superficial layer. Moisture phenomena. Membrane potential; Adsorption phenomena. Coefficient of adsorption. Surface tension of solutions, Gibbs equation. Siskovski equation, the rule of the traube-Duclaux; Electrocapillary and electro-kinetic phenomena. Electroosmosis. Electrophoresis; Ultramicroheterogeneous systems, emulsions, gels. Sols. Emulsion types, emulsion formation. Association colloids. Gels; *Experimental work:* Specific rules and regulations for conducting experimental works in physical chemistry laboratory; Graphical representation of experimental data;
Determination of the heat of neutralization of a strong acid with a strong base; Determination of the equilibrium constant Kc for the esterification reaction of acetic acid with ethyl alcohol; Preparation and purification of colloidal systems; Viscosity determination of of agar-agar solution; Association Colloids: Determination of critical micellar concentration;
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESSEMENT: Exam (written and oral examination, 70% exam, 20% experimental works, 10% projects).

COURSE TITLE: BIOPHYSICS

CODE: D29TPAL105
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing the notions, concepts, laws and principles specific to physics with implications in the phenomena that determine the living structure of the food and its safety. Understanding the physical methods of monitoring, the physical techniques of investigation and exploration of the living. Knowledge of Physical Activity in Assessing Food Technologies. Deepening the knowledge of physics-specific terms to phenomena and laws that determine the properties and characteristics of the food. Knowledge of field-specific applications and recording and research equipment of importance in physics and applied to food science. Discipline aims to explain phenomena, processes, applications and appliances according to the main physical parameters, food characteristics. Students should explain the implication of each physical process in the structure and stability of the food (from the atomic level to the macro level) or interpret the evolution of the food system based on the evolution of the characteristic factors.
COURSE CONTENTS: Introduction to environmental physics. Matter structure and their organization. Cuantum Physics. Elements of spectroscopy. Solar spectrum. Interaction of radiation with matter. Molecule, aggregation states. Molecular biophysics. Contact phenomena between liquid and solid. Molecular transport phenomena. Diffusion and osmosis. Water and its role. Introduction in biological thermodynamics. Radiant energy, characteristics of thermal energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, periodic answers to practical work 10%, results to periodic control works 30 %).

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DESIGN I

CODE: D29TPAL106
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing the methods of descriptive geometry; Knowing the representation techniques of geometric bodies, plane sections in geometric bodies.
COURSE CONTENTS: Axiomatic bases; Elements of flat geometry; Elements of geometry in space; Conventions, notations, symbols; Point representation; Representation of a straight line; applications; Straight lines on projection planes; Straight lines on bisecting and lateral plane; Particular positions of a straight line; The relative position of a straight line; Representation of a plan; General considerations; Traces of a plan; Particular positions of a plan; Relative position of two planes; The relative position of a straight line to a plane; Perpendicular line to a plan; Perpendicular planes; Seminar theme and project: Introduction to the technical drawing; General rules used for drawing technical designs; Projection systems; Representation of parts in view and section -

theoretical notions and applications; Quotation in industrial design - theoretical notions and applications.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Checking (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: ELEMENTS OF MECHANICAL ENGINEERING I

CODE: D29TPAL107

ECTS CREDITS: 4

TYPE OF COURSE: Domain

COURSE OBJECTIVE(S): Knowledge of concepts, theories and methods basics of Mechanics and Materials. Strength in understanding the technological issues needed to operate general engineering processes in food industry equipment. Application of basic engineering principles and methods of Mechanical Engineering (specific for disciplines of Mechanics and Materials Strength) to improve knowledge of the functional and constructive specific issues in food industry equipment.

COURSE CONTENTS: Mechanics - Introduction: Classification of mechanical macroscopic bodies; Mechanics divisions; Principles of mechanics. Statics: Free material point; Center of gravity; Friction lows; Technical applications of statics. Kinematics: Trajectory, speed, acceleration; Angular speed and acceleration; Particular movements of material point; rectilinear motion of the material point; Rotational movement of the rigid body; Spur gear analysis movement. Dynamics: Mechanical work, energy and power; Kinetostatics of mechanisms with cylindrical spur gear.

Materials Strength - Traction: External and internal forces; Reaction forces; Simple and complex soli-citations; Unitar stress; Deformations and displacements; Relationship between tensile stresses and deforma-tions; Real and conventional characteristic curve; Hooke's law. Bending: Efforts dyagrams in straight bar; Defining the bending efforts in straight bar section; Signs convention; Relations between efforts in straight bended bars; Analytical efforts dyagrams for straight bars; Dimensional sizing for bended bars; Bended bars deformations. Torsion: Torsional torque calculation; Unitar stresses and deformations in the circular bar; Torsion for thin-wall tubular bars.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Checking (answers to colloquium 50%; final answers to periodical Laboratory Tests 40%; Laboratory Notebook 10%).

COURSE TITLE: ENGLISH LANGUAGE

CODE: D29TPAL214

ECTS CREDITS: 2

TYPE OF COURSE: Complementary

COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English; a reference material especially designed for students of the Faculty of Horticulture,TPPA Specialization, but also for those who want to learn ESP vocabulary in context; Practice of important TPPA vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly; Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think; Consolidation of skills to dialogue, describe, report; Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.

COURSE CONTENTS: Focus on language: Present Tense Simple/Continuous; Vocabulary: Sterilization - refers to any process that effectively kills or eliminates transmissible agents (such as fungi, bacteria, viruses, spore forms, etc.) from a surface, equipment, article of food or medication, or biological culture medium. Sterilization; can be achieved through application of heat, chemicals, irradiation, high pressure or filtration. Focus on language: Past Tense Simple/Continuous; Vocabulary: Canned food –Food preservation: Fungi and ambient bacteria are used in the preparation of fermented and pickled foods such as leavened bread, alcoholic drinks, cheese, pickles, and yogurt. Many cultures eat seaweed, a protist, or blue-green algae (cyanobacteria) such as Spirulina. Additionally, salt is often eaten as a flavoring or preservative, and baking soda is used in food preparation. Both of these are inorganic substances, as is water, an important part of human diet; Focus on language: Present Perfect Simple/Continuous; Vocabulary :Fungi- Cultured foods: Human use of fungi for food preparation or preservation and other purposes is extensive and has a long history: yeasts are required for fermentation of beer, wine and bread, some other fungal species are used in the production of soy sauce and tempeh. Mushroom farming and mushroom gathering are large industries in many countries. Many fungi are producers of antibiotics, including β-lactam antibiotics such as penicillin and cephalosporin. Widespread use of these antibiotics for the treatment of bacterial diseases, such as tuberculosis, syphilis, leprosy, and many others began in the early 20th century and continues to play a major part in anti-bacterial chemotherapy. The study of the historical uses and sociological impact of fungi is known as ethnomycology; Focus

on language: Past Perfect Simple/ Continuous Vocabulary :Bacteria, often *Lactobacillus* in combination with yeasts and molds, have been used for thousands of years in the preparation of fermented foods such as cheese, pickles, soy sauce, sauerkraut, vinegar, wine and yoghurt. The ability of bacteria to degrade a variety of organic compounds is remarkable and has been used in waste processing and bioremediation. Bacteria capable of digesting the hydrocarbons in petroleum are often used to clean up oil spills.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D29HCL116
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: school elements of jumping and running; Application paths combined with treadmills; Application paths combined with jumping elements; Application paths combined with equilibrium, escalation, climbing, etc.: Sports games: volleyball, badminton; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

1ST YEAR, 2ND SEMESTER

COURSE TITLE: PHYSICAL AND COLLOIDAL CHEMISTRY II
CODE: D29TPAL208
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): To aquire fundamentals of chemical kinetics and electrochemistry; To corelate the kinetic and electrochemical parameters; To develop practical skills and team working skills in physical chemistry lab; To interpret the experimental data.
COURSE CONTENTS: Introduction; Kinetics of simple and complex reactions; Gas-phase reaction mechanism. Chain reactions; Enzymatic kinetics; Non-equilibrium phenomena in electrolyte solutions; Electrochemistry thermodynamics; Electrochemical system operation: electrolysis and batteries.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (final examination 70%, practical work evaluation 30%).

COURSE TITLE: FOOD CHEMISTRY
CODE: D29TPAL209
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Training students as specialists in the field of food chemistry in order to solve specific problems related to this field.
Theoretical and practical foundation of the basic notions of food chemistry and their correlation with the nutritional issues and the orientation of the processing technologies towards the maximum utilization of the raw and auxiliary materials.
COURSE CONTENTS: Compounds with simple functions present in food, their properties and transformations during processing and their preservation: hydroxylic compounds, carbonylic compounds, carboxylic acids. Mixed-function compounds: hydroxyacids, hydroxyaldehydes, hydroxycetones, amino acids, proteins; their implications in food and the food industry. Heterocyclic combinations present in foods or formed during their processing. General principles of substances that improve the quality of foodstuffs. Flavouring substances, natural antioxidants, antiseptics and stabilizers, natural food colorants, natural emulsifiers, natural sugar substitutes. Food contaminants: mycotoxins, pesticides, herbicides, fungicides, polycyclic hydrocarbons, nitrozamines.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to laboratory worksc20%).

COURSE TITLE: DESCRIPTIVE GEOMETRY AND TECHNICAL DESIGN II
CODE: D29TPAL210
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing the methods of descriptive geometry; Knowing the representation techniques of geometric bodies, plane sections in geometric bodies.
COURSE CONTENTS: COURSE: Method of changing projection planes; applications; Rotation method. Overlapping plans; Intersections of geometric bodies with lines; Intersections between geometric bodies; Polyhedra development; Rotary bodies development; Problems specific to the field of specialization; SEMINAR: Quotation in industrial design; Representation, quotation and marking of threads; Noting the materials; Overall drawing; Representation and quotation of geometric bodies specific to the field.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: TRANSFER PHENOMENA

CODE: D29TPAL211
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Familiarization and understanding of fundamental notions, sizes and parameters specific to technological processes. Knowledge of basic laws for impulse transfer, heat transfer and mass transfer, fundamental physical processes for technological processes in the food industry. Understanding the mechanisms of transfer phenomena and acquiring knowledge to allow an analysis of each phase of a technological process. Explanation of the specific influence of hydrodynamic regime on heat and mass transfer. Presentation of the constructive and functional principle for the main types of machines and apparatuses used in fluid transport and basic thermal processes.
COURSE CONTENTS: Similarity, dimensional analysis and fluid characterization. General aspects of fluids statics. Fundamentals notions in fluid dynamics. Macroscopic mass and energy balances. Loss of fluid pressure flow. Principles and basic machinery in the transport of fluids and heat transfer. Fundamental notions in mass transfer.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: ELEMENTS OF MECHANICAL ENGINEERING II

CODE: D29TPAL212
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Application of basic engineering principles and methods of Mechanical Engine-ering (specific for discipline of Machines Elements) to improve knowledge concerning the functional and constructive issues needed to operate general engineering processes in food industry equipment. Knowledge of principles for dimensioning and verification of mechanical assemblies and mechanical transmission components specific in food industry equipment.
COURSE CONTENTS: Consideration concerning of dimensional and shape accuracy of constituting parts in mechanical transmission: Tolerances and fits; Surface roughness. Permanent assemblies: Welded joints; Riveted joints; Removable assemblies: Threaded; Nuts; Shaped. Friction transmission: Belt drive transmission; Geometry of the V-belt transmission; Calculation of V-belt transmission. Spur gear transmission: Classification; Materials used for the gears making; Geometry of cylindrical gears; Basic relations for spur gear; Spur gear basic law; Rack reference; Tooth profile; Gears damage; Load cyclogram characteristics; Forces in cylindrical spur gears; Sizing and verification calculation of cylindrical spur gears; General computing for inclined toothed spur gear. Axles and shafts: General; Materials; Shaft resistance calculi. Bearings: Classification; Materials for bearings; Sliding bearings; Rolling bearings; Bearings symbolization; Dynamic load capacity; Equivalent dynamic load. Couplings: Classification couplings; Couplings choosing calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%; final answers to periodical Laboratory Tests 30%; Laboratory Notebook and Project Notebook 20%.).

COURSE TITLE: APPLIED INFORMATICS

CODE: D29TPAL213
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The use of IT tools to solve problems in the field of specialization; Making documents in a form as appropriate as possible for the purpose for which they were created; Approaching, at various levels of complexity, computerized word processing, by way of example; Computer modeling of engineering processes; Processing and interpreting data using Excel spreadsheets; exemplifying the diversity of areas where Excel can be used.
COURSE CONTENTS: *Microsoft Word:* Edit actions: create/save/open/close file; Page Setup: page margins, page sizes, page orientation, header and footer options; View, Print Preview. Move/copy/paste; Select text; Search and replace, move to document. View Document; Header and footer creation, ruler, toolbars. Insert into file: page numbers; Page break/section break; Footnotes; diagram, object, text box. Text Formatting: specifying all formatting attributes; Create lists numbered/with bullets/hierarchies; Applying curbs and shadows. Formatting text in columns, specifying TAB positions and guiding characters. Insert table, work with tables. Drawing toolbar; Inserting equations in the document; *Microsoft Excel:* Excel Work Environment; data types; input and edit data. Format spreadsheets; Working with data: sorting; query/filter; Creating links. Working with formulas. Usage of functions: time and date functions; Mathematical functions; Statistical functions; Financial functions; Create and edit charts: the Wizard application for chart creation; Types of charts; Editing and formatting charts. Data analysis: pivot tables; scenarios/variants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: ENGLISH LANGUAGE

CODE: D29TPAL215
ECTS CREDITS: 2
TYPE OF COURSE: Complementary

COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English; a reference material especially designed for students of the Faculty of Horticulture,TPPA Specialization, but also for those who want to learn ESP vocabulary in context; Practice of important TPPA vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly; Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think; Consolidation of skills to dialogue, describe, report; Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Focus on language: Means of expressing future Vocabulary: Meat: The meat packing industry is an industry that handles the slaughtering, processing and distribution of animals such as cattle, pigs, sheep and other livestock. The industry is primarily focused on producing meat for human consumption, but it also yields a variety of by-products including hides, feathers, dried blood, and, through the process of rendering, fat such as tallow and protein meals such as meat & bone meal; Focus on language: Plural of Nouns I Vocabulary : Pasteurization is a process which slows microbial growth in foods. The process was named after its creator, French chemist and microbiologist Louis Pasteur. The first pasteurization test was completed by Louis Pasteur and Claude Bernard on April 20, 1862. Unlike sterilization, pasteurization is not intended to kill all
pathogenic micro-organisms in the food or liquid. Instead, pasteurization aims to reduce the number of viable pathogens so they are unlikely to cause disease (assuming the pasteurization product is refrigerated and consumed before its expiration date). Commercial-scale sterilization of food is not common because it adversely affects the taste and quality of the product; Focus on language: Plural of Nouns II Vocabulary: Food irradiation is the process of exposing food to ionizing radiation to destroy microorganisms, bacteria, viruses, or insects
that might be present in the food. Further applications include sprout inhibition, delay of Ripening, increase of juice yield, and improvement of re-hydration. Irradiation is a more general term of deliberate exposure of materials to radiation to achieve a technical goal (in this context 'ionizing radiation' is implied). As such it is also used on non-food items, such as medical hardware plastics, tubes for gas-pipelines, hoses for floor-heating, shrinkfoils for food packaging, automobile parts, wires and cables (isolation), tires, and even gemstones. Compared to the amount of food irradiated, the volume of those every-day applications is huge but not noticed by the consumer.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D29TPAL217
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Gymnastics Aerobics / Fitness; Application trails combined with treadmills; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports game: football; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%
2ND YEAR, 1ST SEMESTER

COURSE TITLE: FOOD BIOCHEMISTRY I
CODE: D29TPAL318
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The course aims to study the main classes of food biochemical compounds, to know the biochemical aspects regarding structure, physical and chemical properties and metabolic role, to identify and study the biochemical indices and parameters of food quality.
COURSE CONTENTS: The composition of the living matter; Carbohydrates; Monosaccharides: structure, isomers, properties; Monosaccharides derivatives; Oligosaccharides; Polysaccharides; Lipids: classification, biochemical role; Fatty acids, acylglycerols waxes, phosphoglycerides, sphingolipids; Amino acids: classification, structure; Proteins; Vitamins: overview; Liposoluble vitamins: biochemical role, structure' Water-soluble vitamins: classification, structure, biochemical role; Enzymes: structure, enzyme catalytic mechanisms, biochemical roles of enzymes, kinetics of enzymatic reactions.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (written examination 70% + continuous evaluation 20% + report 10%).

COURSE TITLE: FOOD MICROBIOLOGY I

CODE: D29TPAL319
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the microflora which is distinctive for the alimentary industry.
COURSE CONTENTS: Description of the main genres and species of the micro-organisms which do hold a role in the alimentary industry. Knowledge of the isolating and identifying techniques able to be applied to the microbic germs that are present within aliments. Knowledge of the parameters which could influe upon the activity of the micro-organisms which are present within aliments. Knowledge of the micro-organisms which are involved to the technology that allows the obtaining of alimentary products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 85%, final responses sustained upon practical works performed in laboratory: 15%).

COURSE TITLE: COOLING AND CLIMATIZATION SYSTEMS IN THE FOOD INDUSTRY I

CODE: D29TPAL320
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Understanding the importance of artificial cold in preserving and processing food; Knowing the refrigeration processes and understanding the consequences of the irreversibility of these processes in using the artificial cold at maximum efficiency; Knowing the construction and the functioning principle of refrigeration installations; Explaining the irreversibility of refrigeration processes through the exergetic method; Explaining the differences between the ideal cycle and the real cycle of refrigeration installations; Explaining the methods of obtaining the artificial cold; Explaining how to choose the refrigeration installation or the artificial ice depending on the technological and quality requirements for preserving, transporting and processing food products.
COURSE CONTENTS: COURSES: Thermodynamic analysis of the irreversible processes in refrigeration installations: The exergetic method; The Gouy The Stodola Theorem; The fundamental equation of irreversible processes; The operating field of refrigeration installations; Balance and exergy yield. Thermodynamic analysis of the irreversible processes in refrigeration installations: The ideal cycle of refrigeration installations; The real cycle of refrigeration installations. Procedures for obtaining the artificial cold. Processes with refrigerant agent; Procedures for obtaining the artificial cold. Processes without refrigerant agent; Work units of refrigeration installations; Refrigeration installations with one compression stages: Moisturizing refrigeration installations; Industrial refrigeration installations. The real cycle of refrigeration installations with mechanical compressors. Refrigeration installations with two compression stages: Refrigeration installations with one lamination; Refrigeration installations with two laminations. Refrigeration installations with three compression stages; Cascade refrigeration installations; Gas refrigeration installations; Refrigeration installations with vapor absorbers; Refrigeration installations with ejection; Automatization of refrigeration installations; Key elements of refrigeration installations; Refrigeration compressors; Heat exchangers; Artificial ice; Refrigeration spaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: OPERATIONS AND APPARATUS IN THE FOOD INDUSTRY I

CODE: D29TPAL321
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Understanding the fundamental notions and parameters specific to the processes of separation of heterogeneous systems, mixing of materials and concentration by evaporation, separation by crystallization, pasteurization and sterilization. Analysis of influence factors on the efficiency of separation processes. Explaining the constructive and functional principles for the main types of apparatus for separating heterogeneous systems, evaporators, mixers, crystallization equipment, pasteurisation and sterilization apparatus.
COURSE CONTENTS: Separation of heterogeneous systems by sedimentation, centrifugal filtration: fundamental aspects, calculation of characteristic sizes, constructive and functional principle of the main types of machinery. Evaporation: definitions, factors of influence, mass balance, thermal balance, variants of the evaporation operation, evaporators. Pasteurization and sterilization: definition, factors of influence,
machinery and plant for pasteurization and sterilization specific to food process technology. Crystallization: solid-liquid equilibrium, nucleation, crystallization variants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: GENERAL TECHNOLOGIES IN THE FOOD INDUSTRY I

CODE: D29TPAL322

ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of general principles, methods and procedures involved in different sectors of the food industry; Appropriate use of technological methods and procedures in various branches of the food industry: malt and beer industry; the vinegar industry; the distillation industry of spirits and spirits; the fruit juice industry.
COURSE CONTENTS: Appropriate use of technological methods and procedures in various branches of the food industry: malt and beer industry; the vinegar industry; the importance of water in the food industry; Explaining and interpreting the processes of obtaining malt and beer and vinegar on the technological lines; Explaining and interpreting chemical and biochemical processes in the various studied industries; Explaining the different technological processes (alcoholic fermentation, acetic fermentation) from the theoretical and practical point of view; Laboratory determination of the main quality parameters of the studied food product; Determination of organoleptic properties by tasting the finished product; Possibilities to identify food products on the market that are inadequate to the standards in force.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: HYGIENE AND BIOSECURITY IN THE FOOD SECTOR

CODE: D29TPAL323
ECTS CREDITS: 4
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Training of the future engineers vowing to become specialized within the domain of alimentary industry in what does concern the scientific grounds of hygiene norms which are specific to agricultural and alimentary industrial units as well as the knowledge and deepening of the modern methods and techniques through which hygiene could be ensured for the personnel, the equipments, the installations and the devices that are made use of in the domain of alimentary industry.
COURSE CONTENTS: Sanitation and hygiene requirements that concern the designing, the location's choice and the construction of alimentary industrial units. Hygiene ensured within alimentary industrial units. Functional requirements in the ensurance of sanitation and hygiene. Sanitation techniques which concern alimentary products. Sanitation methods and means made use of in the alimentary industry. Hygiene ensuring procedures which concern the water made use of in the alimentary industry. Hygiene ensured for the personnel of alimentary units. Biological security within the domain of aliments'biology. European Union's lawful regulations and other requirements as well as international ones.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 85%, final responses sustained upon practical works performed in laboratory 15%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: PRINCIPLES OF HUMAN NUTRITION

CODE: D29TPAL424
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the energy needs of human, of the factors influencing it as well as how to determine the nutritional and energy value of food; Knowledge of the role of proteins, carbohydrates and lipids in human nutrition, the needs in these nutrients and their food sources; Knowledge of concepts related to the nutritional value of food and the role of different food groups to ensure a correct diet
COURSE CONTENTS: Energy metabolism; Metabolism of proteins and amino acids; Lipid metabolism; Beneficial action of unsaturated fatty acids; Digestion and metabolism of carbohydrates; Food fibers; Vitamins; Biomineral compounds; Microelements in human nutrition; Water in the human body; The nutritional characteristics of the main food groups; Influence of technological processes on the nutritional value of food; Food behavior.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, seminar activity 25%; regular testing 15%).

COURSE TITLE: FOOD BIOCHEMISTRY II

CODE: D29TPAL425
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge and understanding of the role of active substances in the regulation of metabolic processes in living organisms; Acquiring knowledge about the stages of development of key metabolic processes, their regulation and various metabolic interconnections.
COURSE CONTENTS: Metabolism: Introductory concepts, bioenergetics, macroergic compounds, examples of intermediary metabolism; Glucidic metabolism: *Catabolic processes*: Glycolysis, stages, energy balance, intermediates for other pathways; Cori cycle; glyoxylic acid cycle; Cellular respiration. Oxidative decarboxylation of pyruvate, Krebs cycle, respiratory chain, aerobic and anaerobic fermentation. *Anabolic processes*: Photosynthesis. Light dependent reactions, light independent reactions, metabolic role; Gluconeogenesis, stages, metabolic role; Lipid metabolism: Fatty acid biosynthesis and

biodegradation.Biosynthesis of triglycerides and glycerol; Aminoacid and protein metabolism: Biosynthesis and biodegradation of aminoacids and proteins; Nucleic acids metabolism: Biosynthesis and biodegradation of nucleic acids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to laboratory works 20%).

COURSE TITLE: FOOD MICROBIOLOGY II

CODE: D29TPAL426
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the microflora which is distinctive for the alimentary industry.
COURSE CONTENTS: Description of the main genres and species of the micro-organisms which do hold a role in the alimentary industry. Knowledge of the isolating and identifying techniques able to be applied to the microbic germs that are present within aliments. Knowledge of the parameters which could influe upon the activity of the micro-organisms which are present within aliments. Knowledge of the micro-organisms which are involved to the technology that allows the obtaining of alimentary products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 85%, final responses sustained upon practical works performed in laboratory 15%).

COURSE TITLE: COOLING AND CLIMATIZATION SYSTEMS IN THE FOOD INDUSTRY II

CODE: D29TPAL427
ECTS CREDITS: 3
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowing the principles of automatization of refrigeration installations; Knowledge the status diagrams and the simple and complex changes of wet air; Knowing the requirements for ensuring the microclimate conditions; Knowing and understanding the principle of construction and functioning of the air conditioning systems; Explaining the air conditioning and climatization techniques, and the air treatment; Explaining the influence of external and internal factors on the microclimate of the climate space; Explaining how to choose air-conditioning installations according to the production requirements of the industrial and effort microclimate.
COURSE CONTENTS: Course: Automatization of refrigeration installations; Theoretical basics of climatization. Status diagrams of wet air; Theoretical basics of climatization. Simple transformations of wet air; Complex treatment of air; Air treatment during summer; Air treatment during winter; Microclimate conditions; Considerations regarding the balance of air-conditioned spaces; Considerations regarding the complex treatment of air; Climatization installations. Autonomous conditioning aggregates; Climatization installations. Dependent conditioning aggregates; Cold processing technologies of food products. Refrigeration; Cold processing technologies of food products. Freezing; Cold processing technologies of food products. Lyophilization; Performance characteristics of refrigeration technologies. The cooling rate of products and the duration of the technological process; Performance characteristics of refrigeration technologies. The need for cold; Refrigeration technologies specific to the main categories of food products. Products of animal origin; Refrigeration technologies specific to the main categories of food products. Vegetables and fruits; Refrigeration technologies specific to the main categories of food products; Drinks based on fermentation
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESEMENT: Exam (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: OPERATIONS AND APPARATUS IN THE FOOD INDUSTRY II

CODE: D29TPAL428
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Approach and understanding of the interphase mass transfer laws and separation principles for homogeneous mixtures by absorption, distillation, rectification and extraction. Knowledge of basic notions and specific parameters for the drying process of food products. Analysis of factors and parameters influencing specific mechanisms and separation efficiency in the processes of absorption, extraction, distillation, rectification and drying. Explication of constructive and functional principles for the absorption, rectification columns, solid-liquid extractors and the main types of dryers.
COURSE CONTENTS: Absorption: fundamental notions. Distillation-rectification: vapor-liquid equilibrium, simple distillation, rectification operation calculation, azeotropic rectification, vapor entrainment. Rectification columns. Extraction liquid-solid. Drying: general aspects, convective, conductive, spray and freeze drying and the main types of driers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: GENERAL TECHNOLOGIES IN FOOD INDUSTRY II

CODE: D29TPAL429
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of general principles, methods and procedures involved in

different sectors of the food industry; Appropriate use of technological methods and procedures in various branches of the food industry: malt and beer industry; the vinegar industry; the distillation industry of spirits and spirits; the fruit juice industry.
COURSE CONTENTS: Proper use of methods and technological processes in different branches of food industry: industry spirits and distilled spirits natural; natural fruit juice industry; Explanation and interpretation on the technological lines of the processes for obtaining ethyl alcohol, natural alcoholic beverages and natural fruit juices; Explanation and interpretation on the technological lines of the processes for obtaining ethyl alcohol, natural alcoholic beverages and natural fruit juices; Explaining the different technological processes (alcoholic fermentation, distillation) from the theoretical and practical point of view; Laboratory determination of the main quality parameters of the studied food product; Determination of organoleptic properties by tasting the finished product; Possibilities to identify food products on the market that are inadequate to the standards in force.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70%, practical workshops 30%).

COURSE TITLE: RAW MATERIALS OF PLANT ORIGIN I

CODE: D29TPAL430
ECTS CREDITS: 3
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the object of study, general aspects of vegetable raw materials, cereals and technical plants related to production, harvesting and exploitation technology, general trends in use and their classification according to the criteria of origin and use; Knowledge of plants raw materials (vegetable, cereal and technical plants) as vegetative and generative anatomo-morphological parts of plants, nutritional value and elements that define their quality..
COURSE CONTENTS: Knowledge the importance of crop plants in the supply of vegetal raw materials processing industry, current trends in the production and utilization of vegetal raw materials. Structure of plant production. Classification of vegetal raw materials according to certain criteria (technological, organisms, perishability and use). Physical properties of vegetal raw materials and their importance in technological practice. Vegetal raw materials represented by metamorphosed roots, tubers, bulbs, fruits (solanaceae, cucurbitaceae), cereals, oil, legumes (for beans and pods), aromatic and seasoning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 60%, regular practical testing during the semester 40%).

COURSE TITLE: PRACTICE

CODE: D29TPAL431
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Practical acquiring of knowledge related to specialized subjects taught in the second year
COURSE CONTENTS: Acquiring the practical aspects of verifying and observing hygiene rules for the above-mentioned raw materials and finished products; Acquiring rules for checking the quality of packaging and packaging; Acquiring practical skills in labeling food products; Acquiring techniques to verify the authenticity and quality of additives and ingredients;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 100%).

COURSE TITLE: POLICIES AND GLOBAL STRATEGIES OF FOOD SECURITY

CODE: D29TPAL332
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Capacity to collect, process and analyze data on food security, nutrition and poverty problems which remaining law in many developing countries
COURSE CONTENTS: Introduction to food security European policy on food security: What is the European Union? The aquis community. Institutions of the European Union. European Food Safety Authority; Introduction to food security Legislative framework. Codex Alimentarius. White Book on Food Safety; Consumer protection policies: Consumer education. Consumer rights. Consumer protection; Food security : concepts and measurement; Impact of market access on food security – aplication of factor analyses; Nutrition Policy Analyses
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: PHYSICAL EDUCATION

CODE: D29HCL334/435
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Fitness - optimization of physical condition; utilitarian-applicative skills; Exercises for the development of general strength;

Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%
3RD YEAR, 1ST SEMESTER

COURSE TITLE: FOOD PROCESSING EQUIPMENT I
CODE: D29TPAL536
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of basic engineering principles and methods to understand the specific constructive and technological issues in food industry equipment. Working principles knowledge of the most representative food industry equipment. Designig principles knowledge and application of specific cons-tructive and functional / technological sizing for food industry equipment.
COURSE CONTENTS: Food and non - food produces action on materials: Considerations concerning different types of corrosion. Metallic materials recommended for food packaging and food industry equipment making: General steels; Steel alloy; Non-ferrous alloys. Plastics materials recommended for food packaging and food industry equipment making: Classification; Physical-chemical and technological charac-teristics. Metallic vessels for food industry equipment: thin / thick wall vessels; Cylindrical vessels subjected to the internal pressure action (constructive / functional description of the representative equipment); Constructive / technological designing. Solids bulk materials transport equipment: Bulk materials characteristics; Types of conveyors action (constructive / functional description of the representative equipment); Constructive / technological designing. Equipment for liquids transport and processing: Centrifugal pumps; Axial pump; Volumic pumps; Vacuum pumps (constructive / functional description of the representative equipment); Constructive / technological designing. Equipment for compressible liquids transport and processing: Compressor; Fans (constructive / functional description of the representative equipment); Constructive / technological designing. Constructions and installations for water supply: Water supply diagram; Groundwater / surface wate supply; Centrifugal pumps mounting (constructive / functional description of the represent-tative equipment). Water treatment, filtration and disinfection installations: Water - treatment plants; Water filtering equipment; Water disinfection equipment. Washing / cleaning equipment: Middle / large washing machines (constructive / functional description of the representative equipment); Utilities consumption estimation; Constructive / technological designing. Dosing and packaging equipment: Dosing solids / liquid / paste equipment; Bottles removing / loading equipment; Labeling equipment (constructive / functional description of the representative equipment).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to colloquy 50%; final answers to periodical Laboratory Tests 40%; Laboratory Notebook 10%).

COURSE TITLE: FOOD INNOCUITY
CODE: D29TPAL537
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowing and understanding the relationship between the presence of contaminants in different products food of animal origin, and/or vegetal with the understanding of the contamination chain and decontamination; understanding methods and techniques for assessing food innocuity during processing and storage, to the consumer; LMA for different food contaminants; understanding decontamination mechanisms (GMP, GAP); acquiring knowledge on: classification and general characterization of innocuity factors from different food matrices; risk analysis; knowledge of the chemical and microbiological characteristics of the main factors of foods inocuity.
COURSE CONTENTS: General notions; natural contaminants which affects the food innocuity; the effect of chemical contaminants on the inocuity; effect of processing on food innocuity; contamination of foodstuffs with molds toxins; microbiological contamination with viruses, protozoa and parasites a food products; effect of food additives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60%, seminar activity 25%; regular testing 15%).

COURSE TITLE: RAW MATERIALS OF PLANT ORIGIN II
CODE: D29TPAL538
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowing the main production directions for grapes and the characteristics of the fruit trees, the classification of temperate climate trees and the importance of these aspects for the use of fruit in the process of preservation and processing; Presentation of the morphological and technological characteristics of the main table grape varieties, seedless grape varieties and grape varieties for wine; Presentation of the physical, sensory and chemical composition of the fruit-growing raw materials with a role in determining the processing direction; Presentation

of the characteristics of the raw materials of the main tree species.
COURSE CONTENTS: Explaining and interpreting the main technological indices that characterize the grape varieties; Explaining and interpreting the main quality parameters of grapes-raw material for winemaking during the maturation process; Determination of the main qualitative parameters of table grapes, apricots and grapes for wine; Defining the principles of methods of assessing the quality of fruit trees; Evaluating olfactory-gustatory possibilities and the quality of fruit trees using specific methods and techniques.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: TECHNOLOGIES IN WINE INDUSTRY I
CODE: D29TPAL539
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the main constituents present in grape must; Knowing the main constituents present in the various categories of wines; Knowledge of the main chemical, physicochemical and biochemical phenomenon that occur during the transformation of must into wine; Explaining the main chemical, physico-chemical and biochemical phenomenon that occur during the conversion of the must to wine.
COURSE CONTENTS: Interpretation of the main chemical, physicochemical and biochemical phenomenon occurring during the transformation of must into wine; Determining the main qualitative parameters of fresh grape must; Determination of the main constituents of wine.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: PRINCIPLES AND METHODS OF FOOD PRESERVATION
CODE: D29TPAL540
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the scientific bases of the conservation processes: refrigeration, modified atmosphere packaging, freezing, thermal treatment, biochemical preservation, marinating, conservation with antiseptics, preservation by reducing water activity (concentration, dehydration, preservation with sugar or salt). Knowledge of product transformations during preservation processes, influence of preservation processes on food quality. Quality control of food products subject to preservation processes.
COURSE CONTENTS: Food spoilage. Classification of the preservation methods. Refrigeration. Modified atmosphere packaging. Freezing. Thermal treatment. Biochemical preservation. Marinating. Preservation with antiseptics. Preservation by reducing water activity: concentration, dehydration, preservation with sugar or salt.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, seminar activity 20%; regular testing 20%).

COURSE TITLE: PRESERVATION TECHNOLOGY OF AGRICULTURAL RAW MATERIALS
CODE: D29TPAL541
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Characterization of horticultural and agricultural products used as raw material in the food industry; Description of the main operations of the technological flux of agricultural raw materials; Description of the main types of storehauses in which agricultural raw materials are stored.
COURSE CONTENTS: Chemical, physical and sensory properties. The main biochemical processes that take place in agricultural products after harvesting; Transformation of agricultural products as a result of the alteration process; Description of the technological flow of fresh storage of agricultural raw materials

Knowing the main types and methods of agricultural products storage.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

3RD YEAR, 2ND SEMESTER

COURSE TITLE: AUTOMATION OF TECHNOLOGICAL PROCESSES
CODE: D29TPAL642
ECTS CREDITS: 3
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge and appropriate use of electronic components, devices and circuits used in the implementation of automated systems and subsystems; Knowledge and understanding of the role of the subsystems that are part of an automated system; Knowledge and proper use of the automated system concept; Explanation and correct interpretation of basic electronic circuits that make up the family of fundamental logic gates; Explanation and correct interpretation of the functions performed by the subsystems involved in the automation systems; Explanation and correct interpretation of performances provided by an automatic adjustment system.
COURSE CONTENTS: Electronics for automation: DC electrical circuits; AC power circuits; Magnetic and electromagnetic circuits; Diode and transistor; Switching circuits; Linear algebra; Logical gates, integration technologies. Automation with

electromechanical elements: Electromechanical devices; Command schemes. Pneumatic and electropneumatic automation: The basic pneumatic system; Actuators and controls; Electropneumatic components and circuits. Control and automation schemes: Combination command schemes; Logical functions, canonical forms, minimal forms; Sequential command schemes; Methods of synthesis of control schemes in different technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 80%, practical workshops 20%).

COURSE TITLE: FOOD PROCESSING EQUIPMENT II

CODE: D29TPAL643
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of basic engineering principles and methods to understand the specific constructive and technological issues in food industry equipment. Working principles knowledge of the most representative food industry equipment. Designig principles knowledge and application of specific cons-tructive and functional / technological sizing for food industry equipment.
COURSE CONTENTS: Sifting, sizing and sorting equipment: Constructive / functional description of the representative equipment; Constructive / technological designing. Grinding equipment: Constructive/functional description of the representative equipment; Constructive/technological designing. Mixing equipment: Constructive/functional description of the representative equipment; Constructive/technological designing. Centrifugal equipment: Constructive/functional description of the representative equipment; Constructive/technological designing. Filtering equipment: Constructive/functional description of the representative equipment. Food produces sterilizing equipment: Constructive/functional description of the representative equipment. Vegetables and fruits thermal processing equipment: Constructive/functional description of the representative equipment; Constructive/technological designing. Vegetables and fruits preserving equipment: Constructive/ functional description of the representative equipment; Constructive/technological designing. Mixing and kneading equipment for meat products industry: Constructive/functional description of the representative equipment. Thermal processing equipment for meat and meat products: Constructive/functional description of the representative equipment. Sausages and salami processing equipment: Constructive/functional description of the representative equipment. High pressure/vacuum conservation equipment: Constructive/functional des-cription of the representative equipment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to colloquium 50%; final answers to periodical Laboratory Tests and Project Tests 30%; Laboratory Notebook and Laboratory Notebook 20%).

COURSE TITLE: ANIMAL RAW MATERIALS

CODE: D29TPAL646
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the breeds of animals for slaughter, the evaluation of the animals quality, the structure and composition of the meat. Knowledge of fishery products, their composition and their nutritional value. Understanding the changes that occur in muscles after slaughtering and their influence on technological processes and product quality. Knowledge of the structure, physical properties and chemical composition of milk, eggs and honey. Control of the quality of animal raw materials
COURSE CONTENTS: Raw materials for slaughter; Morphological structure, chemical composition and quality of meat; Changes occurring in the muscle after the slaughter of the animal; Fishery products; Milk; Eggs; Honey
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 60%, seminar activity 20%; regular testing 15%).

COURSE TITLE: TECHNOLOGIES IN WINE INDUSTRY II

CODE: D29TPAL645
NUMBER OF ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the main constituents present in grape must; Knowing the main constituents present in the various categories of wines; Knowledge of the main chemical, physicochemical and biochemical phenomenon that occur during the transformation of must into wine; Explaining the main chemical, physico-chemical and biochemical phenomenon that occur during the conversion of the must to wine.
COURSE CONTENTS: Interpretation of the main chemical, physicochemical and biochemical phenomenon occurring during the transformation of must into wine; Determining the main qualitative parameters of fresh grape must; Determination of the main constituents of wine.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: TECHNOLOGIES IN CANNING INDUSTRY

CODE: D29TPAL646

ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the food preservation methods: scientific bases, technological processes and specific equipments, applications in the vegetable and fruit processing industry
COURSE CONTENTS: Clasificarea metodelor de conservare; Conservarea prin congelare; Conservarea prin tratament termic; Conservarea prin fermentatie lactica; Conservarea prin marinare; Conservarea cu antiseptice; Controlul calitatii în industria conservelor de legume şi fructe
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, activity at Laboratory works 15%; regular testing 15%).

COURSE TITLE: TECHNOLOGIES IN MILLING AND BAKERY INDUSTRY II
CODE: D29TPAL647
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the main issues that require milling process: raw materials used in milling and their quality; storage areas and equipment used; technological schemes for preparing grains for grinding wheat; grain-grinding.
COURSE CONTENTS: Cereals, chemical composition, physical properties; Storage spaces; Separation of impurities from corn mass; Grain peeling, Conditioning of the cereals. Technological schemes for preparing wheat for milling, Grinding cereals
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESSEMENT: Exam (answers to exam 80%, final answers to Laboratory works work 20%).

COURSE TITLE: PRACTICE
CODE: D29TPAL648
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Practical acquiring of knowledge related to specialized subjects taught in the third year.
COURSE CONTENTS: Knowledge of the chemical and biochemical characteristics of food; Knowledge of chemical, microbiological and biochemical processes defining food quality; Acquisition of practical ways of receiving and storing and processing raw materials and finished products (cheese, yoghurt, kefir, sour, butter, oilseeds - refined oil, margarine, meat - salami, sausages, meat specialties, Bread specialties, pasta, grapes - wine, distilled, vinegar); Acquiring rules for verifying the quality of the batch of food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 100%).

COURSE TITLE: SENSORIAL ANALYSIS
CODE: D29TPAL550
ECTS CREDITS: 4
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Developing skills to characterize the relationships between the physico-chemical and sensory properties of food. Developing the ability to use sensory analysis as a tool for assessing the naturalness and typicality of foods
COURSE CONTENTS: The definition of tasting and tasting types, the physiological bases of the tasting. Sensory organs participating in the tasting. Tasting alcoholic beverages, tasting dairy products and meat preparations. Tasting of confectionery and pastry products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: PACKAGING AND DESIGN
CODE: D29TPAL651
ECTS CREDITS: 3
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Design of packaging products in the food industry, Packaging design in the food industry, Composition and physico-chemical control of packaging to avoid risks of food alteration, Design involvement in new product development, Design reflection in manufacturing costs.
COURSE CONTENTS: Considerations on design concept and activity, Industrial aesthetics in the case of foodstuffs, Two-component product system - packaging in the design concept, Modern labeling and labeling of foods, Modern labeling of food products, Food packaging, Raw materials and materials used in the industry Packaging, packaging used for main food groups, methods of food packaging, specific aspects of food packaging in relation to consumer protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: RECOVERY OF BY-PRODUCTS FROM THE FOOD INDUSTRY
CODE: D29TPAL553
ECTS CREDITS: 3
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Knowledge and understanding of general technologies for obtaining different categories of foods; Knowledge of the main by-products obtained from the processing of various raw materials.
COURSE CONTENTS: Explanation and interpretation on the technological lines of

procedures for obtaining natural distilled alcoholic beverages, spirits and natural juices from fruits, beer, canned fruits and vegetables, sugar and oil; Determination of main parameters of by-products in the food industry; Laboratory determination of the main quality parameters of the product obtained from the processing of the various by-products, with particular reference to the by-products of each type of industry and the possibilities for capitalizing them.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70%, practical workshops 30%).

4TH YEAR, 1ST SEMESTER

COURSE TITLE: TECHNOLOGIES IN MILLING AND BAKERY INDUSTRY I

CODE: D29TPAL755
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the main aspects of the bakery process: raw material and its quality; preparation and fermentation of dough; baking dough; storage and preserving of bakery products.
COURSE CONTENTS: Raw materials and additives used in the bakery industry, Storage of raw materials and auxiliary, Preparation of raw materials and additives in order to manufacture, Preparation of dough, Kneading. Kneading machinery, Dough fermentation, Final proofing, Pre-baking operations of dough pieces, Baking, Storage and Preservation of bakery products.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESSEMENT: Exam (answers to exam 80%, final answers to Laboratory works work 20%).

COURSE TITLE: QUALITY CONTROL OF FOOD I

CODE: D29TPAL756
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of general methods and techniques for assessing food quality characteristics
COURSE CONTENTS: Student's knowledge and correct learning of food quality control and quality assurance; Understanding the concepts of modern concept on quality; The evolution of the concept of quality; Current guidelines on quality definition.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, regular practical testing during the semester 15%, final answers to Laboratory works 15%)..

COURSE TITLE: MEAT AND MEAT PRODUCTS TECHNOLOGY

CODE: D29TPAL757
ECTS CREDITS: 5
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of raw materials, conservation principles, technological processes, machinery and finished products in the meat industry.
COURSE CONTENTS: Raw materials for slaughter; Technology of animal processing in slaughterhouse; Morphological structure, chemical composition and meat quality; Changes occurring in the muscle after the slaughter of the animal; Preservation of meat by refrigeration and freezing; Preserving meat by salting; Thermal treatments used in the meat industry; Meat processing; Sausage manufacturing and technology; Technology of canned meat products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, activity at Laboratory works 15%; regular testing 15%).

COURSE TITLE: TECHNOLOGIES IN SUGAR INDUSTRY

CODE:D29TPAL758
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge and learning of the stages of the process of obtaining sugar. Knowledge and exploitation of plants and equipment which are used in the sugar products industry.
COURSE CONTENTS: Sugar beet - raw material: morphology and anatomy of sugar beet; chemical components of sugar beet. Preparation of sugar beet for processing process. Extracting sugar from beet. Purification of the diffusion juice. Evaporation. Sugar crystallization. Drying and sifting of sugar. Utilization of by-products. Processing of raw sugar. Learning of sugar legislation in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, periodic testing of practical skills throughout the semester 20%, final answers to Laboratory works 20%).

COURSE TITLE: TECHNOLOGIES IN TOBACCO AND AROMATIC PLANTS INDUSTRY

CODE: D29TPAL759
ECTS CREDITS: 4
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Knowledge of the stages in the technological process used in the production of tobacco products and aromatic plants.
COURSE CONTENTS: Knowledge of tobacco and aromatic species and varieties for the development and use of production technologies; Knowledge of the systematics and chemical composition of tobacco and aromatic plants; Establishing differentiated technologies according to the biological characteristics of the varieties, as well as in relation to the technological offer; Establishing

the main ways of using aromatic plants and tobacco in the food industry, Acquiring control legislation for tobacco and aromatic plants in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, regular practical testing during the semester 15%, final answers to Laboratory works 15%).

COURSE TITLE: ADDITIVES AND INGREDIENTS IN FOOD INDUSTRY
CODE: D29TPAL760
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge and use of additives in the food industry, Conditions for the use of food additives, International regulations on the fields of use and maximum admissible food additives
COURSE CONTENTS: The importance and necessity of the use of additives in the food industry, the national and international regulations on the fields of use and the maximum permissible doses for food additives, The role of additives, ingredients and technological auxiliaries in improving the quality of foodstuffs, Classification of food additives and auxiliaries, Preservatives and antioxidants, Sealing, stabilizing, buffering, hardening and sintering, water retention agents, clarifying and stabilizing agents, foam forming agents, baking agents, dough conditioning substances, baking yeast, enzymes, flavorings, flavorings And flavor enhancers, Food colorants, Acid sweeteners, Sweeteners, Emulsifiers, Texturing agents: hydrocolloids
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

4TH YEAR, 2ND SEMESTER

COURSE TITLE: QUALITY CONTROL OF FOOD II
CODE: D29TPAL861
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Deepening modern methods and techniques for assessing food quality.
COURSE CONTENTS: Deepen knowledge of food quality control, Deepening knowledge of the food quality and safety system: HACCP system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, regular practical testing during the semester 15%, final answers to Laboratory works 15%).

COURSE TITLE: TECHNOLOGIES IN OIL INDUSTRY
CODE: D29TPAL862
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowing and acquiring the stages of the technological process of oil production.
COURSE CONTENTS: Knowledge of the main properties of vegetable oils, Undertaking technological processes for obtaining crude oils from different raw materials; Crossing the stages of the oil refining process, Data on the qualitative aspects of vegetable oils.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, regular practical testing during the semester 15%, final answers to Laboratory works 15%).

COURSE TITLE: MILK AND DAIRY PRODUCTS TECHNOLOGY
CODE: D29TPAL863
ECTS CREDITS: 4
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowing and acquiring the stages of the technological process of obtaining drinking milk and technological processes for obtaining dairy products.
COURSE CONTENTS: Knowledge of dairy raw materials to design, develop and use of production technologies; The chemical composition of milk. The factors which influence the chemical composition and characteristics of the milk. Qualitative and quantitative milk reception. National and European requirements. Primary treatments for milk. Milk for drink technology. Dietary acidic dairy products. The technology of obtaining of consumption cream. Butter manufacturing technology. The used technologies in cheese production. Technology of manufacture of special cheeses. Ice Cream Making Technology. SWOT analysis for a milk processing plant.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, periodic testing of practical skills throughout the semester 20%, final answers to Laboratory works 20%).

COURSE TITLE: PRACTICE FOR THE LICENSE WORK
CODE: D29TPAL864
ECTS CREDITS: 10
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the principles and methodology of drafting and editing the license work.
COURSE CONTENTS: Knowledge of the working methods specific to the subject in which the license is being prepared.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project 100%

COURSE TITLE: BIOTECHNOLOGIES IN FOOD INDUSTRY

CODE: D29TPAL865
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the subject matter and biotechnological research methods. Products obtained. Applications.
COURSE CONTENTS: Presentation of the main applications in food biotechnology, Knowledge of micro-organisms of biotechnology interest; Description of Organic Biocatalyst Enzymes Elaborated by the Living Cell, Traceability of biotechnological aspects in technological processes of obtaining food products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, regular practical testing during the semester 15%, final answers to Laboratory works 15%).

COURSE TITLE: FALSIFICATION OF FOOD PRODUCTS AND THEIR TRACING OUT

CODE: D29TPAL868
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Understanding food risk; Food quality control. Food Expertise; Assimilation of techniques and methods of analysis used in order to track falsification of food products of animal and non-animal origin; Understanding the HACCP principles according to "Codex Alimentarius".
COURSE CONTENTS: Course: Food: notion definition, food matrix; Food information; The authenticity and traceability of food; Food risk analysis. Risk assessment principles of food and drinking water, related to human health; Food risk analysis. Chemical risk assessment; Control of the food quality. Food Expertise; Food frauds; Assessing the safety of genetically modified food; Food falsification. Water falsification; Falsification of food products of animal origin: meat, minced meat, meat preparations, food fats; Falsification of animal food products; Falsification of food products of non-animal origin; Applying HACCP principles according to Codex Alimentarius; HACCP food safety management system. Hazard analysis, determination of critical control points. Lab: Research of monounsaturated fatty oils in virgin olive oil: application to oil research in oil residue; Identification of arabic-robust mixtures in soluble coffee; Preservation mode may have an effect upon the consistency and composition of Cymbopogon citrates oil; Dosing glucose acid in honey by CZE a new criterion for analyzing honey characteristics; Physical and chemical characteristics of deb Nyons oil; Assessment of vanilla qualities; Tracking falsifications on dairy products (milk and derivatives); Tracking falsifications on meat and derived products; Physico-chemical control of cereals and cereal derivatives (bread); Physico-chemical control of alcoholic beverages.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: MARKETING

CODE: D29TPAL869
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Planning, organizing and coordinating agro-food marketing activities; Interpretation of legislation in the food industry as well as basic notions of food; Marketing, strict adherence to the principles of human nutrition and current regulations on food additives; Using basic knowledge to interpret marketing projects; Applying the principles of human nutrition and involvement in the selection of information necessary for the creation and completion of databases in the food industry; Objective evaluation of how to develop and implement the marketing strategy; Developing a marketing project with application in the food industry.
COURSE CONTENTS: Introductory Marketing, Organizing Marketing Services, Agribusiness Market, Elements of Consumer Psychology, Segmentation of Markets, Marketing Forecast, Marketing Mix, Market Making of the Economic Agent - An Integral Part of Marketing Strategy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: MANAGEMENT

CODE: D29TPAL870
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the notions of the economic agent in terms of its organization, its functionality, the way of implementation of the modern management techniques and methods.
COURSE CONTENTS: The role of the food industry in the production of food for human consumption, Introductory management, Running management in modern management, Production capacity and optimal ways of use in the food industry, Creation and development of technical-material basis in the food industry, Organization and management of production Nutrition, Organization of food industry production by types of enterprises, Technical and economic forecasting in the food industry, Human resource management in the food industry, Labor normalization in the food industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (answers to exam 70%, final answers to seminars 30%).

FIELD: ENVIRONMENTAL ENGINEERING
PROGRAMME TITLE: ENGINEERING AND ENVIRONMENTAL PROTECTION IN AGRICULTURE
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS
CODE: D30IMAL101
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Understanding students of the basic notions of algebra; Understanding the ways to approach algebra problems; Development of students' logical thinking; Educating students in the spirit of more realistic approaches to practical problems in the environment; Managing positive and responsible attitudes towards the mathematical field, which helps to investigate economic or engineering problems.
COURSE CONTENTS: Equations, inequalities, matrix calculus, determinants, linear systems, vector spaces, linear applications, bilinear forms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, continuous assessment throughout semester 10%, activities such as homework/essays/papers/projects 10%).

COURSE TITLE: ENVIRONMENTAL PHYSICS
CODE: D30IMAL102
ECTS CREDITS: 5
TYPE OF COURSE: Domanin
COURSE OBJECTIVE(S): Knowledge of notions, concepts, laws and principles specific to physics with implications in phenomena that cause environmental pollution. Knowledge of physical monitoring methods, physical techniques of investigation and exploration of the environment. Knowledge of physical activities in assessing and combating environmental pollution. Assumption of knowledge related to physics-specific terms to the phenomena and laws governing the environment, the similarity and the difference between them at all levels of organization of matter, starting at the subatomic level to the biosphere. Knowledge of environment-specific applications and recording and research equipment of importance in physics and applied to environmental engineering. Discipline aims to explain the phenomena, processes, applications and devices according to the main physical parameters, characteristics of the environment. Students should explain the involvement of each process in the correct functioning of the living environment (from the body level to the biosphere) or interpret the evolution of the system based on the evolution of environmental factors.
COURSE CONTENTS: Introduction to environmental physics. Matter structure and their organization. Cuantum Physics. Elements of spectroscopy. Solar spectrum. Interaction of radiation with matter. Molecule, aggregation states. Molecular biophysics. Contact phenomena between liquid and solid. Molecular transport phenomena. Diffusion and osmosis. Water and its role. Introduction in biological thermodynamics. Radiant energy, characteristics of thermal energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60 %, periodic answers to practical work 10 %, results to periodic control works 30 %).

COURSE TITLE: CHEMISTRY
CODE: D30IMAL103
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Familiarize with the concepts of atom structure and classification of elements; Understanding the electronic configuration of the elements, their valence; Acquiring knowledge to understand the types of chemical bonds; Explaining some notions of thermochemistry and chemical thermodynamics in order to establish the conditions of maximum stability and the laws by which they are transformed to reach the chemical equilibrium state; Interpreting the numerical values of all the most important quantitative parameters determined; Identifying, respectively recognizing the ions in the sample solutions to be analyzed by using the appropriate specific reagents; Determination by calculation of the unknown concentration of volumetric and gravimetric samples.
COURSE CONTENTS: Atoms. Atomic structure. classification of elements. Molecules. Chemical links. Chemical thermodynamics. Chemical equipment. Solutions. Ionic balancing. Chemical cinematics. Catalysis. Coloidal status of material. Oxidation and reduction.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: BOTANY AND PLANT PHYSIOLOGY
CODE: D30IMAL104
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The presented botanical notions give students the support of understanding and acquiring the knowledge necessary for the biochemical and systematic approach of the spontaneous plants.
COURSE CONTENTS: General notions. Biology as a science. Branches of biology. Botany development worldwide. Development of botany in Romania. Nomenclature of spontaneous and cultivated species. Plant cell cytology. Theory of vegetal histology. Meristematic, defense, conductive,

mechanical, fundamental and secretory tissues. Organography. Study of the vegetative and reproductive organs (morphology, types and anatomy). Systematic plant. Getting Started. Plant classification systems. Systematic units (taxa). Phyl. Pteridophyta and Spermatophyta - general characters, classification, representatives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: ECOLOGY
CODE: D30IMAL105
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring information regarding the structure and functions of supra-individual biological systems (populations, communities and the entire biosphere). Understanding the structure and functioning of (ecosystem energy, minerals circulation and self-control) natural ecosystems.
COURSE CONTENTS: Introduction to ecology, object and definition, history of ecology. Theoretical bases of ecology; the ecosystem - the concept of ecosystem; Conceptual directions regarding the ecosystem; Ecosystem components - biotope, communities. The structure of the biotope.; The structure of natural communities - the community as a level of organization of living matter; community structure; indices of diversity; similarity indices; functional diversity; interspecific relationships - interspecific competition; competitive exclusion principle.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60% course + 30% practical course and continuous assessment throughout semester 10%).

COURSE TITLE: ENGLISH I
CODE: D30IMAL106
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English, using a reference material especially designed for students of the Faculty of Horticulture, but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Focus on language: Present Tense Simple/ Continuous, Vocabulary: Waste water management. Air pollution control. Recycling, waste disposal, radiation protection. Industrial hygiene. Animal agriculture. Environmental sustainability. Public health and environmental engineering law.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY
CODE: D30IMAL107
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing the methods of descriptive geometry; Knowing the representation techniques of geometric bodies, plane sections in geometric bodies.
COURSE CONTENTS: Axiomatic bases; Elements of flat geometry; Elements of geometry in space; Conventions, notations, symbols; Point representation; applications; Representation of a straight line; Applications; Straight lines on projection planes; applications; Straight lines on bisecting and lateral plane; Particular positions of a straight line; The relative position of a straight line; Representation of a plan; General considerations; Traces of a plan; Particular positions of a plan; Relative position of two planes; The relative position of a straight line to a plane; Perpendicular line to a plan; Perpendicular planes; Seminar theme and project: Introduction to the technical drawing, General rules used for drawing technical designs, Projection systems, Representation of parts in view and section; Quotation in industrial design.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to seminary works 20%)

COURSE TITLE: PHYSICAL EDUCATION AND SPORTS
CODE: D30IMAL108
ECTS CREDITS: 3
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: school elements of jumping and running; Application paths combined

with treadmills; Application paths combined with jumping elements; Application paths combined with equilibrium, escalation, climbing, etc.; Sports games: volleyball, badminton; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

1ST YEAR, 2ND SEMESTER

COURSE TITLE: CHEMISTRY
CODE: D30IMAL209
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The course aims to study the main classes of organic compounds, the correlations between their structure and the main properties that determine and influence the pollution of the environment.
COURSE CONTENTS: Structure of organic compounds. Electronic structure and covalent bonds. Stereochemistry. Types of isomerism; Optical isomers, Characteristic aspects (thermodynamic, kinetic, mechanistic) of organic reactions. Hydrocarbons, Halogenated compounds Hydroxylic combinations: mono- and poly-ols: properties, representatives. Organic combinations of sulfur; Organic combinations of nitrogen. Amines, nitro-derivatives. Carbonyl combinations: aldehydes and ketones; Carboxylic acids: Functional derivatives of carboxylic acids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (written examination 70% + continuous evaluation 20% + report 10%).

COURSE TITLE: APPLIED INFORMATICS
CODE: D30IMAL210
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The use of IT tools to solve problems in the field of specialization; Making documents in a form as appropriate as possible for the purpose for which they were created; Approaching, at various levels of complexity, computerized word processing, by way of example; Computer modeling of engineering processes; Processing and interpreting data using Excel spreadsheets; exemplifying the diversity of areas where Excel can be used.
COURSE CONTENTS: *Microsoft Word:* Edit actions: create/save/open/close file; Page Setup: page margins, page sizes, page orientation, header and footer options; View, Print Preview. Move/copy/paste; Select text; Search and replace, move to document. View Document; Header and footer creation, ruler, toolbars. Insert into file: page numbers; Page break/section break; Footnotes; diagram, object, text box. Text Formatting: specifying all formatting attributes; Create lists numbered/with bullets/hierarchies; Applying curbs and shadows. Formatting text in columns, specifying TAB positions and guiding characters. Insert table, work with tables. Drawing toolbar; Inserting equations in the document. *Microsoft Excel:* Excel Work Environment; data types; input and edit data. Format spreadsheets. Working with data: sorting; query/filter; Creating links. Working with formulas. Usage of functions: time and date functions; Mathematical functions; Statistical functions; Financial functions. Create and edit charts: the Wizard application for chart creation; Types of charts; Editing and formatting charts. Data analysis: pivot tables; scenarios/variants.
LANGUAGE OF INSTRUCTION : Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: SPECIAL MATHEMATICS
CODE: D30IMAL211
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of fundamental problems of differential and integral calculus Explaining the derivation and integral concepts and their practical interpretation; Knowledge of processes and phenomena described by equations; The use of examples of mathematical models of evolutionary processes in various fields (leading to the notion of differential equation); The perception of mathematics as a method of understanding certain disciplinary engineering processes in order to obtain a useful and performing work tool; Understanding the applicative character of mathematics in the cutting-edge areas of current technology
COURSE CONTENTS: Differential and integral calculation. Examples of mathematical models of evolutionary pro- cesses from various domains, leading to the notion of differential equation (the phenomenon of population growth of a species, radioactive disintegration, a mathematical model of epidemics, the harmonic oscillator). Fundamental results regarding the existence and uniqueness, local or global, of the solution of a Cauchy problem. Existence and uniqueness for differential equations of the first order . Differential equations of first order solvable by quadrature (with separable variable, homogeneous, linear of first order, Bernoulli, Riccati, Lagrange and Clairaut). The study of linear differential equations and linear differential equation systems
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (exam answers 70%, final answers for workshops 10%, continuous assessment throughout semester 10%, activities such as homework/essays/papers/projects 10%.)

COURSE TITLE: LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

CODE: D30IMAL212
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing the methods of descriptive geometry; Knowing the representation techniques of geometric bodies, plane sections in geometric bodies.
COURSE CONTENTS: Course: Method of changing projection planes; Rotation method. Overlapping plans; Intersections of geometric bodies with lines; Intersections between geometric bodies; Polyhedra development; Rotary bodies development; Problems specific to the field of specialization. SEMINAR and PROJECT: Quotation in industrial design; Representation, quotation and marking of threads; Noting the materials; Overall drawing; Representation and quotation of geometric bodies specific to the field.
LANGUAGE OF INSTRUCTION : Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to seminary works 20%)

COURSE TITLE: BOTANY AND PLANT PHYSIOLOGY

CODE: D30IMAL213
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and interpretation of the physiological processes of plant organisms and acquiring practical skills for the experimental demonstration of the main vital plant manifestations.
COURSE CONTENTS: Introduction to vegetal physiology. Plant cell physiology. Water exchange between the plant cell and the external environment. Plant water regime (The role of water in plants. Absorption and transport of water in plants. Plant water elimination. Methods of studying plant transpiration). Mineral nutrition (Absorption of mineral elements by plants. Transportation, accumulation and excretion of substances by plants, Physiological role of mineral elements in plants).
Carbon Nutrition - General Notions. Photosynthesis - mechanism, influence of external and internal factors, Chemosynthesis, heterotrophic nutrition, mixedotrophy nutrition. Aerobic and anaerobic respiration. Plant growth: growth of plant organs, regulating growth substances, influence of external factors. Development: Development cycle characteristics, influence of external factors. Resting: seminal and bud rest. Plant movements.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam course 70 % and answers to Laboratory works 30%).

COURSE TITLE: ECOLOGY

CODE: D30IMAL214
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring information regarding the structure and functions of supra-individual biological systems (populations, communities and the entire biosphere). Understanding the structure and functioning of (ecosystem energy, minerals circulation and self-control) natural ecosystems.
COURSE CONTENTS: Population - characteristics, heterogeneity, spatial structure. Population - rates: natality, mortality, natural growth rate; carrying capacity of the environment; the dynamics of a population's size; exponential and logistic growth of a population; self-regulation - adjustment mechanisms. Ecosphere system - Ecosystem structure (toposfer and biosphere), global circuit of matter, turnover rate, turnover time, global biogeochemical cycles, biogeochemical circuit of carbon.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers - 60% course + 30% practical course and continuous assessment throughout semester 10%).

COURSE TITLE: ENGLISH II

CODE: D30IMAL215
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English; using a reference material especially designed for students of the Faculty of Horticulture , but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Focus on language: Past Tense Simple/ Continuous, Vocabulary: The environmental impact of proposed construction projects. The effect of technological advances on the environment. Hazardous-waste management. Advise on treatment and containment. Municipal water supply and industrial wastewater treatment systems. The effects of acid rain, global

warming, ozone depletion, water pollution and air pollution from automobile exhausts and industrial sources.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: PHYSICAL EDUCATION AND SPORTS

CODE: D30IMAL216
ECTS CREDITS: 3
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Gymnastics: Front and Band Exercises; Gymnastics Aerobics / Fitness; Application trails combined with treadmills; Application paths combined with equilibrium, escalation, climbing exercises; Sports games: basketball; Sports game: football; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: BIOLOGY II - MICROBIOLOGY

CODE: D30IMAL317
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Learning morphological, metabolic and reproduction features of important microorganisms (viruses, bacteria, molds) in environmental protection domain.
COURSE CONTENTS: Characterization of the major groups of microorganisms: viruses, bacteria, yeasts, molds. Chemical composition of microorganisms. Enzymatic equipment of bacteria and yeasts. Nutrition of microorganisms; Forming the skill to execute and interpret microscopic preparations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 35%, Active participation in courses 10%, Written assessment (during the semester): questionnaire 10%, Final written assessment (in the exams session) 35%, Active participation in seminars 10%).

COURSE TITLE: MECANICAL ENGINEERING

CODE: D30IMAL318
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of concepts, theories and basic methods of Mechanics and Materials. Strength for understanding the technological issues needed to operate engineering processes within specific equipment for environment protection engineering in agriculture. Knowledge and application of basic engine-ering principles and methods of Mechanical Engineering (specific for disciplines Mechanics and Materials Strength) to improve understanding the functional and constructive issues within specific equipment for environ-ment protection engineering in agriculture.
COURSE CONTENTS: Mechanics. Introduction: Classification of mechanical macroscopic bodies; Mechanics divisions; Principles of mechanics. Statics: Free material point; Center of gravity; Friction lows; Technical applications of statics. Kinematics: Trajectory, speed, acceleration; Angular speed and acceleration; Particular movements of material point; rectilinear motion of the material point; Rotational movement of the rigid body; Spur gear analysis movement. Dynamics: Mechanical work, energy and power; Kinetostatics of mechanisms with cylindrical spur gear. Materials Strength. Traction: External and internal forces; Reaction forces; Simple and complex solici-tations; Unitar stress; Deformations and displacements; Relationship between tensile stresses and deforma-tions; Real and conventional characteristic curve; Hooke's law. Bending: Efforts dyagrams in straight bar; Defining the bending efforts in straight bar section; Signs convention; Relations between efforts in straight bended bars; Analytical efforts dyagrams for straight bars; Dimensional sizing for bended bars; Bended bars deformations. Torsion: Torsional torque calculation; Unitar stresses and deformations in the circular bar; Torsion for thin-wall tubular bars.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (answers to colloquy 50%; final answers to periodical Laboratory Tests 40%; Laboratory Notebook 10%).

COURSE TITLE: COMPUTER AIDED GRAPHICS

CODE: D30IMAL319
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Using the AutoCAD Graphics Environment; To present the theoretical principles, the general notions for engineering graphic representations; To create students the necessary skills to generate two-dimensional (three-dimensional) models for the correct transposition of space objects on the drawing.
COURSE CONTENTS: Basic elements; presentation of AutoCAD interface; Configuration and use of drawing tools; Cordinate systems; specifying distances by coordinates; Interpreting cursor modes and explaining prompts; Setting up a working surface; use AutoCAD modes as drawing tools; Selection of objects; editing using control points; Presentation of graphical menu Draw, using

Drawing Commands; Presentation of graphical menu Modify - editing commands; Hatching; adding text; listing the drawings; Organization of objects with blocks and groups; Managing Layers and Blocks; modeling and creating 3D images.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to Laboratory works 30%).

COURSE TITLE: WASTE MANAGEMENT
CODE: D30IMAL320
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Theoretical and practical training of students in order to know and observe the strategic principles and objectives regarding waste management, norms and legislative acts, as well as the acquis communautaire. It is also intended to stimulate the development of an ecological attitude based on the need for selective waste collection and recycling in order to protect natural resources and respect the concept of sustainable development.
COURSE CONTENTS: The purpose, principles and strategic objectives of integrated waste management. Classification and characteristics of the waste. Collection and recycling of waste paper, glass and plastics. Collection and recycling of textile waste, packaging, wood materials and organic waste. Collection and recycling of ferrous and non-ferrous materials, as well as of rubber materials. Managing industrial waste recycled in agriculture, sewage sludge, septic liquids and slaughterhouse waste. Managing special waste streams. Waste transport. Transfer stations. Waste storage. Waste composting. Other waste treatment processes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers to practical laboratory works - elaboration of statistical surveys in the field of waste management 30%).

COURSE TITLE: TOPOGRAPHY I
CODE: D30IMAL321
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the elements of base Topography. Reading and use of topographic maps. Basic competences in planimetric survey. Ability to use main surveying schemes for realising engineering and environmental protection projects. Identifying the advantages and disadvantages of each alternative solution.
COURSE CONTENTS: Basic topography and general concepts; Measurement units in topography. The topographic circle and angular functions. Orientations and axis of coordinates. Marking and signaling points. Surveying Instruments. Measure of distances and angles. The errors in Topography. Planimetric surveying methods: Closed traverse; Closed-loop traverse; Detailed survey; Abscissas and ordinates method. Intersection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, periodical assessment through practical tests 20%, continuous assessment throughout semester 10%, activities such as homework/papers 20%).

COURSE TITLE: FLUID MECHANICS
CODE: D30IMAL322
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of concepts, theories and basic methods of Fluid Mechanics for under-standing the technological issues needed to operate general engineering processes / facilities within specific equipment for environment protection engineering in agriculture in order to prevent and to reduce the polution fenomena. Knowledge and application of basic engineering principles and methods of Fluid Mechanics to improve understanding the technological and constructive issues within specific equipment for environ-ment protection engineering in agriculture.
COURSE CONTENTS: Course: General consideration concerning Fluid Mechanics: Phisical properties of ideal and real fluids. Fluid Hydrostatics: Considerations hydrostatic pressure; Hydrostatics basic equation of the in the terrestrial gravitational field; Pascal's principle; Euler equation; Hydrostatic force generated by the pressure on flat and curved surfaces. Fluid Dynamics: General hydrodynamics; Classification and defining of fluids movement; Continuity equation in integral form; Fluids flowing in pipes and channel: Basic equation of permanent flowing in pipes and channel. Laminar and turbulent flowing in circular pipe; Fluid leakage through the orifices, nozzles and overflow; Timing drain for reservoir with variable level; Channel optimal cross-section; Silt transport (transport of solid material); Permeability; Fluids flow through porous media. Hydraulic machines: Classification and defining hydraulic machines; Operating regimes for centrifugal pumps; Volumic pumps; Fans. Air hydrodynamics: Air flow in pipes; Air flow equations. Pressure and frictional losses. Filtration conside-rations. Functional dust filters characteristics; Types of filters; Smell sources; Air deodorizing systems.
Practical works: Fluids parameters measurement (temperature, pressure / vacuum, gas velocity). Bunker dis-charging using pneumatically shock waves. Storing and transporting ISCIR vessels for pressurized gas. Fluids filtration through porous adsorbent powder.
Project: Pumps functional parameters (Q, H, NPSH); Pump calculation for free level aspiration,

lower than pump level; Pump calculation for free level aspiration, above than pump level; Pump calculation for closed tank aspiration, when inside pressure is different from the atmospheric pressure.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%; final answers to periodical Laboratory Tests 30%; Laboratory Notebook and Project Notebook 20%).

COURSE TITLE: ORGANIZATION AND ESTABLISHMENT OF THE TERRITORY

CODE: D30IMAL323
ECTS CREDITS: 3
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Transfer of knowledge on the development of territorial operational planning under given conditions and efficient and optimal systematization of the agricultural territory, rural and national areal; Legal awareness on land use; Interpretation of mechanisms by which natural and anthropic factors influence the territorial organization and systematization; Development of capacity to prepare documentation on land use, organization and systematization..
COURSE CONTENTS: Territorial organization and systematization – introductory basis; Structure of agricultural real estate in Romania. Classification of agricultural real estate in Romania. General Land Registry. Use Categories; Particularities of territorial organization depending on business branches; Management of forestry and real estate, development of rural areas; Components of rural infrastructure; Territorial organization in horticulture farms; Organization and systematization of vine and fruit growing areas, hayfields and grazing lands. Rural tourism; Durable development – basics; action plans; Urban land structure. Urban development metrics. Urban planning; Organization and systematization of green areas.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (written assessment 75%, activities such as homework/ essays/ papers/ translations/ projects 25 %).

COURSE TITLE: PHYSICAL EDUCATION III

CODE: D30IMAL325
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: Long jump technique; Utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

2ND YEAR, 2ND SEMESTER

COURSE TITLE: BIOLOGY II - ZOOLOGY

CODE: D30IMAL426
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The capacity to understand the geological evolution of the Romanian fauna, the ways of deterioration of fauna; the knowledge of the protection measures for different faunistic elements.
COURSE CONTENTS: 1. The groups of invertebrates and vertebrates: Protozoa, Porifera, Cnidaria, Ctenophora, Vermes (Platyhelminthes, Annelida, Nemathelminthes), Mollusca, Arthropoda, Echinodermata, Cyclostomata, Pisces, Amphibia, Reptilia, Aves, Mammalia – the ground plan and general features, diversity, biology, importance and interactions with the human activities. 2. Fauna – introductory elements, the spatial distribution of the fauna in Romania. 3. The ways of constitution of the faunas – species and speciation; the geological evolution of the Romanian fauna – the cuaternar glaciation. 4. The anthropic factor in changing and deteriorating the fauna 5. Categories of faunistic elements; protected faunistic elements. 6. The role of the natural parks and reserves; measures and lows for animals, habitats and environmental protection. 7. The parasitic pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, continuous assessment throughout semester 50%).

COURSE TITLE: MECHANICAL ENGINEERING

CODE: D30IMAL427
ECTS CREDITS: 3
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge and application of basic engineering principles and methods of Mechanical Engineering (specific for discipline Machines Elements) to improve understanding the techno-logical and constructive issues needed to operate general engineering processes within specific equipment for environment protection engineering in agriculture. Knowledge the principles for dimensioning and verification of mechanical assemblies and mechanical transmission components within specific equipment for environment protection engineering in agriculture.

COURSE CONTENTS: Consideration concerning of dimensional and shape accuracy of constituting parts in mechanical transmission: Tolerances and fits; Surface roughness. Permanent assemblies: Welded joints; Riveted joints. Removable assemblies: Threaded; Nuts; Shaped. Friction transmission: Belt drive transmission; Geometry of the V-belt transmission; Calculation of V-belt transmission. Spur gear transmission: Classification; Materials for the gears making; Geometry of cylindrical gears; Basic relations for spur gear; Spur gear basic law; Rack reference; Tooth profile; Gears damage; Load cyclogram characteristics; Forces in cylindrical spur gears; Sizing and verification calculation of cylindrical spur gears; General computing for inclined toothed spur gear. Axles and shafts: General; Materials; Shaft resistance calculi. Bearings: Classification; Materials for bearings; Sliding bearings; Rolling bearings; Bearings symbolization; Dynamic load capacity; Equivalent dynamic load. Couplings: Classification couplings; Couplings choosing calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Rxam (answers to exam 50%; final answers to periodical Laboratory Tests 40%; Laboratory Notebook 10%).

COURSE TITLE: ENVIRONMENTAL CHEMISTRY
CODE: D30IMAL428
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Students will be able to approach and explain the complex notions and phenomena specific to environmental chemistry: Explaining and interpreting a problem of environmental chemistry in clear terms; Identification of the processes, concepts and phenomena underlying the specific methods and instrumental analyzes and measures specific to the field of Environmental Science; Explaining a concept / phenomenon involved in environmental chemistry using the related field instruments (physical, geology, biology, ecology, mathematics); Recognize the scientific significance of the magnitudes, phenomena and processes in environmental chemistry and the size orders associated with the values of the usual concentrations; Processing data acquired during the investigation process to solve specific concrete situations specific to the environmental chemistry study program; Critical comparison of data acquired, analyzed and processed with theoretical estimates or data provided by the literature; Elaboration of data sheets comprising: experimentally measured values or theoretically calculated values, calculation of errors, graphical representation, interpretation of results.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (40% Written evaluation; 30% project and 30% portfolio).

COURSE TITLE: TOPOGRAPHY II
CODE: D30IMAL429
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Basic knowledge and competence about the survey and representation of the territory. Measuring level differences and calculating points altitudes; Elaboration of quoted plans and drawing of level curves; Integration of specific topographical problems in environmental engineering protection projects. Identification of alternative solutions.
COURSE CONTENTS: Desing- Surveying plan - Area calculation. Detachment of surfaces. Geometric leveling: scheme, instrumentation, accuracy, methodes. Leveling of the surfaces. Methods of relief representation. Slopes. Relief forms. Elements of the topographic and cartographic drawing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 40%, periodical assessment through practical tests 5%, continuous assessment throughout the semester 5%, activities such as homework/projects 50%).

COURSE TITLE: SOIL SCIENCE
CODE: D30IMAL430
ECTS CREDITS: 3
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of formation, composition and evolution of soils, soil and development of human society, preserving soil quality, objective necessity of increasing agricultural production.
COURSE CONTENTS: Soil-definition, role and importance, Pedogenetic factors of soil formation, Formation and composition of mineral and organic part of the soil, Formation and composition of the soil profile, Classification of soils in our country, The main soil types, Soil physics, Hydro-physical properties,
Soil colloids, soil solution and its reaction, Soil flora and fauna, Nutrient cycle in the soil.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to Laboratory works work 20%).

COURSE TITLE: FUNDAMENTALS OF ENVIRONMENTAL PROTECTION
CODE: D30IMAL431
ECTS CREDITS: 3
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Acquiring knowledge about the main laws, notions and concepts specific to environmental protection; The use of logical connections with other related core scientific areas; Optimal environmental characterization of environmental factors and the elaboration of measures to protect them; Identifying optimal alternatives to respect and protect the environment,

biodiversity, ensuring a harmonious environment, and conditions for a healthy life.

COURSE CONTENTS: Environment, ecology and social development. Social and economic development and nature protection. General regulation on ambient air quality. Norms regulating the protection of the atmosphere. Attributions and obligations regarding atmospheric protection. Programs to combat atmospheric pollution. Prevention and control of water pollution. Water management. Water legislation. Soil pollution sources. Measures to prevent, reduce and protect soil pollution. Legal measures for the protection and sustainable conservation of soil. Sound pollution. Measures to combat vibration and noise. The ambient noise assessment and management regime. Radioactive pollution. Sources of pollution from nuclear activity. Principles and conditions of the nuclear activity in Romania. The impact of waste on the quality of environmental factors. Traffic control rules of the waste. Biodiversity and biodiversity conservation. Genetically modified organisms. Contesting GMOs. The seizure of agriculture by multinationals. Global climate change. Risk assessment of contamination. Environmental risk assessment. Environmental monitoring. Integrated Pollution Prevention and Control. "Seveso" Directive, IED and EMAS Directive.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers to seminar - 30%).

COURSE TITLE: PROTECTED NATURAL AREA

CODE: D30IMAL433

ECTS CREDITS: 3

TYPE OF COURSE: Domain

COURSE OBJECTIVE(S): Familiarization of master students with the current and varied problems related to the potential of protected areas, with emphasis on the "protection and preservation of the environment" aspects.

COURSE CONTENTS: Conservation of plant diversity at global and regional level (Global Plant Conservation Strategy & European Plant Conservation Strategy). Important areas of protection: the conceptual framework; The European program to identify the most important areas of protection; Identifying the most important areas of protection in Romania. Conservation of Plant Diversity: European and Global Coordinates. Plant diversity in the general context of biodiversity conservation. International instruments created for the purpose of biodiversity conservation. International organizations. Implementation of international standards on biodiversity conservation, infrastructure creation and access to programs. Botanical garden involvement in the overall biodiversity conservation process, strategic directions for the development of scientific research aimed at plant preservation. Classification systems and protected area categories. List of threatened species at global, European, endemic and subendemic level. Special areas for the protection and conservation of plants in Romania. Protected areas from other regions of the globe.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: PHYSICAL EDUCATION IV

CODE: D30IMAL435

ECTS CREDITS: 1

TYPE OF COURSE: Complementary

COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.

COURSE CONTENTS: Fitness - optimization of physical condition; utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competition conditions.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

3RD YEAR, 1ST SEMESTER

COURSE TITLE: THE DEVELOPMENT AND THE MANAGEMENT OF WATER RESOURCES

CODE: D30IMAL538

ECTS CREDITS: 5

TYPE OF COURSE: Specialized discipline

COURSE OBJECTIVE(S): Presentation of the basic elements for the design, construction and operation of water management works in circumstances of environment protection.

COURSE CONTENTS: Water resources, Water management, Harmful water effects, Development and ecological reconstruction of rivers, Large water management.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (70% exam answers, final answers to practical laboratory work 30%).

COURSE TITLE: ECOLOGY OF ANTROPIC SYSTEMS

CODE: D30IMAL539

ECTS CREDITS: 4

TYPE OF COURSE: Specialized discipline

COURSE OBJECTIVE(S): Knowledge of the anthropic systems, characteristics, terminology. Evolution of anthropic systems; Dimensions and principles of sustainable development.

COURSE CONTENTS: Definition, history, terminology, importance of discipline and connection with other sciences. Evolution of anthropic systems. Anthropic fruit tree systems - diversity, characteristics, structural elements. Evaluation of favorable climate levels for tree cultivation – agro-ecological zoning and micro-zoning. Interactions and relationships in fruit tree anthropic systems. Degradation factors of fruit-growing anthropic systems – their nature and importance, technological impact, sustainable development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% periodic evaluation).

COURSE TITLE: TOXICOLOGY
CODE: D30IMAL540
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Acquiring basic and specific theoretical knowledge and the practical skills required to conduct work in toxicology laboratories and related fields.
COURSE CONTENTS: General Toxicology, Factors that affect toxicity, Toxicokinetics, Toxicodinamy, Combating toxic effects, Toxic and volatile substances, Toxics of a mineral nature, Toxicity of hydrocarbons, Toxicity of alcohols, glycols, aldehydes and ketones, Toxic of plant and animal nature, Toxicity of phytosanitary substances, Toxicity of drugs and hallucinogenic substances
LANGUAGE OF INSTRUCTION : Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, activities such as homework/essays/papers/projects 10%).

COURSE TITLE: PLANT PROTECTION AND ECOLOGICAL IMPACT I
CODE: D30 IMAL541
ECTS CREDITS: 5
TYPE OF COURSE: specialized discipline
COURSE OBJECTIVE(S): Study of main principles and methods used in Phytopathology, description of the methods and keys used for plant pathogens identification, knowledge of the main species of plant pathogens, pathogens biology, ecology and etiology, assessment of yield losses produced by plants pathogens, pathogens forecasting, warning and control in order to design the best integrated management, environmental impact of pesticides and the carcinogenic impact of mycotoxins.
COURSE CONTENTS: General information about Phytopathology and plant diseases; plant diseases causes, symptomatology, epidemiology, pathogens key identification, characteristics; plant Mycosis; general characters of Ascomycota fungi and Basidiomycota fungi.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): final examination - test paper/oral exam (correct answers for final test 80%, correct answers from practical laboratory classes 20%).

3RD YEAR, 2ND SEMESTER

COURSE TITLE: HYDROLOGY AND HYDROGEOLOGY I
CODE: D30IMAL542
ECTS CREDITS:5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Defining the study topic of hydrology and the implications of the branches of hydrology in the system of environmental protection sciences.
COURSE CONTENTS: Elements of rivers and river basins, Morphometric elements of a hydrographic basin, Hydrological regime of rivers, Main morphological and morphometric characteristics of lakes, Pollution and protection of aquatic systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% exam answers, final answers to practical laboratory work 30%).

COURSE TITLE: BIODIVERSITY CONSERVATION
CODE: D30IMAL543
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge of the role and importance of biodiversity for the present and future of mankind. Getting familiar with biodiversity structural elements and factors of influence. Knowledge of genetic centers of plant diversity. Knowledge of methods and techniques for conservation of plant and animal genetic resources, improvement of the conservation activities and utilization of biodiversity.
COURSE CONTENTS: Concept, importance and strategies used in protection and conservation of biodiversity. Structural elements and influence factors of biodiversity. Genetic centers of plant diversity. Management of biodiversity and collection of genetic resources. *In situ* conservation (protected and non-protected areas). *Ex situ* conservation (gene banks, botanical gardens, field conservation - collections). Protection and conservation of animal genetic resources. Plant and animal biodiversity conservation in Romania. Use of genetic resources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S) Exam (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to laboratory tests).

COURSE TITLE: CLIMATOLOGY
CODE: D30IMAL544
ECTS CREDITS: 4
TYPE OF COURSE: Domain

COURSE OBJECTIVE(S): Knowledge of notions, concepts, laws and principles specific to physics with implications in phenomena that determine the state of the atmosphere. Knowledge of physical monitoring methods, physical techniques of atmospheric investigation.Increasing knowledge on specific terms atmospheric physics, meteorology and climatology, phenomena and laws that govern them, similarities and differences between them. Knowledge of applications specific to atmospheric physics, meteorology and climatology and recording and research apparatuses of importance in agricultural meteorology. The discipline aims at explaining the phenomena, processes, applications and devices according to the main meteorological parameters, characteristics of the environment. Students have to explain the involvement of each process in the proper functioning of the atmosphere (at all levels) or to interpret the evolution of the system based on the evolution of environmental factors.
COURSE CONTENTS: Diffusion and absorption of radiation. Direct and diffused solar radiation. Terrestrial radiation and atmospheric radiation. The greenhouse effect, the radiation balance of the surface and the atmosphere. The specific radiation regime of some regions. Soil thermal regime. The caloric properties of the soil. Periodic variations in surface temperature. Deep soil temperature variations. The influence of various factors on soil temperature. Water as active surface. The thermal regime of the air. Thermodynamics of the atmosphere. Periodic variations in air temperature. Variation of air temperature with height. Radiation inversions. Thermal properties of the boundary layer. Particularities of temperature distribution. Geographic distribution of temperature. Atmospheric humidity and its sources. Evaporation. Hygrometric sizes. Variations in humidity. Condensation, condensation types. Water vapor condensation products. Clouds and showers. Cloud. Atmospheric precipitation. The precipitation genesis. Types of precipitation. Precipitation regime. Geographic distribution. Air pressure. The forces of nature involved in winds. Notions of Climatology. The climate of Romania and the climate of Europe.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to verification 60%, periodic answers to practical work 10%, results to periodic control works 30%).

COURSE TITLE: RIVER REGULATIONS
CODE: D30IMAL646
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Students' initiation in the field of river design and reconstruction.
COURSE CONTENTS: Regulations of watercourses, Objectives of the regulation of riverbeds, Alluvial movement, Alluvial transport mechanism, Dynamics of riverbeds, Constructions and regulation works.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% exam answers, final answers to practical laboratory work 30%).

COURSE TITLE: LAND IMPROVEMENTS
CODE: D30IMAL647
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and understanding of the importance of land improvement works; Knowledge and understanding of the phenomena related to the drainage and drainage of agricultural lands, the arrangement of accumulation basins and irrigation systems, dams, etc. Knowledge of methods of design, execution and maintenance of land improvement works.
COURSE CONTENTS: Object of discipline. The importance and features of land improvement works. Brief history of land improvement improvements. Soil erosion. Definitions, importance and spread of the erosion process in the world and in Romania. Mechanism of water erosion process.Determinants of soil erosion. Damage caused by soil erosion. Studies necessary for the preparation of soil erosion control projects. Mapping and research of soil erosion.Preventing and combating soil erosion on sloping arable land. Prevention and control of soil erosion in vineyards. Preventing and combating soil erosion in fruit plantations. Preventing and combating deep erosion. Insect erosion formations, their development and work to combat deep erosion.Preventing and combating wind erosion.Land landslides. Measures to prevent and combat them.Storage tanks for agriculture. Classification of storage basins. Components of an accumulation. Studies necessary for the design of storage basins Conditions for the location of accumulation basins. Determining the water volume of the storage tank.Dam. Classification of dams. Main issues to solve when designing dams made of soil. Studies needed to prepare irrigation projects. Water consumption of agricultural crops.Watering methods. Irrigation systems - types of irrigation facilities. Water sources for irrigation. Irrigation water quality. Operation and maintenance of irrigation systems.Landfilling of agricultural land. Draining through open channels.Drainage drainage. Special drainage methods.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (exam answers 50%, final answers for workshops 30%, periodical assessment through practical tests 20%).

COURSE TITLE: HYDROLOGY AND HYDROGEOLOGY II
CODE: D30IMAL648

ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Defining the study topic of hydrology and the implications of the branches of hydrology in the system of environmental protection sciences.
COURSE CONTENTS: Groundwater, Groundwater Action on earth's surface, Groundwater Circulation, Improvements in groundwater hydrology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% exam answers, final answers to practical laboratory work 30%).

COURSE TITLE: ECOLOGY OF VINEYARD ANTHROPIC SYSTEMS

CODE: D30IMAL649
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge of the structure, functions and productivity of the wine ecosystems; Knowledge of the main technological systems practiced in viticulture agro ecosystem and their impact on the environment; Promotion of sustainable cropping techniques and technologies compatible with sustainable viticulture; Acquisition of study methods of viticulture agro ecosystems.
COURSE CONTENTS: Introduction; Winegrowing as an ecosystem; Anthropic interventions in the viticulture ecosystem; Zoning of viticulture worldwide and in Romania; Environmental degradation and protection in viticulture agro ecosystems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (examination answers 50%, final answers for workshops 50%).

COURSE TITLE: PLANT PROTECTION AND ECOLOGICAL IMPACT II

CODE: D30IMAL650
ECTS CREDITS: 3
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of plant protection issues as a link between culture technologies. Knowledge of morphological, bio-ecological peculiarities of cultivated plants pests. Knowledge the particularities of the methods, means and measures for prevention and control, the way of action and the reaction of the pest against them. Knowledge of the European Union's phytosanitary legislation. Normative acts for plant protection products and pesticide residues. Student knowledge and deepening of plant protection issues as a link between crop technologies and the establishment of pest control strategies for organically grown plants, taking into account the biological characteristics of the pest and the host plant.
COURSE CONTENTS: Insects general characters, Anatomy and physiology of insects, Insect biology, Ecology of insects, Systematic insects (recognition of pests from: Ord. Orthoptera, Ord. Blattaria, Ord. Dermaptera, Ord. Thysanoptera, Ord. Heteroptera, Homoptera, Ord. Hymenoptera, Ord. Coleoptera, Ord. Lepidoptera, Ord. Diptera), Preventive methods for controlling animal pests (phytosanitary quarantine, forecasting and warning, phytosanitary control, agrofitotechnics), Biological methods for control of animal pests, Territorial planning methods to increase the role of predators and parasites in combating crop pests., Phytosanitary and environmental legislation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 80%, continuous assessment throughout semester 20%).

COURSE TITLE: BIOLOGICAL INTEGRATED COMBAT IN AGRICULTURAL ECOSYSTEMS

CODE: D30IMAL651
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Understanding knowledge about species relationships; Knowledge of the use of hyperparasites in combating parasitic species; Knowing the physiological needs of parasites and hyperparasites, Knowing how to use hyperparasites to fight parasites, Developing skills to analyze the relationships between species and their use in agricultural practice.
COURSE CONTENTS: Hormones and pheromones as regulators of insect growth, development and behavior, Senses in the living world and their use in biological control, The use of zoophagus in the biological control of plant pests, Microbiological control, the use of pathogenic microorganisms in the biological control of plant pests, Genetic methods (autocidal) used to combat plant pests, Relationship between species used in the control of pathogens, Techniques for the growth and use of pathogens against pathogenic microorganisms and insect pests.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (examination 70%, practical workshops 30%).

COURSE TITLE: SOIL BIOLOGY AND ENZYMOLOGY

CODE: D30IMAL652
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the soil population, of ecological relations between elements of the soil population, of the influence of basic works, cultivated plants and fertilizers on the enzymatic potential of the soil - the application of soil analysis methodology from a biological point of view.

COURSE CONTENTS: Organisms (population) soil-fertility effectors. Megafauna, macrophauna, mesophane, microfauna, soil microflora; Metabolism of the soil population; Biochemical activity of soil microbiocenoses, the role of microorganisms in the formation and evolution of organic matter (humus) in the soil; Contribution of microorganisms to the biological circuit of nitrogen, carbon in the soil; Microbial interrelations in soil, interrelations between higher plants and soil microorganisms; Enzymology of cultivated soils - current concepts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (answers to exam 35%, active participation in courses 10%, written assessment during the semester: questionnaire 10%, final written assessment in the exams session 35%, active participation in seminars 10%).

4TH YEAR, 1ST SEMESTER

COURSE TITLE: ECOLOGY OF VEGETABLE GROWING SYSTEMS
CODE: D30IMAL753
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBIECTIVES: Vegetable agroecosystems, way of organization, functioning and their practical importance.
COURSE CONTENTS: The Importance of Vegetables to Ensure Food Security. The current and prospective situation of organic and vegetable crops on the world and national levels. Current trends in the utilization and consumption of biological vegetable products. Vegetable plant relations with environmental factors. Factors that influence the quality of vegetable production. Technology aspects specific to vegetable plants with implications for the proper use of soil and climatic conditions. Vegetable products - qualitative, quantitative and directions of use.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 75%, control paper 25%).

COURSE TITLE: INSTALLATION FOR ENVIRONMENTAL PROTECTION
CODE: D30IMAL754
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge of the main sources of pollution of the environment and the way of their generation; Exposure of some notions regarding the presentation of the main techniques, technologies, installations and equipments intended for the protection of the water resources, the atmosphere and soil.
COURSE CONTENTS: Water purification techniques and technologies, general considerations, sources of water pollution; Physical, chemical and biological processes of wastewater treatment; Unit processes for treatment of the sludge results from wastewater; Atmospheric protection, general considerations, sources of air pollution; Air pollution exploration methods, methods and means of purifying the atmosphere; Soil protection, general considerations, sources of soil pollution; Techniques and technologies used for soil protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, final answers to Laboratory works 40%).

COURSE TITLE: ECOLOGICAL MANAGEMENT
CODE: D30IMAL755
ECTS CREDITS: 5
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): To define the concepts of ecological management, sustainable development, natural capital, socio-economic systems, deterioration of natural capital, ecosystem management, total economic value of ecological resources, ecological economy; To identify the purpose and functions of ecological management and sustainable development; To identify strategies for sustainable development; To report on the mechanisms and tools of environmental management; To relate environmental policies and legislation, the institutional framework in terms of environmental protection.
COURSE CONTENTS: Environment and Sustainable Development; The content and meaning of the concept of sustainable development; Strategies for achieving sustainable development, Technocentrism and ecocentrism in the sustainable development approach; Sustained human development - an essential component of quality of life., environmental management of pollution; Ecology of atmospheric pollution; Ecology of water pollution; Ecology of soil pollution; Ecology of pollution for other situations, Waste management; Classification of waste; Methods of recovery and disposal of waste; The responsibility of producers and consumers in waste generation. Evaluating and authorizing activities with an impact on the environment; System for the assessment and authorization of activities with environmental impact; Audit in environmental management systems. National System of Accounts and Environment; Integrated economic and environmental accounting; Environment in the National System of Accounts; Methodology of environmental accounting. Environmental expenditures; Principles of environmental accounting; The costs of deteriorating the natural environment. Ecological management system; Specific requirements for an ecological management system; The advantages of an ecological management system; Principles of an

environmental management system, Environmental monitoring; Environmental Monitoring Concept; Components of the monitoring system; The environmental data required for the monitoring system; Quantitative indicators of the natural environment. Environmental policy and legislation; EU and Romanian environmental legislation; World and Romanian environmental institutions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 80%, activities such as papers/projects 20%).

COURSE TITLE: BIOSTATISTICS
CODE: D30IMAL756
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of the role, importance and pecularities of biostatistics and research in biology and ecology. Defining research objectives, methodologies and tehniques, set up experiments, data collection, calculus and inference. Capitalization of experimental results.
COURSE CONTENTS: Role, importance, objectives and pecularities of biostatistics, biometry and ecology research. Design and organization of research in ecology. Extraction of samples for analysis. Measurement errors in environmental field experiments. Methods of setting up monofactorial and polyfactorial trials (randomized blocks, Latin square, Latin rectangle, balanced square lattice). Parameters and estimators in statistics (variance, standard deviation, coefficient of variation, correlation, regression). Statistical hypothesis testing, F, *t* and Duncan tests. Analysis of variance. Interpretation and use of experimental results in ecology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to laboratory tests).

COURSE TITLE: POLLUTION INVESTIGATION MEANS
CODE: D30IMAL757
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Know how to sampling, preserving and transporting samples to analyze them and establish the diagnosis of pollution. Knowledge of the principles of operation of the apparatus necessary for the determination of the investigations. Determination of pollutants in soil, water, air for quantitative and qualitative identification of pollution indicators.
COURSE CONTENTS: Notions on sources of air pollution, types of pollutants and their effect. Determinations: O_3, CO, CO_2, CH_4, SO_2, $PM_{2,5}$, PM_{10}, NO_x, NO_2, NO_3, COV etc. Determining sound pollution and making dispersion maps. Concepts of pollution sources of surface and underground waters, types of pollutants and their effect. Determinations: TDS, TSS, pH, acidity, salinity, alkalinity, conductivity, hydrocarbons, biogenic substances, general ions, oxygen regime in water, etc. Notions regarding the sources of soil pollution, types of pollutants and their effect. Determinations: pH, acidity, salinity, alkalinity, conductivity, organic matter, hydrocarbons. Dispersion of pollutants. Determination of water and soil radioactivity. Mathematical Modeling of Soil Pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, periodical assessment through practical tests, continuous assessment throughout semester, activities such as homework/essays/papers/projects 15%).

COURSE TITLE: ENVIRONMENTAL AUDIT AND IMPACT STUDY
CODE: D30IMAL758
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The content of the discipline will track the transmission of related knowledge.
Knowledge of the elements necessary for carrying out an environmental audit, Define the principles and laws applicable in the conduct of the auditenvironment, Use of related domain tools to validate an audit process, Critical evaluation of the options for the stages of the implementation process an audit program.
COURSE CONTENTS: Fields of application, Terms of reference, Regulatory references; Conducting an environmental audit program, Objectives of the environmental audit program, The procedures of an audit program, Implementation of Audit Program, Record audit progress Monitoring and analyzing audit progress, Audit activities, Preparation, approval and distribution of the audit report. Audit within the Environmental Management System, Follow-up of audit results, ISO 19011 Guide to Systems Auditing Quality and/or environmental management, ISO 14001 Environmental Management Systems.Requirements with user guide, Structure and content of the management system manual integrated quality – environment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, activities such as papers/projects 30%).

COURSE TITLE: MONITORING AND DIAGNOSIS OF ENVIRONMENTAL QUALITY
CODE: D30IMAL759
ECTS CREDITS: 3
TYPE OF COURSE: Domain

COURSE OBJECTIVE(S): Developing the skills to obtain and process environmental data in order to reduce the impact of pollutants on the environment. Proper use of the terms of specialty in the field of environmental protection and of the environmental quality monitoring equipment.
COURSE CONTENTS: General considerations on environmental quality monitoring. Monitoring and quality control of the environment. Air quality monitoring. Monitoring of water quality. Monitoring of soil quality. Noise monitoring. The integrated quality-environment concept. General considerations of indoor pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, activities such as homework/essays/papers/projects 10%).

4TH YEAR, 2ND SEMESTER

COURSE TITLE: METHODS AND MEASUREMENTS FOR INVESTIGATION OF DEPOLLUTION

CODE: D30IMAL861
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge of the principles of functioning of the apparatus necessary to determine the investigations. Determination of pollutants in soil, water, air for quantitative and qualitative monitoring. Knowledge of environmental depollution technologies. Specific methods for treating the main atmospheric, surface and groundwater and soil pollutants. Methods of restoration of the polluted underground area. Waste water treatment processes, installations and equipment.
COURSE CONTENTS: Establishment of the spreading area of the pollutants, specific requirements for measurements of physical and chemical parameters. Methods of air depollution (NOx, SO2, CO2, primary and secondary reduction measures). Desulphurization of combustion gases (dry, semi-dry and wet process). Methods and devices for dust retention (gravity, inertia and impact, centrifugation, electrostatic filtering, etc.). Physical methods of soil and groundwater depollution (sealing, hydraulic blocking, stabilization, excavation, pumping, washing, floristry, extraction, etc.). Chemical methods for soil and groundwater abstraction (extraction, oxidation, reduction, precipitation, dechlorination, dehalogenation etc). Thermal methods of soil and groundwater (incineration, desorption, vitrification, etc.). Biological methods of soil and groundwater abatement (bioreactor, biodegradation, bioventing, biolixivation, bioaccumulation, biofiltration, etc.). Decontamination of soils and surface waters in emergency situations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, periodical assessment through practical tests 15%, activities such as homework/essays/papers/translations/projects 15%).

COURSE TITLE: BIOREMEDIATION

CODE: D30IMAL862
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Acquiring basic knowledge on bio-depollution, bioremediation and ecological reconstruction methods using biotic factors and biodiversity resources in depollution biotechnology. This knowledge is useful to the specialists in understanding the importance of developing integrated environmental management strategies, including biotechnological methods, in the context of ensuring sustainable development
COURSE CONTENTS: Biological depollution biotechnologies. Principles of biological depollution, bioremediation and ecological reconstruction. Systematic analysis of ecosystems, their operation, exploitation and rehabilitation. Bioremediation. Biological degradation / biotic degradation: biotransformation, biodegradation. Biodegradation of organic substances in soil. Biodegradation of aliphatic hydrocarbons (methane, ethane, propane, etc.) and aromatics (benzene, toluene etc.) Biological depollution of benzene, petroleum hydrocarbons, pyrene, biphenyl, pesticides etc.). Biodegradation of substances in the nitrogen cycle. Degradation of nucleic acids, creatinine, urea, and other nitrogenous substances in the soil. Soil bioremediation. Enzymes and soil fertility. Methodology of enzymatic soil testing. Restoration of biotopes, biocenoses and degraded ecosystems. Restoration of aquatic ecosystems (wetlands, rivers, lakes, seas). Biological treatment of polluted water. Restoration of terrestrial ecosystems / meadows, agricultural crops, forests. Biological methods of soil decontamination. Biological methods of immobilization / extraction of pollutants. Biomonitoring - methods of pollution assessment by bioindicators. Ecological rehabilitation of tailings dumps, degraded areas. Techniques of bioremediation of technical soil in tailings dumps of coal, iron, lead, zinc, sulfur, manganese, limestone etc. Bioremediation of oil shale, residues at thermal power plants. Bioremediation of degraded industrial and urban sites. Quality biological indicators used in the diagnosis of pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers to seminar 30%).

COURSE TITLE: FLORAL ECOSYSTEMS AND HUMAN HABITAT

CODE: D30IMAL863
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge of floral ecosystem characteristics and the importance of ornamental plants in mitigating atmospheric pollution, moderating the urban climate, combating soil erosion, etc. Knowledge of the main flower species used in outdoor and indoor spaces. Ways to use flower plants in urban green spaces and indoor spaces to create an environment that combines the sanogenic effect and aesthetics of human habitat.
COURSE CONTENTS: General notions about floral ecosystems. Relationships of flower plants with environmental factors. Biological features, ecological requirements and use for the main annual, biennial and perennial species used in green spaces. Indoor flower plants with sanogenic effects. Ways to use flower plants indoors to improve the quality of life.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers to practical works 30%).

COURSE TITLE: THE DEVELOPMENT AND HYDROTECHNICAL CONSTRUCTION

CODE: D30 IMAL864
ECTS CREDITS: 4
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Presentation of the basic elements for the design, development and exploitation of hydrotechnical constructions with impact on the environment in agriculture.
COURSE CONTENTS: Hydrotechnical constructions, Water supply of populated centers, Water supply schemes, Wastewater treatment plants, Technological water treatment schemes, Current treatments and special treatments.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% exam answers, final answers to practical laboratory work 30%).

COURSE TITLE: ENVIRONMENTAL LEGISLATION

CODE: D30IMAL865
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The objective of the discipline is the assimilation by the students of the concepts regarding environmental legislation. The discipline will be analyzed by two important aspects: first, acquiring the basic concepts of law, then passing to the basic notions of environmental law, environmental policies and development strategies.
COURSE CONTENTS: Introduction to Law. The Law, Definition and Etymology. The Legal Norm and law sources. The action of legal norms in space, time and on people. Legal Relations. Civil legal Relations. Elements of the Civil Legal Relation: The subjects of the civil legal relation, Object of the Civil Legal Relation and Content of the civil legal relation. Legal Relations of Administrative Law. The main institutions and governing bodies of the state. Introduction to environmental law. Object, definition and notions specific to environmental law. Functions. Fundamental principles and law sources of environmental law. The place and role of environmental law in the legal system. The legal relation of environmental law. Environment protection. Institutional framework. Environmental protection - desideratum and content. Protection of natural resources and biodiversity. Regulation of hazardous activities for the environment. The main institutions with attributions in the field of environmental protection. Basic notion regarding liability in environmental law. Sustainable development. Concept and Content. Sustainable Development Strategy of Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (exam answers 70%, final answers to seminar 30%).

COURSE TITLE: DESIGNING ECOLOGICAL FACILITIES

CODE: D30IMAL867
ECTS CREDITS: 3
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Acquiring theoretical-methodological concepts and approaching the practical aspects, students acquire a consistent knowledge bag in accordance with the partial competencies required for the possible occupations provided in the RNCIS.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (project presentation)

COURSE TITLE: PROFESSIONAL COMMUNICATION

CODE: D30IMAL868
ECTS CREDITS: 5
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Knowledge and deepening of the students with some fundamental concepts that define communication in a knowledge-based society, modern means of communication and documentation that make it possible to access virtual information resources on the Internet. The technical and applicative learning of professional knowledge regarding: Preparing and supporting an oral presentation, Preparing for the interview, Drawing up a curriculum vitae, Writing a letter of intent / motivation, Drawing a business card, Drawing an invitation.
COURSE CONTENTS: Communication and language; Nonverbal communication; Mass Communication; Communication within working

groups; Oral Communication (Preparation and support of an oral presentation; Preparing for the interview); Written communication (Writing a curriculum vitae; Writing a letter of intent/motivation, The structural requirements of a scientific work; Drawing a business card; Drawing an invitation; Press Release)

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Colloquy (exam answers 50%, activities such as homework/ essays/papers/translations/projects 50%).

FIELD: BIOLOGY
PROGRAMME TITLE: BIOLOGY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL CHEMISTRY
CODE: D30BIOL101
ECTS CREDITS: 4
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Familiarize with the concepts of atom structure and classification of elements. Understanding the electronic configuration of the elements, their valence. Acquiring knowledge to understand the types of chemical reactions.
COURSE CONTENTS: Atoms, Atomic structure, Classification of elements, Molecules, Chemical links, Chemical thermodynamics, Chemical equipment, Solutions, Ionic balancing, Chemical cinematics, Catalysis, Coloal status of material, Oxidation and reduction.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, continuous assessment throughout semester 5%, activities such as homework/ essays/ papers/ translations/ projects 5%).

COURSE TITLE: MATHEMATICS WITH APLLICATIONS IN BIOLOGY
CODE: D30BIOL102
ECTS CREDITS: 4
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Solving specific problems of linear programming, such as crop distribution, setting feed ration for animal feed and working technology, based on matrix computing techniques. Knowledge of the fundamental concepts of probability theory, probabilistic computation rules, the main probability schemes, the notion of random variable. Knowledge of the main classical distribution laws. Statistical analysis of the phenomenon. Graphical representation of a statistical series. The distribution of statistical data and graphical representation. The determination of statistical indicators of populations and samples (for example, indicators of the variations, moments, etc.).
COURSE CONTENTS: Linear programming. The calculus of probabilities. Elements of mathematical statistics. Biosystems. Biocenoses.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, continuous assessment throughout semester 5%, activities such as homework/ essays/ papers/ translations/ projects 5%).

COURSE TITLE: HUMAN ANATOMY AND HYGIENE
CODE: D30BIOL103
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of the anatomical structure of the main systems of the human body, methods of contraception, sexual transmissible diseases and hygiene rules.
COURSE CONTENTS: Anatomical terminology. Organ systems. The skeletal system: parts of the skeleton. Bone tissues: compact and spongy bone. Articulations. Muscle structure and body movements. The major skeletal muscles. The nervous system. The sense organs. The respiratory system. The digestive system. Heart and the circulatory system. The excretory system. The male and female reproductive systems. The endocrine glands. Methods of contraception. Sexual transmissible disease. Rules of hygiene and the prevention of different diseases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Final theoretical exam 60%, final practical exam 20%, 1uropean1s evaluation during the semester 20%).

COURSE TITLE: RELATIONSHIP, NUTRITION AND REPRODUCTION FUNCTION
CODE: D30BIOL104
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowing the mechanisms of coordinating nutrition functions and how to integrate them with the functions of relationship and reproduction in the animal body.
COURSE CONTENTS: Structural and Functional Nervous System Particularities in Animals. The structural and functional particularities of organs of animal senses. Structural and functional features of locomotion in animals. Structural and functional features of the digestive system in animals. Structural and functional features of the respiratory system in animals. Structural and functional features of the circulatory system in animals. Animal domestic environment. Structural and functional particularities of the animal excretory system. Structural and functional particularities of the reproductive system in animals.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, continuous assessment during the semester 20%).

COURSE TITLE: MORPHOLOGY AND VEGETAL ANATOMY
CODE: D30BIOL106
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Acquiring concepts of morphology and plant anatomy. Developing the

skill to analyze and describe the morphology of the plant organs, to perform transversal and longitudinal sections through the vegetal organs, to analyze them and microscopically draw them. Understanding the phylogeny and ontogeny of the organs on scientific basis, also calling on paleobotanic data, the possibility for current students, future teachers or researchers to make various macroscopic and microscopic preparations and their interpretation.
COURSE CONTENTS: Introduction to plant morphology and anatomy, shape, size and structure of the plant cell, definition and classification of vegetal tissues. Organism: study of vegetative and reproductive organs of plants both morphologically and anatomically.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (course notions - 70%, practical notions - 30%).

COURSE TITLE: INVERTEBRATE BIOLOGY

CODE: D30BIOL107
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The study of the morphology and anatomy of the invertebrates with emphasize on the evolutionary acquisitions in form and function in order to understand invertebrate evolution. The study of the general biology of invertebrates.
COURSE CONTENTS: 1. Introduction in Invertebrate Zoology – objectives, related disciplines, history of Invertebrate Zoology in Romania and worldwide. The evolution of the systematic of the living beings: short history; introducing Protista, Protozoa and Metazoa. The protozoan cell: structure and function. 2. Types of Protozoan cells: the flagellates, amoeboids, ciliates and the spore-forming parasitic protozoa. 3. The general features of the Metazoa – multicellularity and tissues, the features of the 2uropean2s2 development and it importance in explaining the evolution – ontogeny and phylogeny. 4. Porifera, Placozoa – form, function, biology. 5. Cnidaria, Ctenophora – form, function, biology. 6. Platyhelminthes, Orthonectida, Dicyemida, Nemertea – form, function, biology. 7. Mollusca – form, function, biology. 8. Annelida – form, function, biology. 9. Echiura, Sipuncula – form, function, biology. 10. Onycophora, Tardigrada – form, function, biology. 11. Arthropoda – form, function, biology. 12. Cycloneuralia – form, function, biology. 13. Gnathifera – form, function, biology. 14. Kamptozoa, Cycliophora – form, function, biology. 15. Lophophorata – form, function, biology. 16. Chaetognatha – form, function, biology. 17. Deuterostomia – Echinodermata – form, function, biology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, periodical assessment through practical tests 25%, continuous assessment throughout semester 25%).

COURSE TITLE: ENGLISH I

CODE: D30BIOL10
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English, using a reference material especially designed for students of the Faculty of Horticulture, but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think.
Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English
COURSE CONTENTS: Structural and Functional Nervous System Particularities in Animals. The structural and functional particularities of organs of animal senses. Structural and functional features of locomotion in animals. Structural and functional features of the digestive system in animals. Structural and functional features of the respiratory system in animals. Structural and functional features of the circulatory system in animals. Animal domestic environment. Structural and functional particularities of the animal excretory system. Structural and functional particularities of the reproductive system in animals.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: FRENCH I

CODE: D30BIOL10
ECTS CREDITS: 2
TYPE OF COURSE: Optional
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French, using a reference material especially designed for students of the Faculty of Horticulture, Biology Specialization, but also for those who want to learn vocabulary in context.

Practice of important Biology vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think.
Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Focus on language, Vocabulary: Sterilization - Canned food –Food preservation, cyanobacteria such as Spirulina. Fungi- Cultured foods: Mushroom farming. Bacteria, *Lactobacillus.* Waste processing and bioremediation. Bacteria capable of digesting the hydrocarbons in petroleum.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checking 20%).

COURSE TITLE: PHYSICAL EDUCATION
CODE: D30BIOL109
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: school elements of jumping and running; Application paths combined with treadmills; Application paths combined with jumping elements; Application paths combined with equilibrium, escalation, climbing, etc. ; Sports games: volleyball, badminton; Bilateral games under similar competitions conditionss.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

1ST YEAR, 2ND SEMESTER

COURSE TITLE: BIOPHYSICS
CODE: D30BIOL210
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of notions, concepts, laws and principles specific to physics. Knowledge of methods, techniques of investigation and exploration of biological systems. Knowing the perspectives of physics, as well as the relationships of physical dimensions with the environment from the perspective of biology. Knowledge of organisms. The Impact of Physics on the Life. Knowledge of the branch and its importance in biology. Knowledge of physical dimensions specific to the violin, measurement units and measurement systems. Knowledge of the global evolution of the living. Knowledge of the properties of the substance and its association with the life. Knowing the way of measuring the physical parameters specific to the living organism.
COURSE CONTENTS: Introduction to biophysics. Its importance. Branches and sub-branches. Physical notions specific to biophysics. Organization of living matter. Constituent elements of living matter. Atomic and Nuclear Physics. Quantum theory, Introduction and principles. Atomic Structure and Atomic Spectra. Molecular structure and symmetry. Spectroscopy. Electronic microscopy. Nuclear magnetic resonance. Molecular biophysics. Molecular phenomena. Superficial tension. Diffusion. Osmosis. Cellular biophysics. Specific notions of cellular biophysics. Cell potential. Active transport. Bioelectricity. Biological thermodynamics. Thermodynamic quantities. Principles of thermodynamics. Entropy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (answers to exam 60 %, periodic answers to practical work 10 %, results to periodic control works 30 %).

COURSE TITLE: VEGETAL CYTOLOGY
CODE: D30BIOL211
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring general cytology concepts. Deepen knowledge of the cell, the ability to make microscopic preparations using appropriate dyes to study different cellular constituents, make semifixes and fix preparations needed in research work and at the department.
COURSE CONTENTS: Introduction to cytology. Brief History of Research. Methods, techniques and tools for studying the cell; The main characters of prokaryotic and eukaryotic cells; Cell division: amitose, mitosis and meiosis, cell differentiation and dedifferentiation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (course notions - 70%, practical notions - 30%).

COURSE TITLE: MORPHOLOGY AND VEGETAL ANATOMY

CODE: D30BIOL212
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Acquiring concepts of morphology and plant anatomy. Developing the skill to analyze and describe the morphology of the plant organs, to perform transversal and longitudinal sections through the vegetal organs, to analyze them and microscopically draw them. Understanding the phylogeny and ontogeny of the organs on scientific basis, also calling on paleobotanic data, the possibility for current students, future teachers or researchers to make various macroscopic and microscopic preparations and their interpretation.
COURSE CONTENTS: Phylogeny, ontogeny, morphology, filotaxia and leaf anatomy; Vegetative multiplication, asexual and sexually transmitted to plants; Fruit and carpogenesis; Seed and seminogenesis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam (course notions - 70%, practical notions - 30%).

COURSE TITLE: INVERTEBRATES SYSTEMATIC

CODE: D30BIOL213
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Study of invertebrate diversity. Phylogenetic systematic of the invertebrates.
COURSE CONTENTS: 1. Introduction in systematic Zoology, principles of phylogenetic zoology. 2. Protozoa – diversity and phylogeny. 3. Porifera and Placozoa – diversity and phylogeny. 4. Cnidaria and Ctenophora – diversity and phylogeny. 5. Platyhelminthes, Orthonectida, Dicyemida – diversity and phylogeny. 6. Nemertea – diversity and phylogeny. 7. Mollusca – diversity and phylogeny. 8. Annelida – diversity and phylogeny. 9. Echiura and Sipuncula – diversity and phylogeny. 10. Onicophora and Tardigrada – diversity and phylogeny. 11. Arthropoda – diversity and phylogeny. 12. Cycloneuralia – diversity and phylogeny. 13. Gnathifera – diversity and phylogeny. 14. Kamptozoa and Cycliophora – diversity and phylogeny. 15. Lophophorata – diversity and phylogeny. 16. Chaetognatha – diversity and phylogeny. 17. Deuterostomia – Echinodermata – diversity and phylogeny.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, periodical assessment through practical tests 25%, continuous assessment throughout semester 25%).

COURSE TITLE: ANIMAL HISTOLOGY AND EMBRIOLOGY

CODE: D30BIOL214
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of the procedures for using a microscope, the microscopic studies of various types of tissues and cells. Notions of 4uropean4s.
COURSE CONTENTS: Microscopes: components, the procedures for using. Light microscope. Epithelial tissues: simple, stratified and pseudostratified. Connective tissues: clasifications, matrix, cell, fibers (collagenous, reticular, elastic). The ground substance. Adipose tissue. Reticular tissue. Dense fibrouse tissue and loose fibrouse tissue. Special connective tissue: hemopoietic, support coneective tissue. Cartilage: hyaline, elastic, fibrocartilage. Bone tissue. The integument: the epidermis, the dermis, 4uropean4s4a glands. Sweat glands. Histological studies of nerve tissues. Exocrine glands: mucus – producing cell and serous cell. Endocrine glands. Mitosis. Meiosis. Oogenesis. Spermatogenesis. The stages of the 4uropean4s4al development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, 4uropean4s evaluation during the semester 20%).

COURSE TITLE: ENGLISH II

CODE: D30BIOL215
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken English and specific vocabulary texts written in English; using a reference material especially designed for students of the Faculty of Horticulture , but also for those who want to learn ESP vocabulary in context. Practice of important vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of English in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in English.
COURSE CONTENTS: Microorganisms, bacteria, viruses, or insects. Sprout inhibition. Delay of Ripening. Improvement of re-hydration.

LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: FRENCH II

CODE: D30BIOL2154
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Improving the ability to understand spoken French and specific vocabulary texts written in French; using a reference material especially designed for students of the Faculty of Horticulture, Biology Specialization, but also for those who want to learn vocabulary in context. Practice of important Biology vocabulary and grammar practice, tackle four skills, reading, listening, speaking and writing, explain specific vocabulary, and grammar lessons which are thought in detail, with exercises that give students useful practice in this particular area. True or false exercises, gap filling, matching the words with their definition, translations, in context dialogues and lessons with key bolded words are really selected for students to understand and use it correctly. Deepening the main grammar rules of French in a modern way, problematic, requiring students to learn but also to think. Consolidation of skills to dialogue, describe, report. Emphasizing the practical nature of learning, the course is ment to stimulate students' interest in written and spoken language, to improve knowledge and communication in French.
COURSE CONTENTS: Food irradiation. Microorganisms, bacteria, viruses, or insects. Sprout inhibition. Delay of Ripening. Improvement of re-hydration. 'Ionizing radiation'. Non-food items.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Checking (exam answers 80%, theoretical and practical checks 20%).

COURSE TITLE: GENERAL CHEMISTRY

CODE: D30BIOL216
ECTS CREDITS: 5
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): The course aims to study the main classes of organic compounds, the correlations between their structure and their main properties.
COURSE CONTENTS: Structure of organic compounds. Electronic structure and covalent bonds. Stereochemistry. Types of isomerism; Optical isomers, Characteristic aspects (thermodynamic, kinetic, mechanistic) of organic reactions. Hydrocarbons, Halogenated compounds Hydroxylic combinations: mono- and poly-ols: properties, representatives. Organic combinations of sulfur; Organic combinations of nitrogen. Amines, nitro-derivatives. Carbonyl combinations: aldehydes and ketones; Carboxylic acids: Functional derivatives of carboxylic acids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (Written examination 70% + continuous evaluation 20% + report 10%).

COURSE TITLE: PHYSICAL EDUCATION

CODE: D30BIOL217
ECTS CREDITS: 2
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Gymnastics: Front and Band Exercises. Gymnastics Aerobics/Fitness. Application trails combined with treadmills. Application paths combined with equilibrium, escalation, climbing exercises. Sports games: basketball, football. Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: THE BIOLOGY OF VERTEBRATES

CODE: D30BIOL317
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): This discipline offers information about Phylum Chordata, the last phylum of the Animalia kingdom. It aims at: *Knowing the main morphological, anatomical, ecological and ethological characteristics concerning the main classes of protochortades (tunicates, cephalochordates) and vertebrates (agnathes, fish, amphibians, reptiles, birds, mammals) in relation to their adaption to their habitats. *Learning the ecological and behavioural aspects of the main groups of vertebrates. Developing one's abilities to recognize, identify and describe the components of the studied systems and to notice the differences between animals.
COURSE CONTENTS: Introduction to the study of the discipline. Phylum Chordata. Subphylum: Urochordata. Subphylum Cephalochordata and Vertebrata. General characteristics (external and internal morphology). The Agnatha Superclass. General characteristics. Infraphylum Gnathostomata. Fish Group: Class Chondrichthyes. Suprerclass Osteichthyes. External morphology, internal organization (intertegumentary system, skeletal system, muscular and nervous systems, sense organs, digestive system, respiratory system, circulatory, excretory

and reproductive systems); ecology and ethology notions (feeding, defensive reproductive and migratory behaviour) of fish. Tetrapod Group. Amphibia Class: External morphology, internal organization, ecology and ethology notions about amphibians. Reptilia Class: External morphology, internal organization, ecology and ethology notions about reptiles (tortoises, rhyncocephals, snakes, lizards, crocodiles. Aves Class: External morphology, internal organization, ecology and ethology notions concerning birds. Mammalia Class: General characteristics. External morphology, internal organization, ecology and ethology notions about mammals.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% answers from course notions + 40% answers from practical work notions).

COURSE TITLE: COMPARATIVE ANATOMY I
CODE: D30BIOL318
ECTS CREDITS: 4
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and understanding of structures (tissues, organs, systems) and of phylogenetic meanings. Acquiring information on the structure of the animal body to understand the composition and functioning of living organisms, and how organ systems evolved into different classes of vertebrates in the context of changing environmental conditions (shifting from the aquatic environment to the terrestrial environment) and way of life in their long phylogenetic history.
COURSE CONTENTS: Principles of Comparative Anatomy. The tegumentary system in the vertebrate series. Skin and glandular vertebrates and glands. The ribs and the sternum in the vertebrate series. The skull in the vertebrate series. The scales of the belts and limbs in the series of vertebrates. Muscle and muscular system in the vertebrate series. The nervous system in the vertebrate series. Spinal cord and spinal nerves. Encephalus in the vertebrate series. The cranial nerves. The vegetative nervous system.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Final theoretical exam 60%, final practical exam 20%, continuous assessment during the semester 20%)

COURSE TITLE: GENERAL VEGETAL PHYSIOLOGY I
CODE: D30BIOL319
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge and interpretation of the physiological processes of plant organisms and acquiring practical skills for the experimental demonstration of the main vital plant manifestations.
COURSE CONTENTS: Knowledge and interpretation of the physiological processes of plant organisms and acquiring practical skills for the experimental demonstration of the main vital plant manifestations.
TOPICS: Introduction to vegetal physiology. Plant cell physiology. Water exchange between the plant cell and the external environment. Plant water regime (The role of water in plants. Absorption and transport of water in plants. Plant water elimination. Methods of studying plant transpiration). Mineral nutrition (Absorption of mineral elements by plants. Transportation, accumulation and excretion of substances by plants, Physiological role of mineral elements in plants).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam course 70 % and answers to Laboratory works 30%).

COURSE TITLE: CRYPTOGAMIC SYSTEMATIC
CODE: D30BIOL320
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of the main characters of lower spontaneous plants, their scientific names as well as ecology and scientific importance. Assimilation of the main methods of plant investigation. Recognition of the main groups of studied organisms. Identifying the notions needed to classify the vegetable world. Differentiation between the main groups of the studied organisms. Knowing the ecology of the analyzed species. The presentation of the practical and scientific importance of the plants.
COURSE CONTENTS: General characters, classification, scientific and practical importance to Phyl representatives. Bacteria, and Phyl. Cyanobacteria. Phyl. Euglenophyta, Phyl. Chrysophyta, Phyl. Pyrrophyta, Phyl. Phaeophyta (brown algae), Phyl. Rhodophyta (red algae), Phyl. Chlorophyta, (green algae) Phyl. Bryophyta (vegetable Mushrooms) Phyl. Pteridophyta (ferns) - cellular organization of the talus, nutrition, highlighting the characters of inferiority and superiority to other related groups. Classification, representatives, scientific and practical importance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: ENTOMOLOGY
CODE: D30BIOL321
ECTS CREDITS: 5
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge and understanding of general morphological, anatomical and physiological characteristics of insects, biology, ecology and theoretical and practical importance of insects... Knowledge of

morphoanatomic characters of the insect type, reproduction and insect development; Knowledge of distinctive characters for all orders and families of insects, of the more important groups, with the retention and description of more common species or those of particular practical or scientific importance; Knowledge of aspects of insect biology and ecology.
COURSE CONTENTS: Insect general characters. External insect morphology. Anatomy and physiology of insects. Insect biology. Insect development. Ecology of insects. Insects systematic. Entognatha Class. Protura Order. Collembola Order. Diplura Order. Insecta Class. Zygentoma Order. Microcoryphia Order. Ephemeroptera Order. Plecoptera Order. Odonata Order. Orthoptera Order. Dictotype Order. Dermaptera Order. Phthiraptera Order. Thysanoptera Order. Hemiptera Order Hymenoptera Order. Coleoptera Order.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: CELLULAR BIOLOGY
CODE: D30BIOL322
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of the basic cell structure and function.
COURSE CONTENTS: Cellular anatomy. The molecular organization and the function of the membrane. Cytoplasmic matrix. The descrition and the roles of the cytoplasmic organelles such as mitochondria, ribosome, endoplasmic reticulum, Golgi Apparatus, lysosomes, centrosome. Cytoskeletal elements: microtubules, microfilaments. Nucleus. Secretion and excretion of cellular products. Osmosis and cell membrane integrity. Cellular differentiation: cilia and flagella, microvilli. Celular cycles. Cell division: mitosis, meiosis. Blood cell. Immunity - humoral and cell-mediated, active and adoptive, artificial. Immunization
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (Final theoretical exam 60%, final practical exam 20%, continous evaluation during the semester 20%).

COURSE TITLE: PARASITOLOGY
CODE: D30BIOL323
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): The knowledge of the main species of animal parasites and the etiphatogenie, epidemiology, clinical simptoms, diagnosis and prevention of the parasitical diseases.
COURSE CONTENTS: Specific terminology. Symbiosis. Commensalism. Parasitism. Parasitical relations. Parasitical specificity. The action mode of the parasites. Biological way of transmission. Protective reaction of the body. The extermination of the parasites. Parasitical protozoa. Phylum Mastigophora. Phylum Opalinata. Trichomoniasis. Giardia. Giardiasis. Philum Rhizopoda. Intestinal Amebiosis. Phylum Apicomplexa. Toxoplasmosis. Plasmodium. Paludism. Pneumocystis carinni. Patogene fungus. Major animal and human Helminthiasis. Helminths – evolution, infestation, prevention. Phylum Plathelminthes and Nemathelminthes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, continous evaluation during the semester 20%).

COURSE TITLE: NATURE PROTECTION
CODE: D30BIOL324
ECTS CREDITS: 3
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Knowledge of Flora and Farming Fund of Romania, their distribution on the territory of Romania. Nature protection in the world and in Romania. The Protected Areas Network (the reservations in Romania) and the objectives that are required to be protected.
COURSE CONTENTS: Nature protection and environmental protection - international and national priority for sustainable development; International conferences on environmental issues. International conventions and international organizations involved in environmental protection and biodiversity conservation issues. Human-nature impact. General characterization: over exploitation of species; Over exploitation of habitats; Deterioration of ecosystems through construction and arrangement for economic and social purposes; Pollution of living environments and effects on livestock; Ecoprotective actions and their complex significance: biological, social, ethical and aesthetic, cultural. Semantic considerations: ecological crisis, the environment, environmental types, sustainable development, biodiversity, nature conservation, ecological reconstruction, national park, natural reserves, natural monument, biosphere reserve. Some aspects of nature protection worldwide. Overall characterization. Some aspects of nature protection worldwide: National Parks and Natural Reserves in Europe; National Parks and Asian Nature Reserves; National Parks and Nature Reserves in Africa; National Parks and Nature Reserves in North America; National parks and nature reserves in Central and South America; National parks and nature reserves in Australia and New Zealand. Nature protection and environmental protection in Romania.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Colloquy (exam answers 70%, final answers to practical laboratory work 10%, periodic testing by practical control exercises 10%, 5% continuous testing, activities like topics / essays / translations / projects, etc).

COURSE TITLE: PHYSICAL EDUCATION III

CODE: D30BIOL325
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Athletics: Long jump technique; Utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competitions conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%.

2ND YEAR, 2ND SEMESTER

COURSE TITLE: BIOCHEMISTRY

CODE: D30BIOL426
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Students will be able to explain and apply the main concepts, theories and methods of structural and functional characterization of biological molecules.
Solving some punctual requirements by identifying and using specific notions and concepts of biochemistry.
Apply biochemistry principles and methods to solve a biology-specific problem and identify possible conclusions
Obtain and interpret an experimental set of experimental data on a process, phenomenon or biological structure using biochemistry-specific methods, techniques and devices
Elaboration of a material (portfolio) containing text, data tables, graphical representations and images using software applications, based on the results obtained in practical biochemical works
Realization and presentation of a small-scale synthesis paper on a topical topic on molecular issues relevant to the organization and functioning of the living world, using sources of documentation both in Romanian and in an international language.
COURSE CONTENTS: Cellular organization and chemical composition of living matter. General characteristics of biomolecules: directionality, informational content, hierarchy, three-dimensional architecture. Forces involved in interactions between biomolecules and the importance of conformational complementarity.
Proteins. Carbohydrates, lipids. Introduction to the metabolism study. Fermentation - Biological and Biotechnological Importance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, continuous assessment throughout semester 5%, activities such as homework/ essays/ papers/ translations/ projects 5%).

COURSE TITLE: THE SYSTEMATICS OF VERTEBRATES

CODE: D30BIOL427
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Classification of the main classes of vertebrates: Pisces, Amphibia, Reptilia, Aves, Mammalia in conformity with the recent research. Gaining knowledge about the distinctive characteristics concerning the biology of the representative species of vertebrates in both our country and the world. Establishing the phylogenetic origins and ties between different taxonomical groups, as well as their evolution in the context of the change in environmental conditions (going from the aquatic environment to the terrestrial one). Gaining knowledge on the role of vertebrates in nature and in man's life, on the protection status and the main protection measures. Forming and developing observational skills, recognizing the main vertebrate species in Romania (fish, amphibians, reptiles, birds, mammals) based on key determining and characterization features studied during course hours.
COURSE CONTENTS: Phylum Chordata. Types of classifications. Systematics of urochordates, cephalochordates. Vertebrates. Agnatha Superclass. Systematics: Myxinii Class, Cephalaspidomorphi (Hyperoartia) Class. The origin, evolution and importance of phylogenetics of protochordates and agnathes. Infraphylum Gnathostomata. Group Pisces. Systematics of nowadays fish. Class Chondrichthyes: Subclass Elasmobranchii: Group Selachii (Selachimorpha). Group Batoidea. Superclass Osteichthyes: 1. Class Actinopterygii. Subclass Chondrostei Subclass Neopterygii: Infraclass Holostei, Infraclass Teleostei. 2. Class Sarcopterygii – Subclass Actinistia and Dipnoi. Class Amphibia. Systematics of nowadays amphibians. Orders: Gymnophiona, Urodela, Anura. Class Reptilia. Systematics of nowadays reptiles. 1. Subclass Anapsida – Order Testudines. 2. Subclass Diapsida. Infraclass Archosauromorpha – Order Crocodylia. Infraclass Lepidosaurimorpha: Order Rhynchocephalia. Infraclass

Lepidosaurimorpha: Order Squamata with Suborder Lacertilia and Serpentes. Class Aves. Systematics of nowadays birds: Subclass Neornithes. Infraclass Palaeognathae, Infraclass Neognathae Class Mammalia. Classification of nowadays mammals. Subclass Prototheria: Order Monotremata. Subclass Theria: Infraclass Marsupialia. Infraclass Eutheria. Origin and evolution of vertebrates. The importance of vertebrates. Protection measures

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (50% course notions + 50% practical notions (50% practical notions + 40% the ability to recognize the representative species in our country by using the keys of determination and to fit them into a certain taxonomic group: class, order, family, specifying the morphological characteristics of the species, data regarding species biology, spread, importance + 10% activity during the semester).

COURSE TITLE: COMPARATIVE ANATOMY II

CODE: D30BIOL428

ECTS CREDITS: 4

TYPE OF COURSE: Specialized discipline

COURSE OBJECTIVE(S): Knowledge and understanding of structures (tissues, organs, systems) and phylogenetic meanings. Acquiring information on the structure of the animal body to understand the composition and functioning of living organisms and how organ systems evolved into different classes of vertebrates in the context of changing environmental conditions (shifting from the aquatic environment to the terrestrial environment) and way of life in their long phylogenetic history. Understanding the general organization and structure of vertebrates. Understanding evolutionary meanings of changes in structures in vertebrates.

COURSE CONTENTS: Vertebrate series analyzers: skin receptors, visual analyzer, stato-acoustic analyzer, tasteful, olfactory and kinesthetic analyzer. The digestive system in the vertebrate series. Supplementary glands in the vertebrate series. The respiratory system in the vertebrate series. The circulatory system in the vertebrate series. Blood. The lymphatic system. Excretory system in the vertebrate series. Kidney types and nephron types in vertebrates. The genital system in the vertebrate series.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (Final theoretical exam 60%, final practical exam 20%, continuous assessment during the semester 20%).

COURSE TITLE: GENERAL VEGETAL PHYSIOLOGY II

CODE: D30BIOL429

ECTS CREDITS: 4

TYPE OF COURSE: Fundamental

COURSE OBJECTIVE(S): Knowledge and interpretation of the physiological processes of plant organisms and acquiring practical skills for the experimental demonstration of the main vital plant manifestations.

COURSE CONTENTS: Carbon Nutrition - General Notions. Photosynthesis - mechanism, influence of external and internal factors, Chemosynthesis, heterotrophic nutrition, mixedotrophy nutrition.

Aerobic and anaerobic respiration

Plant growth: growth of plant organs, regulating growth substances, influence of external factors

Development: Development cycle characteristics, influence of external factors. Resting: seminal and bud rest. Plant movements

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (answers to exam course 70 % and answers to Laboratory works 30 %).

COURSE TITLE: SYSTEMATIC OF PHANEROGAMS

CODE: D30BIOL431

ECTS CREDITS: 4

TYPE OF COURSE: Fundamental

COURSE OBJECTIVE(S): Knowledge and recognition of the major spontaneous species in Romania's flora. Highlighting the transition from the lower to the higher (evolution) and the progeny of some groups of others (phylogeny). Among the specific objectives of this discipline are: the assimilation of the main methods of plant investigation; Recognition of the main groups of the studied organisms; Differentiation between the main groups of the studied organisms; Knowing the ecology of the analyzed species; The presentation of the practical and scientific importance of plants.

COURSE CONTENTS: The general characters of the vegetative and reproductive apparatus in the upper vascular plants, on the biochemical novelties (lignin and cutin) as well as the histological ones: the vascular bundles and the central cylinder (the stella); Epidermis with stomata and trichomes. Fenerogamous framing of Spermatophyta with two Subphylums: Pinophytina (Gymnospermae) and Magnoliophytina (Angiospermae). The two subphylum present: general characters, classification, representatives, scientific and practical importance.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: VEGETAL HISTOLOGY

CODE: D30BIOL432

ECTS CREDITS: 4

TYPE OF COURSE: Complementary

COURSE OBJECTIVE(S): Acquiring the concepts of plant histology. Acquiring and deepening knowledge of histology and plant embryology; Forming the skill to perform microscopic

preparations using appropriate dyes to study different types of tissues and embryos; Making semifixes and fix preparations necessary for scientific research and the department.
COURSE CONTENTS: Definition, classification and structure for plant tissues: meristematic, protective, parenchymal, conductive, mechanical, secretory and sensitive. Antera, microsporogenesis and microgametogenesis in gimnosperm and angiosperms. Ovulation, macrosporogenesis and macrogametogenesis in gimnosperm and angiosperms. Embryogenesis in bryophytes, pteridophytes, gimnosperm and angiosperms. Types of embryo development and structure.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (course notions - 70%, practical notions - 30%).

COURSE TITLE: ORNITHOLOGY
CODE: D30BIOL434
ECTS CREDITS: 2
TYPE OF COURSE: specialized discipline
COURSE OBJECTIVE(S): Knowing birds from a morphological, anatomical, systematic and spreading point of view. Obtaining information concerning bird behaviour (notions of communication, locomotion, feeding, reproduction, migration). Gaining knowledge about taxonomic position, origin and evolution of birds. Knowing the role of birds in nature, human life, as well as national and global protection measures. Learning the main methods and means used in the study of birds. Forming and developing the skills and abilities of observing, recognizing, identifying and characterizing the main species of birds (with emphasis on those in Romania) based on the acquired theoretical knowledge.
COURSE CONTENTS: Introduction to ornithology. Origin and evolution of birds. Ethology notions: locomotion and flight of birds; feeding of birds, bird communication; reproduction (nuptial parade, nesting, nest construction, egg laying, caring for chickens). Parasitism in the world of birds. Migration and orientation in the world of birds. Zoogeographical bird categories: polar birds, from temperate areas, from tropical forests, savannah birds, aquatic birds (marine and freshwater). The role of birds in nature and in human life. Bird protection measures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (50% answers from course notions + 50% practical work - performing the practical work, direct participation in discussions, interest, attendance).

COURSE TITLE: PHYSICAL EDUCATION IV
CODE: D30BIOL435
ECTS CREDITS: 1
TYPE OF COURSE: Complementary
COURSE OBJECTIVE(S): Discipline aims at forming the theoretical, practical and methodical skills for individual or group practice for a healthy lifestyle; Awareness of students about the role and importance of practicing physical exercise.
COURSE CONTENTS: Fitness - optimization of physical condition; utilitarian-applicative skills; Exercises for the development of general strength; Exercises for speed development; Exercises for the development of coordination capacity; Sports games: handball, table tennis; Bilateral games under similar competition conditions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Assessment through practical tests 80%, continuous assessment throughout semester 20%

3RD YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL GENETICS I
CODE: D30BIOL536
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of the notions regarding cell division, mitosis, meiosis, chromosomes and genes.
COURSE CONTENTS: Specific terminology. The celular cycles. Cell division. Cytokinesis and kariokinesis. Stages of mitosis. Meiosis. Chormosomes – structure and morphological forms. Telomeric regions. Nucleic acids: DNA, RNA. DNA repair. Patterns of protein synthesis. Translation. Transcription. Genes. Human gene diversity and expression patterns. Alleles. Mutations. The human genome. Codon usage and genome evolution. Human genome project. Principles of human heredity. Mendelian inheritances. Caryotypiques. Autosomal dominant/recesive transmission. Dermatoglyphics. Fingerprints.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, continous evaluation during the semester 20%).

COURSE TITLE: GENERAL ANIMAL PHYSIOLOGY I
CODE: D30BIOL537
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing and studying comparatively the functions of different groups of animals; the understanding of the complexity of the physiological mechanisms, the normal functioning of the animal body and the way it adapts to the variations of the internal and external environment.
COURSE CONTENTS: The general physiological properties of the body. Driving excitement states. Physiology of nervous centers. Cutaneous sensitivity. Gustative sensitivity. Olfactory sensitivity. Kinesthetic sensitivity. Visual sensitivity. Hearing sensitivity. Vestibular sensitivity. Electrical sensitivity. Muscle

tone. Postural activities. The kinetic activities. Upper nerve activity. The vegetative nervous system. Physiology of effectors.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Final theoretical exam 60%, final practical exam 20%, continuous assessment during the semester 20%).

COURSE TITLE: GENERAL ECOLOGY I

CODE: D30BIOL538
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring information regarding the structure and functions of supraindividual biological systems (populations, communities and the entire biosphere). Understanding the structure and functioning of (ecosystem energy, minerals circulation and self-control) natural ecosystems.
COURSE CONTENTS: Introduction to ecology, object and definition, history of ecology. Theoretical bases of ecology; The ecosystem - the concept of ecosystem; Conceptual directions regarding the ecosystem; Ecosystem components - biotope, communities. The structure of the biotope.; The structure of natural communities - the community as a level of organization of living matter; community structure; indices of diversity; similarity indices; functional diversity; interspecific relationships - interspecific competition; competitive exclusion principle.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60% course + 30% practical course and continuous assessment throughout semester10%).

COURSE TITLE: PHYTOPATOLOGY

CODE: D30BIOL539
ECTS CREDITS: 5
TYPE OF COURSE: specialized discipline
COURSE OBJECTIVE(S): Learning and accumulating knowledge on some aspects of biological characteristics of the main types of pathogens, the role of interaction parasite- plant, host-environment in the pathogenesis process, mechanisms of plant resistance to diseases and protection means for plants in the context of integrated control.
COURSE CONTENTS: Phytopathology - object of study, importance and practical implications, links with other sciences, branches, Types of losses due to plant diseases, General concepts of diseases and phytopathogenic agents, Classification of diseases; Host - parasitic plant interference; Changes suffered by plants in the pathogenesis process, Parasitism from origins to the present and its consequences; Parasitic traits of pathogens; Transmission and spread of pathogens, General features of phytopathogenic viruses (morphology, chemical composition, structure, properties, multiplication, nomenclature and classification), The main plant viroses, the mode of transmission and spread, the possibilities of prevention and combat, General features of myoplasms and phytopathogenic bacteria. The main mycoplasmosis and bacteriosis of plants, mode of transmission and spread, possibilities of prevention and control, General characteristics of phytopathogenic fungi, Types of vegetative apparatus; Resistance organs of the vegetative apparatus; Possibilities of multiplication; General classification, The Protista Kingdom. General characters; classification, Chromista kingdom, Oomycota phylum, Oomycetes class; General characters, classification, representative mushrooms and diseases of economic importance produced by them, Fungi Kingdom, Chytridiomycota phylum. General characters, important representatives, Ascomycota phylum, diseases produced by representative fungi,symptomatology,pathogenesis, epidemiology and controling possibilities, Basidiomycota phylum. General characters, classification, representative fungi of the Ustilagomycetes class, diseases produced by them and possibilities for control, Basidiomycota phylum. General characters, classification, representative fungi of the Uredinomycetes class, diseases produced by them and possibilities for control, Conidial ascomycetes: Hyphomycetes and Coelomycetes classes. General characters, classification, representative fungi. fruiting Forms of the fungi. Symptomatology, pathology, epidemiology and controling possibilities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70% course and 30% practical course).

COURSE TITLE: EVOLUTIONISM

CODE: D30BIOL540
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of the current conception of the origin and evolution of life on Earth, as well as of the main moments that led to the conception of this concept: scientific personalities, discoveries, theories. Underlining the importance of Charles Darwin's theory for understanding the mechanisms underlying species evolution. The contribution of molecular biology to support Darwinian theory. Knowledge of the current classification system of the living world. Identification of mechanisms for generating and amplifying / reducing genetic variability in populations; Understanding the importance of maintaining species diversity as a guarantee of the continuity of life on Earth. Presenting modern methods for assessing the genetic diversity of species.
COURSE CONTENTS: Evolution of theories and hypotheses regarding the origin of life.

Spontaneous generation theory; Panspermy theory; Life Stability Theory; Biochemical theory of evolution (Oparin-Haldane theory). Other theories. Theory of bio-structure. The cold theory of Simionescu and Dénes. The Genotype Theory. Monod's hypothesis. The theory of ribbing. The theory of the egoistic gene and the extended phenotype theorem. The Origin of the Universe. The Big Bang. Black holes and multiple universes. Big-Crunch and the hypothetical end of the Universe Biological Evolution. Classical pre-Darwinist evolutionary theories. Darwinian theory of evolution: the premises of its emergence. Darwinian Factors of Evolution. The main post-Darwin currents. Neo-Darwinism, Neo-Lamarckism. Synthetic theory of evolution. The factors of evolution. Microevolution and macroevolution of creatures. Evidence of Evolution. Cytological, embryological, biochemical and physiological evidences, serological, systematic, paleontological, bio-geographic, comparative anatomy. The origin and evolution of man. Considerations on humanization phenomena.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Final theoretical exam 60%, continuous assessment during the semester 20%, elaborarea de referate 20 %).

COURSE TITLE: GENERAL MICROBIOLOGY
CODE: D30BIOL541
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring and understanding basic notions in the field of microbiology, notions used by students in the study and understanding of other specialized disciplines (cell biology, plant protection, biochemistry, molecular biology, modern biotechnology, etc.).
COURSE CONTENTS: Methods of research used in Microbiology. Microbiology relationships with other sciences. Bacteria and Archea. Growth and nutrition of prokaryotes. Metabolism of prokaryotic cells. Eukaryotic cell structure and functions. Fungi. Yeasts. Viruses. Pathogenic microorganisms. Influence of physical and chemical factors on microorganisms. Ecology of microorganisms. Microbiology of the environment. Microorganisms involved in biotechnology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (Final theoretical exam 70%, continuous assessment during the semester 30%).

3RD YEAR, 2ND SEMESTER

COURSE TITLE: GENERAL GENETICS II
CODE: D30BIOL64
ECTS CREDITS: 5
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): The knowledge of the principles of molecular medificne, genetic diversity, the etiology of genetically determined diseases and mechanisms of oncogenesis.
COURSE CONTENTS: Sex determination and the Y chromosome. Blood types. Genetic counseling. Clinical and ethical aspects. Genetic risk assessment. Bloodline. Genetically determined diseases. Genetics of intermediary metabolism. Familial hypercholesterolemia. Genetics of atherosclerosis. Human type 1 diabetes and the insulin gene. Enzymatic diseases. The hyperphenylalaninemias. The molecular basis of blood diseases. The Thalassemia syndromes. The hemoglobinopathies (genetic disorders of hemoglobin). Sequence of mutation in the factor VIII gene of heamophiliacs. Down syndrome. The cytoskeleton and disease. The spectrum of cystic fibrosis mutations. Oral facial genetics. Colour vision and its genetic defects. Molecular genetics of muscular disorders. Genetic causes of hearing loss. Genetic diversity. The etiology of psychiatric diseases. Alzheimer's disease. Cancer and genomics. Progress in medical genetics. Disorders of sexual differentiation. Cloning
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, continous evaluation during the semester 20%).

COURSE TITLE: GENERAL ANIMAL PHYSIOLOGY II
CODE: D30BIOL643
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowing and studying comparatively the functions of different groups of animals; the understanding of the complexity of the physiological mechanisms, the normal functioning of the animal body and the way it adapts to the variations of the internal and external environment.
COURSE CONTENTS: Endocrine system in invertebrates. Endocrine system in vertebrates. Digestion. Absorbtion. Internal environment. Physiology of the heart. Physiology of blood circulation in vessels. Breathing on invertebrates. Breathing on vertebrates. Energy metabolism. Thermoregulation. Excretion in invertebrates. Excretion in vertebrates. Reproductive function in male. The breeding function of the female body.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, continuous assessment during the semester 20%).

COURSE TITLE: SPECIAL MICROBIOLOGY
CODE: D30BIOL644
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring and understanding basic notions in the field of microbiology, notions that are used by students in the study and understanding of other specialized

disciplines (cell biology, plant protection, biochemistry, molecular biology, modern biotechnology, etc.).
COURSE CONTENTS: Human host microorganisms. Pathogenity of microorganisms. Infection and infectious disease. Microbiological bases of infection prophylaxis. Microbiological bases of the etiological treatment of infectious diseases. The main types of microorganisms involved in human pathology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, continuous assessment during the semester 30%).

COURSE TITLE: GENERAL ECOLOGY II

CODE: D30BIOL645
ECTS CREDITS: 4
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Acquiring information regarding the structure and functions of supraindividual biological systems (populations, communities and the entire biosphere). Understanding the structure and functioning of (ecosystem energy, minerals circulation and self-control) natural ecosystems.
COURSE CONTENTS: Population - characteristics, heterogeneity, spatial structure. Population - rates: natality, mortality, natural growth rate; carrying capacity of the environment; the dynamics of a population's size; exponential and logistic growth of a population; self-regulation - adjustment mechanisms. Ecosphere system - Ecosystem structure (toposfer and biosphere), global circuit of matter, turnover rate, turnover time, global biogeochemical cycles, biogeochemical circuit of carbon.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers - 60% course + 30% practical course- and continuous assessment throughout semester 10%).

COURSE TITLE: PHYTOSOCIOLOGY

CODE: D30BIOL647
ECTS CREDITS: 2
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Understanding the inter-specific relationships in a phytocenosis, the distribution of vegetal groups both horizontally and vertically, as well as the factors that contribute to their distribution. Recognition of the main zonal, azonal and intrasonal vegetal associations.
COURSE CONTENTS: The relationship between flora and vegetation. Phytocenosis - study of phytosociology. The relationship between phytocenosis and other over populative biological systems. Functions of phytocenoses. Phytocenosis sampling, Structure of phytocenoses (Sinstructure), Phytocenosis dynamics (Sindinamica), Phytocenotaxonomy of plant groups. Spread of phytocenoses. Geographical classification of plant cover. The conditions for the formation of the vegetation cover and of the phytosociological units in our country.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 60%, final answers to practical laboratory work 10%, periodic testing by practical control exercises 15%, continuous testing during the semester 15%, activities like topics / essays / translations / projects, etc.)

COURSE TITLE: MICOLOGY

CODE: D30BIOL650
ECTS CREDITS: 2
TYPE OF COURSE: Specialized discipline
COURSE OBJECTIVE(S): Presenting the unity and biodiversity of mushrooms, the phylogeny, the evolution and the current classification system. Presentation of the diversity of mushroom species in relation to the current concepts regarding the classification of these categories of organisms. Synthesizing aspects related to the biology, ecology and physiology of mushrooms, insisting on their practical importance.
COURSE CONTENTS: Brief history of mycology. Morphology and nutrition of mushrooms. Cultivation of mushrooms, their nutritional value. Nutritional index. Toxins produced by mushrooms. Mushroom poisoning (syndromes). Influence of environmental factors on growth, multiplication and life cycle of mushrooms Food value of mushrooms. Inedible mushrooms and poisonous mushrooms. Mushrooms of medicinal and industrial importance. Fundamentals of fungi systematics: Protozoa, Chromista and Fungi. Archimycetes, Myxomycetes. Phytomycetes (Oomycetes, Zygomycetes). Ascomycetes (fam. Hemiascomycetidae, Euascomycetidae). Basidiomycetes. Actinomycetes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

FIELD: HORTICULTURE
PROGRAMME TITLE: EXPERTISE IN VITICULTURE AND OENOLOGY
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: CLIMATOLOGY AND WINE ECOPHYSIOLOGY

CODE: D29EVVOM101
ECTS CREDITS: 7
TYPE OF COURSE: Thorough discipline
COURSE OBJECTIVE(S): Acquiring and learning concepts of wine climatology, developing knowledge about the influence of climate on biological processes, physiological and biochemical vines, using the climatic potential of various global and national areas for vineyards, applying the knowledge gained to improve the microclimate and topoclimate with positive influence on the quantitative and qualitative vines
COURSE CONTENTS: Getting Climatology applied in viticulture, Regional Climatology applied in viticulture, wine Pedoclimat; levels of appreciation of climate favorability for vines (wine Macroclimate, Mezoclimate, Topoclimate, Microclimate, etc.); the influence of climatic conditions on the main processes physiological vines, climate hazards and their influence on the vine, current and possible future climate changes, physiological and biochemical reactions of the vine response to the action of unfavorable climatic factors, technological possibilities of counteracting the negative effect of unfavourable climatic factors .
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 60%, practical workshops 40%).

COURSE TITLE: INTEGRATED PROTECTION MANAGEMENT

CODE: D29EVVOM102
ECTS CREDITS: 6
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Familiarizing the future vine farm manager with the selection technique of a certain pesticide to prevent or combat a particular pest agent which increases the cost price of production and ways to reduce the financial burden with minimal impact on the ecosystem and the environment.
COURSE CONTENTS: General methods of prevention and control of vineyards damaging agents; Chemical control measures (methods of application for phytopharmaceutical products and types of treatment, dose and concentration, toxicity, pesticide resistance, compatibility, economic efficiency of control measures); The main groups of pesticides used in controling the damaging agents of vineyards (Herbicides, Fungicides, Insecticides, Acaricides, Nematocides, Moluscocides, Rodenticides, etc.); Elaboration of short and long-term forecasts; Evidence of pest biology; Integrated control of damaging agents in vine nursery< Integrated control of damaging agents of vineyards, depending on vineyard yield destination; Protecting the environment, eliminating accidental pollution or discomfort agents in wine ecosystems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70 %, workshops 30%).

COURSE TITLE: MODERN TECHNIQUES AND METHODS OF MICROBIOLOGICAL ANALYSIS

CODE: D29EVVOM103
ECTS CREDITS: 7
TYPE OF COURSE: Thorough discipline
COURSE OBJECTIVE(S): Microbiological quality assessment of foods by using multitest microorganism systems.
COURSE CONTENTS: Qualitative assessment techniques for the selective highlighting of indicator micro-organisms by tests attesting their presence or absence in wine. Quantitative assessment techniques to determine the microbial load to be reflect total micro-flora or specific micro-organism groups. Techniques for the isolation and characterization of microorganisms from the non-specific microbiota In particular for the detection of pathogenic, toxicogenic or altering potential
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 85%, final responses sustained upon practical works performed in laboratory 15%).

COURSE TITLE: OENOTURISTIC RESOURCES

CODE: D29EVVOM104
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge of general aspects of oenotourism resources and how to make them acquainted with the knowledge of the main national and regional environmental resources.
COURSE CONTENTS: General concepts of oenotourism and oenotourism resources; Resources and destinations in the main wine-growing countries; Resources and destinations in the wine-growing region of the Transylvania Plateau and Moldovan Hills; Resources and destinations in the wine region of the Muntenia and Oltenia Hills; Resources and destinations in the wine region of Crişana, Maramureş and Banat; Resources and destinations in the wine region of the Dobrogea Columns, the sands and other favorable lands in the south of the country; Promotion of oenotourism activities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 60%, practical workshops 40%).

COURSE TITLE: DERIVATIVES AND BY-PRODUCTS IN WINE INDUSTRY

CODE: D29EVVOM105
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge and understanding of general technologies for obtaining different types of wines; Knowledge of the main by-products obtained from the grape processing process; Determination of organoleptic properties by tasting the finished product
COURSE CONTENTS: Explaining and interpreting on the technological lines the processes of obtaining natural distilled alcoholic beverages, spirits and natural fruit juices; Determination of the main parameters of the by-products of the wine industry; Establishing the main physico-chemical and biological characteristics of the by-products of the wine industry; Laboratory determination of the main quality parameters of the product obtained from the processing of various by-products from winemaking.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70%, practical workshops 30%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENVIRONMENTAL TECHNOLOGIES IN VITICULTURE

CODE: D29 EVVOM206
ECTS CREDITS: 7
TYPE OF COURSE: Thorough discipline
COURSE OBJECTIVE(S): Further study of the impact of viticulture on the environment; Knowledge of the advanced technological systems and their impact on the environment; The identification and use of the means to realize vineyard production in an integrated technological system under environmental control;
COURSE CONTENTS: The evaluation and use of maximally favorable areas; Organic soil management; Health Phytotherapy (mostly organic); The agro-ecosystem - pollution impact; Quality management in biological viticulture; Ecological cultivation technologies; Concepts and techniques specific to wine sustainable development
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 50%, activities such as homework/essays/papers/ translations/projects 50%).

COURSE TITLE: MANAGEMENT OF VINEYARD HOLDINGS

CODE: D29EVVOM207
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of knowledge
COURSE OBJECTIVE(S): Knowing the theoretical bases of viticulture management; knowledge of the types and structure of the viticultural holdings; understanding the ways in which economic activities are conducted in wine-growing; promoting a successful viticulture through the efficient organization and exploitation of farms.
COURSE CONTENTS: Organization of viticultural holdings; factors of production and their use in viticulture Economic performance of wine-growing holdings; use of European financial resources for the development of viticulture
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (wxamination 50%, final answers to Laboratory works 50%).

COURSE TITLE: CONCEPT OF TERROIR IN VITICULTURE

CODE: D29EVVOM208
ECTS CREDITS: 7
TYPE OF COURSE: Thorough discipline
COURSE OBJECTIVE(S): Acquiring knowledge about: the notion of terroir in viticulture; methodologies for the study and characterization of the terroir effect in viticulture; sustainable functioning and protection of vine areas.
COURSE CONTENTS: Procedures for territorial delimiting in world and national viticulture, national and international regulations on the geographical origin of wine products, methodologies for the evaluation and study of the terroir effect in viticulture: levels of evaluation; spatial integrated approach and focused eco-physiological approach; territorial wine units; the legal territorial delimitation of wine areas at world level and in Romania; Sustainable functioning and protection of vine areas.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 60%, activities of the type homework/papers/ essays/translations/projects 40%).

COURSE TITLE: ELABORATION, CLARIFICATION AND STABILIZATION OF STRICTO-SENSU WINES

CODE: D29EVVOM209
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge of modern technologies and procedures for the elaboration and conditioning of various types of wine.
COURSE CONTENTS: Modern technologies in white wine; Red wine modern technologies; Special winemaking technologies; Colloidal phenomena in wine; Wine clarification; Wine stabilization.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 60%, written papers 40%).

COURSE TITLE: WINE MARKETING AND LEGISLATION

CODE: D29EVVOM210
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis

COURSE OBJECTIVE(S): Knowledge and understanding of the techniques and methods of marketing; knowledge of the wine products market and their study techniques, consumer behavior, types and methods of forecasting, knowledge of legal regulations concerning the production and marketing of wine products
COURSE CONTENTS: Marketing considerations in the wine sector, concepts and strategies; Wine products market and methods of study; Consumer profile and demand for wine products; Quality attributes and supply of wine products; Differentiation of wine products on the market and their distribution; Market promotion and price of wine products; General on Legislative Regulations. Evolution of legislation in the wine sector; Wine-making regulations in Romania
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 50%, practical workshops 50%).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: WINE AND TERRITORIAL IDENTITY

CODE: D29EVVOM311
ECTS CREDITS: 4
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge of the relationship between wine and the economic and spiritual specificity of its territory of origin.
COURSE CONTENTS: The influence of wine on the image of a territory; Wine, food and culture as elements of spiritual inheritance in a territory; The relationship between wine, heritage and tourism.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70%, practical workshops 30%)

COURSE TITLE: CONTROL AND EXPERTISE TECHNIQUES OF FOOD

CODE: D29EVVOM312
ECTS CREDITS: 7
TYPE OF COURSE: Discipline of knowledge
COURSE OBJECTIVE(S): Deepening knowledge of control and expertise techniques applied in the main branches of the fermenting food industry; Participants' acquisition of methods of controlling foodstuffs and combating their falsification and fraud patterns.
COURSE CONTENTS: General aspects of food quality; Drinking water control and expertise techniques used in the food industry; Wine control and expertise techniques; Techniques of control and expertise of natural fruit juices; Techniques of control and expertise of wine and fruit vinegar.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: WINE AND FOOD

CODE: D29EVVOM313
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): The propagation of wine and gastronomy values, of the nutrient potential, in the spirit of environmental protection, safety and consumer culture, in the spirit of the law; Knowledge and understanding the association of categories and types of wine with various types of dishes.
COURSE CONTENTS: Wine - food beverage, knowledge about what wine means; the main categories of wine and how to drink them; Gustative balance between wine and food; Associated foods with light red wines, white wines with residual sugar, old wines and with special wines; Serving sparkling wines; Culinary preparations not associated with any wine.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: FRAUD CONTROL AND PREVENTION IN THE WINE INDUSTRY

CODE: D29EVVOM314
ECTS CREDITS: 4
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge and understanding of general technologies for obtaining different types of wine; Knowledge of European legislation on forgeries in the wine industry
COURSE CONTENTS: Explaining and interpreting the concept of quality and authentication of vine-wine products; Explaining and interpreting the concept of fraud in the wine industry; Determination of counterfeits in the wine industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70%, practical workshops 30%).

COURSE TITLE: SENSORY ANALYSIS

CODE: D29EVVOM315
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge of the sensory characteristics defining wine quality and typicality.
COURSE CONTENTS: The main types of wine produced in Romania; Types of tasting, Wine tasting conditions; The role of sensory organs in sensory analysis; The tasting technique; Visual examination; Examination by smelling; Examination by tasting; Tasting vocabulary.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 60%, practical workshops 40%).

COURSE TITLE: OENOTURISTIC AND TRADITIONAL PRODUCTS

CODE: D29EVVOM316
ECTS CREDITS: 5
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowledge of oenological tourism, traditional oenological and traditional products specific to the wine region in our country, through the promotion of brands and wine-making methods.
COURSE CONTENTS: Oenotouristic and traditional products from the Plateau region of Transylvania; Oenotouristic and traditional products from Crisana and Maramures; Oenotourist and traditional products from the Moldavian Hills region; Oenotouristic and traditional products from the Muntenia and Oltenia Hills region; Oenotouristic and traditional products from the Banat Hills; Oenotouristic and traditional products from the Danube Terraces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (examination 70%, practical workshops 30%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: MODERN RESEARCH TECHNICS - PREPARATION OF THE MASTER`S THESIS

CODE: D29EVVOM417
ECTS CREDITS: 30
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Performance of scientific multidisciplinary/interdisciplinary research projects using innovative methods with significant impact on the development of viticulture and wine sector; Ability of drawing conclusions and suggesting solutions/ recommendations for academic research and practice in viticulture and wine sector based on the research studies performed.
COURSE CONTENTS: Finalisation of Master`s thesis plan and bibliography; Speciality literature reviews based on academic speciality resources recommended by the research supervisor or other sources considered as being relevant by the student; Finalisation and implementation of the research methodology intended for the achievement of objectives; Preparation and drafting of the Master`s thesis; Presentation of results and conclusions of the research studies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (Master`s thesis presentation -100%).

FIELD: HORTICULTURE
PROGRAMME TITLE: MANAGEMENT AND CONSULTING SERVICES IN HORTICULTURE AND RURAL DEVELOPMENT
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: PLANTING MATERIAL PRODUCTION LEGISLATION

CODE: D29 M.C.H.M.101
ECTS CREDITS: 5
TYPE OF COURSE: advanced knowledge discipline
COURSE OBJECTIVE(S): Knowledge and assimilation of legislation about seeds and horticultural seedlings, the conditions that must be met by propagating and planting material to ensure good management, the importance of multiplication and certification scheme of biological material.
COURSE CONTENTS: The importance and necessity of knowing the legislation on the production of seeds and propagating material, a determinant factor in horticultural production.
The conditions to be met by seed and horticultural planting material;
The role of controlling on horticultural crops to establish identity, authenticity, variety purity and health status;
Record keeping, control and certification of seed and horticultural seedlings;
Ensuring and maintaining the biological and phytosanitary value of seeds and propagating material;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (theoretical answers at the colloquy 50% and practical and theoretical verification at the laboratory 50%).

COURSE TITLE: INTEGRATED PROTECTION MANAGEMENT

CODE: D29MCHM102
ECTS CREDITS: 5
TYPE OF COURSE: Advanced knowledge
COURSE OBJECTIVE(S): Knowledge of issues related to integrated control of horticultural plants, Knowing the role of integrated control in obtaining quality horticultural productions, Knowledge of phytosanitary legislation on organic horticultural products in Romania and in the European Union, Enhancement of plant protection knowledge as links of crop technologies and complementary means for obtaining quality and stable horticultural productions
COURSE CONTENTS: Integrated Plant Protection and Ecological Impact - Principles and Components, Types of losses and damages caused by harmful organisms (phytopathogens, pests and weeds) of the main horticultural plants, Host plant relationship - parasite / predator, Types of plant resistance to diseases and pests, The role of resistant varieties in the integrated protection of horticultural plants, Recommended methods, measures and means of prevention and control in the protection of plants with reduced impact on the environment and consumers of horticultural products, Technologies for the prevention and control of integrated pest control of key diseases and pests at: the main vegetable, floricultural and ornamental species, fruit trees and vines.
LANGUAGE OF INSTRUCTION: Română
ASSESSMENT METHOD(S): Checking (exam answers at the colloquy 70% and practical verification at the laboratory 50%).

COURSE TITLE: VEGETAL DESIGN

CODE: D29MCHM103
ECTS CREDITS: 6
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the basic principles and design elements in landscaping. Knowledge of the vegetal elements and the ways of framing them into the exterior and interior decoration. Recognising the thematic gardens according to the compositional elements. Knowledge of the new trends in plant design for outdoor, interior and intermediate spaces.
COURSE CONTENTS: Design as a modern field of technique and art. Vegetable design - introductory concepts. Stylistic typologies in landscape design. Principles and elements of composition in landscape design. Vegetation as a landscape design element. Ways of framing the dendro-floral vegetation in the green spaces decoration. Elements of vegetation. Visual effects of arrangement of vegetation elements in landscaping. Types of gardens. Classification criteria. Thematic gardens according to the compositional elements. Vegetable design and ways of embodying ornamental plants in indoor and intermediate spaces (terraces and balconies).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, activities such as homework/essays/papers/ projects 50%).

COURSE TITLE: GROWING VEGETABLES IN SUSTAINABLE SYSTEM

CODE: D29MCHM104
ECTS CREDITS: 7
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Developing the knowledge about the object of study and the importance of the culture of vegetables for a sustainable rural development. The current situation of organizing the culture of vegetables in our country and on world level into a sustainable system, developing the knowledge about the elements defining the frame of general technologies of the cultivation of vegetable plant species within the frame of the

systems and forms practiced in the context of sustainable development. Developing the knowledge, in general, about the eco-techniques of vegetable plants' cultivation in different systems, as an alternative for sustainable development.
COURSE CONTENTS: The ecosystem of vegetables. Systems and subsystems in alternative farming, sustainable, organic vegetable production etc., principles and peculiarities. The vegetable system as a sustainable and integrated system, that is ecological, biological, technological, informational, energetic and with a good marketing. The technological bases of vegetable plant's cultivation. Cultivation systems. New systems of water supply. Basic principles and particulars relating to sustainable vegetable fertilization. Particulars regarding the choice of the land and preparing the ground for sustainable vegetable growing (by "minimum work "). Organization and rational use of land – the ecological factor and the technological characteristic element. The rotation of vegetables, an important factor in growing vegetables in the context of sustainable development. Associated (mixed) crops of vegetable plants in a system of sustainable development. Choice of an assortment of species, of a genotype and the seed for the establishment of vegetable crops in a sustainable system. Weed prevention and weed control in vegetable crops in an integrated system of plant protection. Protection in an integrated system of vegetable crops in the context of a sustainable development
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, continuous testing 15%, general thematic work/ translations/projects 15%).

COURSE TITLE: TECHNICAL MANAGEMENT OF TREE HOLDINGS

CODE: D29M.CHM105
ECTS CREDITS: 7
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Learning, knowledge and solutions on modern management functions; Deepening knowledge of the importance and efficiency of the organization and functioning of the fruit holdings; Deepen knowledge of resources and factors of production, their management; Deepening knowledge about production management in fruit orchards; Deepening knowledge about efficient managing and use of technical, material and human resources; Knowing the product quality management and capitalizing on them; Knowledge of marketing activity in fruit growing and managerial behavior.
COURSE CONTENTS: Economic aspects regarding the main tree species cultivated in Romania; Presentation of the criteria for determining the optimum size of viable fruit farms; Management of the organization and establishment of orchards in fruit farms; Fruit tree cultivation systems. Yield and quality of fruit production. Grouping of trees, degree of mechanization. Exploitation time and value of the investment; Management of maintenance works in fruit plantations until entry into the fruit and during exploitation (of fruit); Quality management and fruit harvesting in a sustainable fruit tree.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESSEMENT: Exam (written exam weight and practical check 20%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ORNAMENTAL CONSTRUCTION IN LANDSCAPING

CODE: D29MCHM206
ECTS CREDITS: 8
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the elements built specifically to parks and gardens. Establishing their role in green space design from a decorative and functional point of view. Selection of buildings according to the compositional principles adopted for general arrangement. Knowledge of the main building materials used in landscaping, their properties and ways of using them. Establishment of construction materials used in accordance with their role and importance and with the characteristics of the space in which they are located.
COURSE CONTENTS: Introduction, purpose and content of the course. The role of ornamental constructions. Building Materials. The main categories of ornamental constructions. Pavements, curbs, ladders, supporting walls; Pergolas, trenches and colonnades. Water "decorative element of ornamental constructions". Alpine gardens, rocks. Jardiniers, decorative pots. Plastic art pieces. Park and garden furniture.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, activities such as homework/essays papers/ projects 50%).

COURSE TITLE: MANAGEMENT OF VINEYARD HOLDINGS

CODE: D29MCHM207
ECTS CREDITS: 7
TYPE OF COURSE: Discipline of synthesis
COURSE OBJECTIVE(S): Knowing the theoretical bases of viticulture management; knowledge of the types and structure of the viticultural holdings; understanding the ways in which economic activities are conducted in wine-growing; promoting a successful viticulture through the efficient organization and exploitation of farms
COURSE CONTENTS: Organization of viticultural holdings; factors of production and their use in viticulture Economic performance of wine-growing

holdings; use of European financial resources for the development of viticulture
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, final answers to Laboratory works 50%).

COURSE TITLE: ELABORATION, CLARIFICATION AND STABILIZATION OF STRICTO-SENSU WINES

CODE: D29MCHM207
ECTS CREDITS: 7
TYPE OF COURSE: Specialized disciplines
COURSE OBJECTIVE(S): Knowledge of modern technologies and procedures for the elaboration and conditioning of various types of wine.
COURSE CONTENTS: Modern technologies in white wine; Red wine modern technologies; Special winemaking technologies; Colloidal phenomena in wine; Wine clarification; Wine stabilization
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 60%, written papers 40%).

COURSE TITLE: PROJECT MANAGEMENT

CODE: D29MCHM209
ECTS CREDITS: 8
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Understanding the basic notions, the main knowledge base that makes the content of the project management. Creating the necessary skills to carry out projects in economic, cultural, political, non-governmental organizations etc.
COURSE CONTENTS: Introduction. Project cycle management. Quality management. Management of human resources. Time management. Financial management. Other management activities (management of communication, conflict management in projects, risk management in projects, management of public acquisitions, management of the objectives). Control and evaluation. Monitoring. The management of the project cycle. Fundamental principles. Analysis tools. Impact study. Feasibility study. Business Plan. The selection of projects.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESSEMENT: Exam (60% written examination, 40% periodic evaluation).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: QUALITY AND EXPLOITATION STANDARDS OF HORTICULTURAL PRODUCTS

CODE: D29MCHM310
ECTS CREDITS: 8
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Increasing knowledge regarding the quality and exploitation of horticultural products. Acquaintance by the participants of the main quality standards for fresh horticultural products as well as processed products obtained from the processing industry; Knowing the quality standards of horticultural products; Implementation of the HCCP system; Knowledge of the internal and EC legislation regarding the quality and exploitation of horticultural products.
COURSE CONTENTS: The quality of horticultural products. Definitions. Quality Parameters. Examination and quality assessment; Standardization of horticultural products. General issues of standardization. Elaboration and approval of the standards. Content and classification of the standards. Advantages of the standardization. Internal rules. Certificate of approval. HACCP control systems. National legislation regarding the exploitation of the horticultural products. European Community legislation regarding the quality and exploitation of the horticultural products.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to laboratory works 30%).

COURSE TITLE: NEW CONCEPTS IN LANDSCAPING

CODE: D29MCHM311
ECTS CREDITS: 6
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of concept and ecological, economic, social and aesthetic benefits of vegetated roofs and vertical gardens integrated into sustainable urban architecture. Knowledge of building technologies of vegetated roofs, green facades and outdoor and indoor vertical gardens. Knowledge of the criteria of choosing, association and arranging of the dendrologic and flower species and of the specific maintenance works.
COURSE CONTENTS: Vegetated roofs (concept, history, importance). Types of green roof systems. Components and construction details. Maintenance of vegetated roofs. Current constructive systems of vegetated facades and vertical gardens. Advantages and disadvantages. Maintenance of vegetated facades and vertical gardens. Criteria of ornamental species choosing for vegetated roofs, green facades and vertical gardens.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (exam answers 60%, presentation of papers, projects 40%).

COURSE TITLE: CONCEPTS AND STRATEGIES FOR RURAL DEVELOPMENT

CODE: D29MCHM312
ECTS CREDITS: 8
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): : the course aims at conveying the knowledge, the understanding and the use of concepts and strategies for rural development as well as the knowledge, understanding and use of diagnostic procedures

and assessment of the rural space and of the developing regions, in order to elaborate strategies and the implementation of rural development policy and sustainable development; the application and transfer of knowledge and conceptual-methodological skills in integrated analysis of rural space, in order to establish the basis for coherent strategies of rural development

COURSE CONTENTS: The concept of rural development – methodological approaches. The concept of rural space. Socio-economic characteristics of the Romanian rural space. The structure and functions of rural space. Agriculture and rural space. The industrialization of the rural environment. Sustainable development - conceptual approaches. Sustainable development of rural space. The preservation and management of natural resources. Rural Economy and quality of life. Rural development strategy - Conceptual approaches. The evolution of rural development strategies - worldwide and in Europe. Methods and procedures for the analysis of rural development. Indicators of rural development. Strategy of rural development. European strategies and policy for a sustainable development. National strategies and policy for a sustainable development. Strategies and policies for rural development at the global level and at the EU level

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (answers to exam 50%, activities such as homework/essays/papers/ translations/projects 50%).

COURSE TITLE: CONSULTING, ASSESSMENT AND HORTICULTURAL EXPERTISE

CODE: D29MCHM313

ECTS CREDITS: 8

TYPE OF COURSE: Domain

COURSE OBIECTIVES: Knowledge of the current situation also with regard to consulting, assessment and horticultural expertise; the development of capacities to communicate the results of activities in a demonstrative manner, to elaborate studies and reports for professional use; the ability to implement HACCP system and all systems of quality according to European standards; the ability to implement modern methods of modeling and simulation; acquisition of knowledge on project management.

COURSE CONTENTS: Definition, object, terminology, importance, current situation and perspective. Objectives and policies concerning the quality of horticultural products. The enterprise as an object of evaluation and horticultural expertise (typology of agricultural holdings; the farm-management; the management of associative agricultural companies; the management of commercial agricultural companies).

Diagnosis of a horticultural farm (organization and presentation of information). Indicators of economic activity of an agricultural farm, content, classification (absolute indicators as an individual state and as an average state; relative indicators as an individual state and as an average state). Analysis of horticultural Systems. Factors that condition the quality of horticultural products. Recognizing the quality of horticultural products; perception of the quality of horticultural products; signs of quality, labeling and coding of food; measuring quality characteristics (horticultural production quality Assessment (fruit, vegetables, wine); quality system). Standardization of technical conditions. Prescribing the level of indicators and the establishment of quality classes.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (answers to exam 70%, referrals, themes 30%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: RESEARCH MODULE, PRACTICE AND ELABORATION OF DISSERTATION PAPER

CODE: D29MCHM414

ECTS CREDITS: 30

TYPE OF COURSE: Speciality

COURSE OBJECTIVE(S): Ability to draw conclusions and propose solutions based on the results of the analyzes carried out in accordance with the field of interest. Mastering students' ability to carry out independent research - research work and to generate originality data and conclusions. The dissertation thesis must attest to the professional maturity of the graduate, having to meet certain minimal requirements of content, form and scientific level.

COURSE CONTENTS: Defining the structure and bibliography of the work as a result of the study of the specialized literature, Review of the specialized literature based on the specialized academic sources recommended by the scientific guide and the sources considered relevant by the student, Defining the research methodology in order to achieve the proposed objectives, Writing the paper . Preparing the presentation for the dissertation, Presentation of the study results

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Checking (oral presentation 100%).

FIELD: FOOD PRODUCTS ENGINEERING
PROGRAMME TITLE: FOOD SECURITY AND CONSUMER PROTECTION
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: QUALITY MANAGEMENT OF FOOD PRODUCTS

CODE: D29CPAM101
ECTS CREDITS: 8
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Knowledge, understanding and appropriation of theoretical and practical notions, useful for the understanding the concepts on the food safety management; This course is conceived in a formula that combines the theoretical training with a series of applied exercises in order to provide: knowledge and understanding of the requirements of the principles of the food safety management and the HACCP principles, a set of necessary useful to specialists in order to identify the risks throughout food production and distribution, controlling them and improving the quality performance and the food quality of not being harmful, the assimilation of the theoretical notions, useful for understanding the concepts of the food safety management, understanding the requirements of the implementation of the food safety management system, knowledge of the risk identification methodology and determination of the critical control points, knowing how to approach the process of implementing of the Food Safety Management System.
COURSE CONTENTS: The National and European legislative framework: Legislative Framework and Standards, HACCP system - regulations on the use of the HACCP system at national and international level, The need to define food quality; Terms and definitions applicable to the HACCP implementation. Hygiene principles in production units: Terms and definitions applicable to the implementation of the food safety management system, Terms and definitions in the field of auditing, Principles of food hygiene, Usual practices for achieving hygiene and sanitary requirements in the food industrial establishments; The principles and benefits of the food safety management system: Benefits of the Food Safety Management System, Presentation of the HACCP principles of action, Action steps for the application of the HACCP principles according to the "codex alimentarius"; Process management; Presentation of the SR EN ISO 22000: 2005 standard
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: ADVANCED SEPARATION OF CONTAMINANTS FROM FOOD PRODUCTS

CODE: D29CPAM102
ECTS CREDITS: 7
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Approach and understanding of fundamental principles in separating mixtures using unconventional techniques. Analysis of influence factors and interpretation of characteristic quantities for the analysis of a separation process. Understanding the mass transfer phenomena through membranes, ion exchange, and separation with supercritical fluids. Modeling and simulation of separation processes. Use of modern instrumental analysis methods to determine food quality.
COURSE CONTENTS: Membranes: types, obtaining, mass transfer through membranes, transfer mechanisms.
Microfiltration, ultrafiltration, reverse osmosis, separations using ionic fluids and supercritical fluids,
molecular distillation, ion exchange, adsorption, dialysis and electro dialysis: principle, techniques, applications, apparatus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, final answers to Laboratory works 20%, tests 10% and reference 20%).

COURSE TITLE: **COMMUNITY LEGISLATION ON FOOD SAFETY**

CODE: D29CPAM103
ECTS CREDITS: 7
TYPE OF COURSE: Specialized
COURSE OBJECTIVE(S): Understanding food risk. Control of food quality. Food Expertise; Assimilation of techniques and methods of analysis used to detect the falsification of food products of animal and non-animal origin; Understanding the HACCP principles according to „Codex Alimentarius".
COURSE CONTENTS: Food Safety Strategy in Romania and the European Union; The Community Acquis in the field of food safety;Principles and general requirements of food legislation. Procedures in the field of food safety established by the European Authority for Food Safety; Competencies and responsibilities of authorities with responsibilities in the field of food safety in Romania; Legislation in the field of food safety and its correlation with the EU Directives Standards - volunteering and obligation, tools for the implementation of the food safety management; The HAACP system on national and international level; Provisions regarding the use of HACCP method at national level; Provisions regarding the use of HACCP method at international level.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 80%, final answers to seminary works 20%).

COURSE TITLE: FOOD SAFETY

CODE: D29CPAM104
ECTS CREDITS: 8
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Knowledge of the physico-chemical and biochemical risks encountered along the food chain and of the European Directives on chemical criteria for food contaminants and food additives. The use of modern instrumental methods of chemical analysis for the determination of food quality
COURSE CONTENTS: Food security, food sovereignty and food safety; Food supplementation; Toxic substances that occur naturally in foods; Nitrates and nitrates in food; Toxic products which are formed in the processes of food storage and processing; Contamination of foodstuffs with toxin-producing molds; Contamination of foods with heavy metals; Contamination of foodstuffs with pesticides; Contaminants from industrial activity; Residues of veterinary medicines in food; Use of additives in the food industry; Genetically modified organisms (GMOs) and food safety; Substances that can migrate from plastic packaging to food
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 50%, activity at Laboratory works 20%, regulat testing 20%; essay 10%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: FOOD TRACEABILITY

CODE: D29CPAM205
ECTS CREDITS: 8
TYPE OF COURSE: Domain
COURSE OBJECTIVE(S): Knowledge of traceability requirements, utility, types and characteristics of traceability systems; Knowledge of the components of the internal traceability system; Implementation of traceability systems.
COURSE CONTENTS: Traceability of food products (concept, principles, requirements, utility); Characteristics of traceability systems; Types of traceability systems within a food production chain; Components of the internal traceability system; Stages in introducing traceability systems; Traceability of analytical measurements; Implementation of traceability systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 60%, seminar activity 20%, regular testing 20%).

COURSE TITLE: MICROBIOLOGICAL CONTROL OF FOODSTUFFS

CODE: D29CPAM206
ECTS CREDITS: 7
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Knowledge of the European Union's regulations concerning the microbiological norms which are enforced for the most important groups of foods. Modifications of a microbiological nature that might be suffered by the foods
COURSE CONTENTS: Knowledge of the means and procedures through which the microbial loading of the main agricultural and alimentary products could be evaluated. Explanation of the potential risks to which the population could be submitted due to the consumption of some alimentary products which might have suffered unwanted modifications of a microbiological nature. Knowledge of the role held by the specialist within the alimentary industry in what does concern the survey upon the alimentary products' processing and the ensurance of the alimentary safety.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 85%, final responses sustained upon practical works performed in laboratory: 15%).

COURSE TITLE: ANALYSIS OF CRITICAL RISKS AND POINTS IN THE FOOD INDUSTRY

CODE: D29CPAM207
ECTS CREDITS: 8
TYPE OF COURSE: Main subject
COURSE OBJECTIVE(S): Familiarization with the food quality notice; Understanding the need for analyzes of food products; Knowledge of knowledge necessary for analysis of food products.
COURSE CONTENTS: Organization and importance of quality technical control in the food industry and quality control of food products of vegetable origin.Food quality. Keeping the nutritional value of food.Sensory and presentation qualities of food.Rapid and objective assessment of risk in the food chain. The Importance of HACCP for Global Food Quality. The objectives of the specialized sanitary inspection and of the managerial self-control. The traceability of the food with reference to the quality and safety parameters.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, continuous assessment throughout semester 5%, activities such as homework/ essays/ papers/ translations/ projects 5%).

COURSE TITLE: NEW APPROACHES TO THE FOOD PACKAGING AND LABELING

CODE: D29CPAM208
ECTS CREDITS: 7
TYPE OF COURSE: Mandatory
COURSE OBJECTIVE(S): Learning by participants of the latest methods of food packaging and labeling; Learning of the newest methods of food packaging and labeling according to the European requirements and standard; Learning of packaging and labeling requirements for organic food

according to European Union regulations and standards.
COURSE CONTENTS: Food packaging, introductory notions. Terminology; Types of packaging used in the food industry. Packaging functions; Principles of design and packaging aesthetics; Factors influencing the quality of packaged products; he types of packaging used. Auxiliary materials used for packaging; Criteria and packing standards; Packaging methods. Packing food in vacuum. Food packaging in modified atmosphere; Food labeling; Criteria and standards for the packaging and labeling of organic food.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final answers to laboratory works 30%).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: MODERN TECHNIQUES AND METHODS OF MICROBIOLOGICAL ANALYSIS
CODE: D29CPAM309
ECTS CREDITS: 7
TYPE OF COURSE: Mandatory
COURSE OBJECTIVE(S): Microbiological quality assessment of foods by using multitest microorganism systems.
COURSE CONTENTS: Qualitative assessment techniques for the selective highlighting of indicator micro-organisms by tests attesting their presence or absence in foods. Quantitative assessment techniques to determine the microbial load to be reflect total micro-flora or specific micro-organism groups. Techniques for the isolation and characterization of microorganisms from the non-specific microbiota In particular for the detection of pathogenic, toxicogenic or altering potential.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 85%, final responses sustained upon practical works performed in laboratory: 15%).

COURSE TITLE: ANALYSIS AND CONTROL METHODS IN THE FOOD INDUSTRY
CODE: D29CPAM310
NUMBER OF ECTS CREDITS: 8
TYPE OF COURSE: Speciality
COURSE OBJECTIVE(S): Deepening knowledge of control and expertise techniques applied in the main branches of the fermenting food industry; Participants' acquisition of methods of controlling foodstuffs and combating their falsification and fraud patterns.
COURSE CONTENTS: Improving practical skills in the quantification, analysis and interpretation of experimental data applied in chemical determinations specific to the food industry; Specifying ways to diversify production in line with internal and external consumer claims.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

COURSE TITLE: **IGIENIZATION OF FOOD INDUSTRY UNITS IN ACCORDANCE WITH EU NORMATIVES**
CODE: D29CPAM311
ECTS CREDITS: 7
TYPE OF COURSE: Fundamental
COURSE OBJECTIVE(S): Deepening the knowledge about modern methods for control of diseases and pests of agro-food products, stored according to the norms applied in the European Union, Training of practical skills in the field of phytosanitary control in mills and bakery factories, Practical training on the hygiene and disinfection of units in the food industry in accordance with EU regulations.
COURSE CONTENTS: The economic significance and consequences of the pest infestation of agri-food products stored, Conditioning the optimal conservation of agri-food products and favoring factors for the development, multiplication of animal pests during storage, Factors that can influence the quality of food during storage, Detecting pests and determining the intensity of the attack, Determination of pest infestation of agro-food products. Control of stored food, The main animal pests of stored agri-food products, Controling harmful organisms from food storage facilities in line with EU food safety standards, Storage facilities Control of infestation, Controling pests in mills and bakery plants, Sanitizing, Disinfection, Pest control, The peculiarities of sanitation according to the company profile, Hygienic processing of sugar beet processing plants; Processing of vegetable, milling and bakery oils, preservation of fruits and vegetables, brewing and tobacco processing, National and Community legislation applied to agri-food products in line with EU food safety standards.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70%, final responses sustained upon practical works performed in laboratory 30%).

COURSE TITLE: CONTROL OF FRAUDE OF FOOD PRODUCTS
CODE: D29CPAM312
TYPE OF DISCIPLINE: Speciality
COURSE OBJECTIVE(S): Knowledge and understanding of general technologies for obtaining different types of foods; Knowledge of the main food subject to fraud; Knowledge of European legislation on counterfeiting in the food industry.
COURSE CONTENTS: Explaining and interpreting the concept of food quality and fraud in the food industry; Determination of counterfeits in the wine, beer and spirits industry; Determination of counterfeits in the dairy and dairy industry;

Determination of counterfeits in the meat and meat products industry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, practical workshops 30%).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: MODERN RESEARCH TECHNICS - PREPARATION OF THE MASTER`S THESIS
CODE: D29CPAM313
ECTS CREDITS: 30
TYPE OF COURSE: Synthesis
COURSE OBJECTIVE(S): Performance of scientific multidisciplinary/interdisciplinary research projects using innovative methods with significant impact on the development of viticulture and wine sector; Ability of drawing conclusions and suggesting solutions/recommendations for academic research and practice in viticulture and wine sector based on the research studies performed.
COURSE CONTENTS: Finalisation of Master`s thesis plan and bibliography; Speciality literature reviews based on academic speciality resources recommended by the research supervisor or other sources considered as being relevant by the student; Finalisation and implementation of the research methodology intended for the achievement of objectives; Preparation and drafting of the Master`s thesis; Presentation of results and conclusions of the research studies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (Master`s thesis presentation -100%).

FIELD: ENVIRONMENTAL ENGINEERING
PROGRAMME TITLE: ENVIRONMENTAL MANAGEMENT OF NATURAL RESOURCES
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: VEGETAL BIOTECHNOLOGY AND ECOLOGICAL IMPACT

CODE: D30MERNM101
ECTS CREDITS: 8
TYPE OF COURSE: Knowledge study
COURSE OBJECTIVE(S): Knowing the importance of biotechnologies and their prospects in the field of environmental protection.
COURSE CONTENTS: Plant biotechnologies: definition, history, importance, current situation and perspectives in environmental protection; General considerations on biotechnology for environmental protection. Biotechnologies for restoration of degraded soils. Biotechnologies for the regeneration of polluted sites. Plant propagation biotechnologies and their role in the protection of ecosystems. Creation and use of variability in breeding programs. Ecological impact. Genetically modified plants. Opinions on biosecurity. Conservation of plant genetic resources and ecological impact.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (60% written examination, 40% periodic evaluation).

COURSE TITLE: SOIL RESOURCE MANAGEMENT

CODE: D30MERNM102
ECTS CREDITS: 6
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): The study of land resources of our country and evaluation methods of sustainable use of them; The study of land quality and usage categories. Qualitative evaluation by soil evaluation; The study of lucrative methods of ecological management.
COURSE CONTENTS: General knowledge about soil. The classification of land resources. The group of waterlogged soils. The group of newly developed soil (young soils). The group of saline and alkali soils. The group of acid soils. The group of mountain soils. The group of fine textured and sandy soils. The erodded soils. The quality status of soil resources. Pollution ways of soil. The changing of soil features under the influence of human activity. The main restrictions on soil quality. The qualitative classification of soils by evaluation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquy (exam answers 50 %, projects during semester 50%).

COURSE TITLE: VEGETABLES RESOURCES IN SUSTAINABLE TERRITORIAL PLANNING

CODE: D29MERNM103
ECTS CREDITS: 8
TYPE OF COURSE: Knowledge study
COURSE OBJECTIVE(S): Deepen knowledge of the organization and functioning of ecosystems and complex relationships established between biotic and abiotic subsystems. Developing an ecological concept to act to achieve ecological balance between ecosystems and human activities. Sustainable protection and valorisation of elements of the natural and built environment, determination, mitigation or annihilation of the effects of destructive phenomena (natural and anthropic risks). Presentation of plant resources and their role in spatial planning. Knowledge of existing interrelations between ecosystems and environment; Between productive activity and the obligation of environmental protection; Training the system approach to all problems; Formation of practical features necessary for the development and protection of natural ecosystems and those exploited by human society.
COURSE CONTENTS: Systematic organization of living matter. Ecological characteristics of natural and anthropic systems. Presentation of plant resources and their role in spatial planning. Managing plant resources and using them in an integrated system. Ensuring the necessary areas for secondary functions by expanding intravilanes and converting non-performing activities that occupy important land resources. Influence of environmental pollution on plant resources. Prevention and control of pollution. Reconstruction of affected horticultural ecosystems: making a micro-habitat and macro-habitat on ecological principles;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, continuous testing 15%, general thematic work/ essay/essay/translations/projects 15%, final laboratory work 20%).

COURSE TITLE: ECOLOGICAL PROTECTION METHODS FOR PLANTS

CODE: D30MERNM104
ECTS CREDITS: 8
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Deepen knowledge of plant protection in organic farming. Deepen knowledge of plant protection organic methods against harmful organisms. Knowledge of legislation on plant protection products used in plant protection. Practical training on organic methods of plant protection against harmful organisms. Practical training on "good phytosanitary practice" regarding the use of plant protection products used in plant protection.
COURSE CONTENTS: Plant Protection - a link to the organization and practice of sustainable agricultureOrganic farming - a change of conception. Harmful organisms. Definitions and

classifications. Measures to prevent pest infestations in agricultural crops. Using radiation of temperature and light to controt pests. Use of technological links of culture. Use of mineral products or herbal prodacts. Products based on viruses, bacteria and entomopathogenic fungi. Invertebrate species antagonist to animal pests. Species of insectivorous vertebrates. Plant breeding, autocidal, etc. Use of sticky colored and pheromones traps as biotechnical combat means, etc. Reduction of pollution by rational use of pesticides (advantages and disadvantages of pesticides use in agriculture. Residues - Remanence- Phytotoxicity. Influence of pesticides on the human body. The place of pesticides in sustainable agriculture.
LANGUAGE OF INSTRUCTION : Romanian
ASSESSMENT METHOD(S): Exam (exam answers 50%, activities such as homework/essays/papers/ translations/projects 50%).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: BIODIVERSITY AND SUSTAINABLE DEVELOPMENT

CODE: D30MERNM205
ECTS CREDITS: 8
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): The knowledge of factors that influence biodiversity (primary factors in the development of vulnerability and genetic erosion) and methods of preserving; Biodiversity of horticultural plants (role, importance, current state, perspective); The structure of biodiversity and its factors of influence (primary factors of evolution and anthropogenic factors); Relations between biodiversity - biotechnology, biodiversity - climatic changes, biodiversity - food security; Knowledge of the concept and the main elements of the sustainable development in horticulture; Sustainable development and its involvement in the progress of horticulture; The main elements of sustainable development and their involvement in horticulture.
COURSE CONTENTS: Biodiversity - definition, role, importance, current state. Biodiversity to horticultural plants; Factors influencing biodiversity (primary factors of evolution, vulnerability and genetic erosion); Diversity and uniformity of biodiversity; Methods of biodiversity conservation; Biodiversity and climate change relations, biodiversity and biotechnology, biodiversity and food security; Sustainable development and its involvement in horticulture development; The main elements of sustainable development in horticulture.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESEMENT: Exam (theoretical examination 70% and practical assessment and verification 30%).

COURSE TITLE: CLIMATIC CHANGES

CODE: D30MERNM206
ECTS CREDITS:6
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Climate change - exemplifying evidence of global and national climate change, acquiring knowledge of climate scenarios, acquiring knowledge of the flexible previsions and mechanisms of the Framework Convention on Climate Change and the Kyoto Protocol, acquiring knowledge about the National Inventory and the greenhouse gas trading scheme.
COURSE CONTENTS: Climate and factors that define it. Climate change - causes. Geological phenomena, atmospheric phenomena, extreme physical phenomena, extreme hydric phenomena. Greenhouse effect (greenhouse gases), phenomena generated by earth and cosmos physics, magnetic anomalies. Solar storms, magnetic pole migration, magnetic pole inversion, magnetic field and life forms, magnetic field loss model, magnetic chaos theory, magnetic field of the earth, and global warming. Climate scenarios for the 21st century. Forecasts on climate change defining parameters, future climate change scenarios. Consequences and phenomena associated to the current global warming (increase of the planetary ocean, increase of the frequency and intensity of climatic and hydrological risk phenomena, the impact of climate change on water resources). Dramatic reduction of biodiversity, consequences on the biosphere and pedosphere. Current global warming legislative framework on mitigation of climate change. European legislation. National legislation. Legal framework and environmental policies in the field of climate change.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, periodical assessment through practical tests, continuous assessment throughout semester, activities such as homework/essays/papers/ projects 15%).

COURSE TITLE: ECOLOGICAL RECONSTRUCTION OF DEGRADED LANDS

CODE: D30MERNM207
ECTS CREDITS: 8
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Knowledge of the main causes and processes of soil degradation, The evolution of degraded areas at national and regional level, Establishment of ecological reconstruction methods depending on the system of soil degradation.
COURSE CONTENTS: Soil. General composition of the soil. Soil functions, Soil degradation phenomena in the world and in our country, Need for ecological reconstruction, surface mining impacts on soils, ecological reconstruction methods of waste dumps, Land degradation due to

petroleum extraction, land degradation through flue dusts from power plants, ecological reconstruction of degraded land through erosion, ecological reconstruction of desertified areas, ecological reconstruction of degraded lands by different wastes, ecological reconstruction of land polluted with nitrates and heavy metals.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSEMENTS: Oral examination (answers to exam 80%, final answers to Laboratory works 20%).

COURSE TITLE: TRACEABILITY OF VEGETABLE ECOLOGICAL PRODUCTS

CODE: D30MERNM208
ECTS CREDITS: 8
TYPE OF COURSE: Knowledge study
COURSE OBIECTIVES: General concepts of ecological products. The benefits of using organic products. Characteristics of organic products.
COURSE CONTENTS: Environmental protection rules. Evolution of organic products in Romania. How to get organic products. Storage and marketing of organic products. Presentation of legislation in force on organic products - raw materials and processed products. Certification of organic products. Getting the Ecolabel
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 75%, control paper 25%).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: MICROBIAL ECOLOGY AND ENVIRONMENTAL QUALITY

CODE: D30MERNM309
ECTS CREDITS: 8
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Knowledge of the main types of microorganisms of the terrestrial, aquatic and aerial media; acquiring the morphological, eco-physiological and reproductive characteristics of microorganisms important in the ecological management of natural environments.
COURSE CONTENTS: Importance and weight of microorganisms in the biosphere; Microorganisms in the natural and anthropic environment - classification, functional structures, ecophysiology; Behavior of microorganisms at the action of ecological factors; Soil microbiota: bacteria, actinomycetes, fungi, algae, protozoa, viruses; Ecological relationships of soil microorganisms; Ecological aspects of soil inoculation with useful bacteria; Microbiology of water - importance of microorganisms in water in the process of mineralization, in water self-purification, in aquatic ecosystems productivity, in corrosion, hygienic-sanitary importance; Air Microbiology - importance of microorganisms in the air; The role of air in transmitting pathogenic microorganisms to humans.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 100%).

COURSE TITLE: ENVIRONMENTAL POLICIES AND STRATEGIES. SPECIFIC LEGISLATION FOR ENVIRONMENTAL PROTECTION

CODE: D30MERNM310
ECTS CREDITS: 6
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Knowing the premises of the emergence and implementation of environmental policies; Knowledge of environmental policy objectives; Promotion of sustainable cropping techniques and technologies compatible with sustainable viticulture; Knowledge of institutions involved in implementing environmental policies; Practice of a sustainable agriculture.
COURSE CONTENTS: Environmental policy in the European Union; Objectives and principles of environmental policies; The evolution of environmental policies, environmental policy enforcement tools; Zoning of viticulture worldwide and in Romania; Environmental degradation and protection in viticultural agroecosystems; Strategies in environmental policy, environmental protection in Romania, legal and institutional framework.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination answers 50%, final answers for workshops 50%).

COURSE TITLE: PROJECT MANAGEMENT

CODE: D30MERNM311
ECTS CREDITS: 8
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Understanding the basic notions, the main knowledge base that makes the content of the project management. Creating the necessary skills to carry out projects in economic, cultural, political, non-governmental organizations etc.
COURSE CONTENTS: Introduction. Project cycle management. Quality management. Management of human resources. Time management. Financial management. Other management activities (management of communication, conflict management in projects, risk management in projects, management of public acquisitions, management of the objectives). Control and evaluation. Monitoring. The management of the project cycle. Fundamental principles. Analysis tools. Impact study. Feasibility study. Business Plan. The selection of projects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Checking (60% written examination, 40% periodic evaluation).

COURSE TITLE: ECOTOXICOLOGY, ENVIRONMENTAL IMPACT END EFFECTS OF POLLUANTS

CODE: D30MERNM312
ECTS CREDITS: 8
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Knowledge of distribution disturbance in the key compartments of the ecological systems of some elements and chemical compounds. Explaining the bioaccumulation, bioconcentration and bio-amplification processes. Knowledge of the processes of abiotic transformation, biodegradation and biotransformation of contaminants. Knowledge of the effects of pollutants at individual, population and ecosystem level.
COURSE CONTENTS: Bioaccumulation, bioconcentration, bio-amplification and biodegradation processes. Factors influencing the bioaccumulation phenomenon. Bioaccumulation phenomena in trophic chains and networks. Bioaccumulation in terrestrial ecosystems. Accumulation of contaminants in plants. Accumulation of contaminants in invertebrates. Transfer of contaminants along the trophic network. Bioconcentration. Factors influencing the bioconcentration process. Biomagnification. Bio-amplification in aquatic systems. Methods for determination of bioconcentration and bio-amplification factors. Biodegradation of chemical compounds. Factors influencing biodegradation processes. Aerobic Biodegradation. Anaerobic biodegradation. Persistence of chemicals in the environment. Toxicity of chemical elements and their compounds. Toxicity of phytosanitary substances. Extremely dangerous toxic substances. Toxicity of endotoxins, algotoxins and molds. Phytotoxins, mycotoxins. Psychotoxic and hallucinogenic substances.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, periodical assessment through practical tests 15%, activities such as homework/essays/papers/translations/projects 15%).

FIELD: BIOLOGY
PROGRAMME TITLE: BIODIVERSITY AND ECOSYSTEM CONSERVATION
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ELEMENTS OF SYSTEMS ECOLOGY

CODE: D30BCEM101
ECTS CREDITS: 7
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): The aim of the course is to know the structural and functional aspects of ecological systems as an essential condition for understanding how these systems work to develop rules of rational exploitation and protection of them.
COURSE CONTENTS: Systemic organization of the living world, types of systems, general attributes of biological systems and the hierarchy of biological systems; hierarchical organization of nature and human society; the relationships between the taxonomic hierarchy and the hierarchy of supra-individual biological systems; homomorphic models; organizational evolution of the population, intraspecific relations - the main processes involved in the realization of the essential strategy of the populations; structure of socio-ecological complexes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 80% + 20% practical course)

COURSE TITLE: BIODIVERSITY OF THE LIVING WORLD

CODE: D30BCEM102
ECTS CREDITS: 8
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): The course provides information on plant and animal biodiversity, the value and utility of biodiversity, the dynamics of biodiversity and the consequences of human activities on it.
COURSE CONTENTS: Diversity of species, genetic diversity, community diversity and ecosystem diversity. Measuring biological diversity. Geographical distribution of biodiversity. Mechanisms that determine the diversity of life. Biodiversity at community level. Biodiversity and the functioning of ecological systems. Dynamics of biodiversity and consequences of human activities. Value and usefulness of biodiversity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, papers, essays, participation in debates 40%).

COURSE TITLE: GRASSLANDS AND FORESTRY HABITATS

CODE: D30BCEM103
ECTS CREDITS: 8
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Approaching the complex study of the structure and functions of pratice and forest phytocenoses, their relations with the abiotic and biotic environment, their spreading, type and classification, as well as the elaboration of principles and procedures of rational use and preservation.
COURSE CONTENTS: General aspects of Romanian habitats. Correspondence between the types of pratical and forest habitats in Romania and those of the international habitats classification systems. The geographical and ecological ambience in which the pratical habitats in Romania develop. Presentation of the main zonal units on latitude and altitude. Presentation of pratice habitats from xeric, calcofile and silicic, mesophilic, wetlands and high herb communities (weeds) as well as those from the alpine and subalpine regions. Types of habitats in temperate forests of deciduous, coniferous, or meadow and marshland shrubs. Of the many habitats described, they will be characterized as the most significant.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).
ASSESSMENT TYPE: exam

COURSE TITLE: AQUATIC ECOLOGY

CODE: D30BCEM104
ECTS CREDITS: 7
TYPE OF DISCIPLINE: Deepening study
COURSE OBJECTIVE(S): Forming an overview on the knowledge of aquatic ecosystems, the understanding of the complex phenomena occurring in the aquatic basins and the interdependence of these phenomena. Learning the main physical, chemical and biological properties of aquatic ecosystems, as well as the complex relationships established between the different categories of aquatic organisms. Gaining knowledge about the main measures for preventing and combating water pollution. Developing skills to search for and select scientific information, to write a report on a given topic, to present it in front of an assistant, to have discussions on a scientific topic.
COURSE CONTENTS: Introduction to the Aquatic Ecosystem. Physical, chemical and biological characteristics of water. Freatology concepts: General characteristics of groundwater. Limnology concepts. The lotic ecosystem. Types of springs, streams, rivers: ecological characteristics of lotic biotopes and biocenosis. Lentic ecosystem: types of lentic ecosystems; General characteristics of lentic biotopes and biocenoses. Palustrian ecosystem: types of palustrian ecosystems; Ecological

characteristics of biotopes and palustrian biocenosis. Ecosystem of marshes: types of marshes; Associations of aquatic organisms from a marshy ecosystem. Deltaic ecosystem. Notions of oceanology. Marine and oceanic ecosystem: the general structure of the marine and oceanic basin; Physical and chemical properties; Classification of seas and oceans; Diversity and organization of life forms from seas and oceans. Water pollution. Pollution sources and types of water pollutants. Strategies in the field of water quality protection.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESMENT: Oral Exam (60% answers from course notions + 40% practical notions - 30% making papers and delivering a PP presentation in front of the colleagues + 10% overall activity in practical works: direct participation in discussions, interest, attendance).

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENVIRONMENTAL LEGISLATION

CODE: D30BCEM205
ECTS CREDITS: 5
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Knowledge of legislation on the legal protection of environmental factors and national and international structures with environmental attributions. Developing the skills to obtain and process environmental data in order to reduce the impact of pollutants on the environment.
COURSE CONTENTS: Introduction to the environment. General environmental considerations. European Union and Romanian Environmental Legislation. Authorization of activities with environmental impact. Environmental permits. Legal liability in the field of environmental protection. The notion of environmental liability. Legal protection of air. Legal protection of waters. Legal protection of soil. Hazardous waste and waste regime. Regime of protected areas and natural monuments. Conservation of biodiversity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 70%, final answers for workshops 10%, periodical assessment through practical tests 10%, activities such as homework/ essays/ papers/ projects 10%).

COURSE TITLE: QUANTITATIVE METHODS FOR MONITORING PLANTS AND ANIMALS

CODE: D30BCEM206
ECTS CREDITS: 7
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): This course provides information regarding the stages of building a sampling and monitoring program for organisms. Monitoring of plant and animal species is an integral part of conservation programs, this course being indispensable for future environmental specialists.
COURSE CONTENTS: Sampling design; the principles of sampling; ensuring representativeness of evidence; sampling, precision and reality; sample size and repetition; defining sample units; shape and size of sample units; replication; representativeness; the mathematical bases of sampling; random sampling General methods for assessing the abundance of organisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 80% + 20% practical course).

COURSE TITLE: PRINCIPLES OF BIOLOGICAL CONSERVATION

CODE: D30BCEM207
ECTS CREDITS: 7
TYPE OF COURSE: Knowledge study
COURSE OBJECTIVE(S): Understanding the effects of human activities on species/populations, communities and ecosystems; Developing methodologies for preserving biodiversity, estimating the evolution of long-term systems.
COURSE CONTENTS: Red lists of species; Strategies for biodiversity conservation; Research and conservation modeling; Methods used to conserve biodiversity; Criteria for determining the size of protected natural areas; Classification of protected entities worldwide.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam course 70% and answers to seminars 30%).

COURSE TITLE: STATISTICAL ECOLOGY

CODE: D30BCEM208
ECTS CREDITS: 7
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Knowledge of the role, importance and pecularities of biostatistics and research in ecology. Knowledge and defining research objectives, design and organization of research, main elements of the experiment, research methods and tehniques in ecology. Design and setting up of experiments, data collection, calculus and inference. Evaluation and capitalization of experimental results.
COURSE CONTENTS: Role, importance, objectives and pecularities of statistics in ecology research. Objectives of scientific research in ecology. Design and organization of research in ecology. Descriptive statistics. Probability and distributions. Extraction of samples for analysis. Measurement errors in environmental experiments. Statistical hypothesis testing. Component elements of one experiment. Single and multi - factor experimental designs. Analysis of variance (ANOVA). Correlations and regressions. Interpretation and use of experimental results in ecology. Statistical softwares.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Verification (75% of the final grade represent the response to the written theoretical questions and 25% of the final grade the answers to laboratory tests).

2ND YEAR, 1ST SEMESTER

COURSE TITLE: GIS APPLICATIONS IN ENVIRONMENTAL MANAGEMENT

CODE: D30BCEM310
ECTS CREDITS: 7
TYPE OF COURSE: Knowledge study
COURSE OBJECTIVE(S): The general objective of the course is to familiarize students with GIS terminology in environmental management, as well as the development of practical skills for carrying out specific tasks.
COURSE CONTENTS: GIS components; raster and vector data; statistical modeling of GIS data; management of natural populations using GIS techniques; the role of GIS in the management of natural protected areas; GIS modeling and landscape ecology; analysis of habitat fragmentation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (exam answers 80% + 20% practical course).

COURSE TITLE: STRATEGIES FOR THE CONSERVATION OF PROTECTED AREAS

CODE: D30BCEM311
ECTS CREDITS: 8
TYPE OF COURSE: Knowledge study
COURSE OBJECTIVE(S): Familiarization of master students with the current and varied problems related to the potential of protected areas, with emphasis on the "protection and preservation of the environment" aspects.
COURSE CONTENTS: Conservation of plant diversity at global and regional level (Global Plant Conservation Strategy & European Plant Conservation Strategy). Important areas of protection: the conceptual framework; The European program to identify the most important areas of protection; Identifying the most important areas of protection in Romania. Conservation of Plant Diversity: European and Global Coordinates. Plant diversity in the general context of biodiversity conservation. International instruments created for the purpose of biodiversity conservation. International organizations. Implementation of international standards on biodiversity conservation, infrastructure creation and access to programs. Botanical garden involvement in the overall biodiversity conservation process, strategic directions for the development of scientific research aimed at plant preservation. Classification systems and protected area categories. List of threatened species at global, European, endemic and subendemic level. Special areas for the protection and conservation of plants in Romania. Protected areas from other regions of the globe.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (final theoretical exam 70%, final practical exam 30%).

COURSE TITLE: GENETICS OF POPULATIONS

CODE: D30BCEM312
ECTS CREDITS: 7
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): The knowledge of the notions of the types of transmission of normal and pathological traits, genetic diseases and the prophylaxis of genetic diseases.
COURSE CONTENTS: DETERMINATION OF SEX. Genetic Sex. Postgenetic sex. The biological significance of the sexes. DNA DAMAGE REPAIR MECHANISM. Nuclear excision repair system - NER. MITOCONDRIAL GENOME. The mitochondrial genome. Replication of DNA. Transcription and mitochondrial translation. Mutations and mitochondrial pathology. GENETIC ANALYZES AND PRENATAL DIAGNOSIS. Autosomal diseases: Down Syndrome (trisomy 21), Patau syndrome (trisomy 13), Edwards syndrome (trisomy 18). Diseases of sexual chromosomes: Turner Syndrome (Monosomy X), Trisomy XXX, Trisomy XYY. MULTIFUNCTIONAL DISEASES. Diabetes mellitus. Coronary disease. High blood pressure. Parkinson's disease. BIOETICS AND FUNCTION TECHNOLOGIES. EUGENIA IN THE CONTEXT OF MODERN GENETICS. DISEASES OF SEXUAL DIFFERENCES. Hermaphroditism. MANIPULATION OF GENETIC MATERIAL. Genetic engineering. Biotechnologies, cloning, amelioration. Oncogenesis. Proto-oncogene, tumor suppressor gene, cytogenetic abnormalities in cancer. CYTOGENETIC AND MOLECULAR DIAGNOSIS OF GENETIC DISEASES. Cytogenetic diagnosis: standard cytogenetic analysis, in situ fluorescence hybridization, comparative genomic hybridization, spectral karyotyping; Molecular diagnosis: PCR technique, real-time PCR, sequencing.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Exam (final theoretical exam 60%, final practical exam 20%, continuous evaluation during the semester 20%).

COURSE TITLE: PROJECTS MANAGEMENT

CODE: D30BCEM313
ECTS CREDITS: 8
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Understanding the basic notions, the main knowledge base that makes the content of the project management; Creating the necessary skills to carry out projects in economic, cultural, political, non-governmental organizations etc.

COURSE CONTENTS: Introduction. Project cycle management. Quality management. Management of human resources. Time management. Financial management. Other management activities (management of communication, conflict management in projects, risk management in projects, management of public acquisitions, management of the objectives). Control and evaluation. Monitoring. The management of the project cycle. Fundamental principles. Analysis tools. Impact study. Feasibility study. Business Plan. The selection of projects.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% written examination, 40% periodic evaluation).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: ECOLOGICAL RECONSTRUCTION OF DEGRADED LANDS
CODE: D30BCEM414
ECTS CREDITS: 7
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Knowledge of the main causes and processes of soil degradation, The evolution of degraded areas at national and regional level, Establishment of ecological reconstruction methods depending on the system of soil degradation.
COURSE CONTENTS: Soil. General composition of the soil. Soil functions, Soil degradation phenomena in the world and in our country, Need for ecological reconstruction, surface mining impacts on soils, ecological reconstruction methods of waste dumps, Land degradation due to petroleum extraction, land degradation through flue dusts from power plants, ecological reconstruction of degraded land through erosion, ecological reconstruction of desertified areas, ecological reconstruction of degraded lands by different wastes, ecological reconstruction of land polluted with nitrates and heavy metals.
LANGUAGE OF INSTRUCTION: Romanian
KNOWLEDGE ASSESSEMENT: Exam (answers to colloquy 100%).

COURSE TITLE: EVALUATION OF ANTROPIC IMPACT AND ENVIRONMENTAL BALANCE
CODE: D30BCEM415
ECTS CREDITS: 6
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): In this course, the master students will have the opportunity to learn how to assess the anthropic impact on the environment and the environmental balance taking into account: the intensity and size of the impact, the duration of the effects, the irreversibility of the induced changes, the interdependence of the processes and phenomena, the costs involved, Economic and political presentation of the data obtained.
COURSE CONTENTS: Environment protection; Environmental management system, Impact of anthropogenic activities on the environment, Environmental balance sheet level 0; Legislative provisions; Content of the Environmental Balance Sheet Level 0 cf. MMGA Order 184/1997, Level I environmental balance sheet; Legislative provisions; Content of the Environmental Balance Sheet Level I, according to Order MMGA 184/1997; Content of the Report on the Level I environmental balance, Level II environmental balance sheet; Legislative provisions; Content of the Environmental Balance Sheet Level II, according to Order MMGA 184/1997; Content of the Report on the Level I environmental balance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (examination 70%, activities such as papers/ projects 30%).

COURSE TITLE: SYMBIOSIS IN THE LIVING WORLD
CODE: D30BCEM416
ECTS CREDITS: 6
TYPE OF COURSE: Synthesis study
COURSE OBJECTIVE(S): Knowledge of the symbiosis concept in the evolution of organisms and the understanding of some aspects of the interrelations between the vegetal organisms and the animal organisms in correlation with the environmental factors.
COURSE CONTENTS: The concept of symbiosis in the evolution of organisms. Interrelations of microorganisms - plants. Nitrogen fixation in microorganism-plant associations. Associations with nitrogen-binding cyanobacteria. Rhizobium symbiosis - leguminous plants. Symbiosis between fungi and plants (mycorrhiza). Symbiotic relationships in the world of carnivorous plants. Antagonism and symbiosis in nature: fungi like plant parasitic symbiosis. Symbiosis relationships of organisms (microscopic and macroscopic) with herbivorous animals and aspects of interrelations between plant organisms and animal organisms.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (answers to exam 70% and answers to Laboratory works 30%).

COURSE TITLE: MICROORGANISMS INVOLVED IN THE DEVELOPMENT AND CONSERVATION OF ECOSYSTEMS
CODE: D30BCEM417
ECTS CREDITS: 6
TYPE OF COURSE: Deepening study
COURSE OBJECTIVE(S): Familiarization of master students with the current and varied problems of microorganisms with impact on ecological reconstruction; Utilization and use of natural resources and microorganisms involved in ecological reconstruction; Accumulating advanced knowledge of ecological reconstruction using biotic

factors and microorganisms, in the context of ensuring sustainable development of life.

COURSE CONTENTS: Complexity of ecological reconstruction technology of degraded sites. The role of plants and edaphic microorganisms in ecological reconstruction. The issue of bioremediation technologies. Bioremediation through biodegradation and biodegradation of organic substances. Biological indicators of pollution. Bio indicators in the aquatic environment. Bio indicators in the terrestrial environment Biological methods for soil toxicity determination and assessment of bioremediation technologies. Soil as substrate for microorganisms. Biotechnologies and de-pollution of biological and ecological systems. Biodegradation of pollutants from soils contaminated by the action of microorganisms and plants. Use of microorganisms in conventional water rehabilitation. Methods of bioremediation of ecosystems. Microorganisms for ecological reconstruction.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (Final theoretical exam 70%, continuous assessment during the semester 30%).

Faculty of Sciences

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Faculty of Sciences

Bachelor's Degree

Duration: 3 years
No. of credit points: 180

Field: *Informatics*
Programme title: Informatics

Field: *Environmental Science*
Programme title: Environmental Chemistry

Field: *Chemistry*
Programme title:
Chemistry
Technological Biochemistry
Pharmaceutical Chemistry
Environmental Chemistry

Field: *Mathematics*
Programme title:
Mathematics
Mathematics and Informatics

Field: *Geography*
Programme title:
Geography
Tourism Geography

Field: *Physics*
Programme title:
Computational Physics
Medical Physics

Master's Degree

Duration: 2 years
No. of credit points: 120

Field: *Physics*
Programme title:
Applied Physics
Theoretical Physics (English-taught programme)

Field: *Informatics*
Programme title:
Advanced Techniques for Information Processing (English-taught programme)
Methods and Models in Artificial Intelligence

Field: *Chemistry*
Programme title:
Chemistry of Biologically Active Compounds
Applied Chemistry

Field: *Environmental Science*
Programme title: Environmental Quality

Field: *Mathematics*
Programme title: Applied Mathematics

Field: *Geography*
Programme title: Tourism and Sustainable Development

FIELD: MATHEMATICS
PROGRAMME TITLE: MATHEMATICS; MATHEMATICS AND INFORMATICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ABSTRACT ALGEBRA (1)
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The presentation of fundamentals results of algebraically structures (groups, rings, fields) according to the necessity for Linear algebra, Mathematical analysis, Numerical analysis, Geometry;
COURSE CONTENTS: C_1: Algebraically operations; Semigroups; Monoids; Morphisms of monoids; Peano Triple; Reecurence theorem; The set ℕ of natural numbers; The monoids (ℕ, +), (ℕ, ·); C_2: Group; Subgroup; Calculus in a group; The subgroup generated by a set; Cyclic groups; The order of an element in a group; The lattice of subgroups of a group; C_3: The index of a subgroup in a group; Lagrange theorem; Normal subgroups; Factor group; Cauchy theorem for finite groups; Applications; C_4: Morphisms of groups; Isomorphisms of groups; The transport of subgroups by morphisms of groups; The group (ℤ,+); The Subgroups of the group (ℤ, +); The monoid (ℤ, ·); The Kernel and Co-kernel of a couple of morphisms of groups; Theorems of isomorphisms for groups; Direct product of groups; Chinese remainder theorem; C_5: Groups of permutations; Cayley theorem; Transpositions; Cycles; The decomposition of a permutation in a product of disjoint cycles; C_6: Applications of the theory of groups; Characterizations of the finite groups with maximum 11 elements; C_7: Ring; Calculus in a ring; Specials elements in a ring: zero divisors, unit elements, nilpotent elements; Subring; Subring generated by a set; The lattice of subrings of a ring; The Gauss ring of integers ℤ[i]; The finite ring of classes modulo n: ($\mathbb{Z}_n$, +, ·); Integral domain; The integral domain (ℤ, +, ·); C_8: Left (right, bilateral) ideal; Ideal generated by a set; Principal ideal; The lattice of ideals of a ring; Operations with ideals; Prime ideals; Maximal ideals; Factorization of a ring by a bilateral ideal; C_9: Morphisms of rings; The transport of ideals and subrings by morphisms of rings; Theorems of isomorphisms for rings; C_{10}: Field; Subfield; Prime subfield; Calculus in a field; Morphisms of fields; The characteristic of a field; The field (ℚ,+, ;) of rationals numbers; The field of reals (ℝ,+,·), complex (ℂ, +, ·) and quaternions (ℍ, +, ·); Extensions of fields; C_{11}: Rings of polynomials; Rings of polynomials in one variable with coeficients in a commutative unitary ring; Construction; Universal property; C_{12}: Rings of polynomials in many variables; Construction; Universal property; C_{13}: Symmetric polynomials; The fundamental theorem of symmetric polynomials; The fundamental theorem of algebra (D'Alembert – Gauss); C_{14}: The solving of algebraic equations of degree maximum 4 with real coeficients (Cardan's formula);
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MATHEMATICAL ANALYSIS 1 – ANALYSIS ON REAL LINE
CODE:
ECTS CREDITS: 9
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The familiarization with the basic results of differential and integral calculus of the functions of one real variable, as well as with the topological characterization of the convergence of numerical sequences and the continuity of the functions of one real variable;
COURSE CONTENTS: 1. Real numbers field; Comments on axioms list defining R; The functions: absolute value, positive/negative part; Infimum and supremum of a function; Arhimede's Principle; The functions integer part and fractional part; Density of Q in R; Decimal representation of real numbers; Continuous ratios (optionally); 2. Sequences; Countable/ uncountable sets; Cantors's Principle of enclosed intervals; The cardinal of R; Existence of transcedental numbers; 3. Metrical structure of R; Convergent sequences of real numbers; Algebraic operations; Order properties; Weierstrass's Criterion; D; J; Newman's Lemma; Bolzano-Weierstrass Theorem; Cauchy's Criterion (completeness of R); Remarkable sequences of numbers: $(n^{\sim})_n$, $(a^n)_n$, $(\sqrt[n]{n})_n$, the theory of number e; Recurrent sequence; Banach fixed point theorem; 4. Extended line; Convergence in $\overline{\mathbf{R}}$; Stolz-Cesaro Lemma; Upper/lower bound of a sequence of real numbers; 5. Topological structure of the real line; Open/ closed sets; Structure of open sets; Characterization of closed sets using sequences; Bolzano-Weierstrass Theorem (for infinite sets); 6. The complex field; Convergence of sequences of complex numbers; 7. Series of numbers; Series of nonnegative numbers; Absolutely convergent series; Product of series; The Abel-Dirichlet Criterion; Application to alternant series; Estimate of the sum of a series; The question of order summation; 8. Continuous functions defined on intervals; Characterization of the continuity using ε and δ, neighborhoods, sequences (Heine's criterion); Classes of continuous functions; Operations with continuous functions; Limits of functions; Discontinuities of the functions of real variable; The intermediate value theorem (Darboux's property); Special properties of continuous functions defined on compact intervals:

Weierstrass's Theorem, the inversion of continuous functions, the property of uniform continuity; 9. Sequences and series of continuous functions; Dini's Lemma; Weierstrass's M-test; Power series; Abel's Theorems; Radius of convergence, disk of convergence; Formulae for the radius of convergence; Elementary functions as sums of power series; Elementary functions as solutions of functional equations; 10. Differentiable calculus on R; The derivative and lateral differentiability; Geometric view of the derivative; Operations with differentiable functions; The differentiability of the inverse function; The link between differentiability and derivability; The basic theorems of differentiable calculus: Fermat's Theorem, Rolle's Theorem, Cauchy's Theorem, Lagrange's Theorem; Applications: roots separation, uniqueness of the antiderivatives, the monotonicity of the functions, calculus of the lateral derivatives, L'Hospital rules; High order derivatives; Linear movement; Taylor's formula; Characterization of the extremes using the second derivative; Applications of the extremum problems; Convexity; Drawing the sketch of a graph; Taylor expansions; Applications: computing limits; the method of the undetermined coefficients; 11. Integral calculus on R; Step functions; Regular functions; The integral of regular functions (Cauchy's integral); Comparison with Riemann integral; The fundamental theorem of calculus; Calculus technics of defined integrals; Dependence on parameter; Approximate calculus of the integrals (trapezoid method and Simpson's method); Applications of the integral calculus: the area of planar regions or rotation surfaces; The volume of some rotation solids; Lengths of graphics; Calculus of mechanical work, forces, energies etc.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: LOGIC AND SET THEORY

CODE:

ECTS CREDITS: 6

TYPE OF COURSE: speciality, compulsory

COURSE OBJECTIVE(S): The presentation of fundamentals principles of set theory (operations with sets, ordered sets, cardinal numbers) and mathematical logic (propositional and predicate calculus).

COURSE CONTENTS: C_1: Sets; Operations with sets; The Boolean ring (P(M), Δ, $\cap$); C_2: Binary relations on a set; General properties; Equivalence (congruence) relations; The factorization of a set (quotient set) by an equivalence (congruence) relation; C_3: The (direct) product and co-product of a family of sets; General properties; C_4: Cardinal numbers; Properties; Operations with cardinal numbers; Countable (uncountable) sets; C_5: Relations of (pre) order on a set; Total ordered sets (chains); Special elements in an ordered set (bottom,top, minimal, maximal, irreducible, atom etc.); Natural order relations on the main sets of numbers; Inductive sets; Zorn's lemma; C_6: Semilattices; Lattices; Filters; Ideals; Morphisms of (semi) lattices; C_7: Modular lattices; Distributive lattices; The quotient lattice by filters or ideals; C_8: Pseudo-complemented lattices; Stone and Heyting algebras; C_9: The complement of an element in a bounded distributive lattice; Boolean algebras; The connections between Boolean algebras and Boolean rings; Morphisms of Boole algebras; C_{10}: The factorization of a Boolean algebra by filters; Ultrafilters in a Boolean algebra; Stone representation theorem; C_{11}: Propositional calculus; The system SC; The Lindenbaum – Tarski algebra of propositional calculus; C_{12}: The completeness and compactness of propositional calculus; C_{13}: Predicate calculus;The language L; Interpretations of L; An axiom system for predicate calculus; The Lindenbaum – Tarski algebra of predicate calculus; C_{14}: The completeness of predicate calculus;

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination

COURSE TITLE: COMPUTER POGRAMMING

CODE:

ECTS CREDITS: 6

TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): To present and teach the C++ Programming Language so that it can be utilized and incorporated in other disciplines such as Linear Algebra, Mathematics Analysis, Geometry, Numerical Analysis, etc. as an aid to solving mathematical and scientific problems.

COURSE CONTENTS: A. Getting Started; B. Structure of a C++ program; C. C++ building blocks; a. defining variables, data types; b. arithmetic, assignment, increment, decrement operators and operations; c. elementary input/ output; D. Debugging in C++; E. Pretest and posttest loops; a. for loop; b. while loop; c. do while loop; d. nesting loops; F. Decisions; a. logical expressions and operators; b. if statements; c. switch statement; d. nested if statements; G. Introduction to C++ functions; a. Introduction to C++ functions; b. function structure; c. performing calculations in functions; d. using simple library functions; H. Functions with arguments; a. input arguments; b. output arguments; c. function scope; I. Using functions to build larger programs; a. pre-processor; b. header files; J. Representation and conversion of data types; K. Array processing; L. String processing; M. Pointers

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Colloquium (C): a written paper and a lab exam

1ST YEAR, 2ND SEMESTER

COURSE TITLE: LINEAR ALGEBRA (2)
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The presentation of fundamentals results in theory of linear spaces according to the necessary of linear algebra for Mathematical analysis, Numerical analysis, Geometry, etc.
COURSE CONTENTS: 1. Determinants and Systems of linear equations; Matrix; The definition of a determinant of order n; The expansion of a determinant according to a row(column); Laplace's rule of expansion of a determinant according more rows (columns); Applications; Inverse matrix; Systems of linear equations over a commutative field; Homogeneous systems; 2. Modules and vector (linear) spaces; Module; Sub-module; Z-module; Vector spaces; Vector subspaces; Calculus in a vector spaces; Operations with vector subspaces; Vector subspace generated by a set (linear closure); The lattice of subspaces of a vector space; System of generators; Linear independent (dependent) elements; Base; The coordinates of an element with respect to a basis; Every nontrivial linear space has a basis; Every two finite basis for a vector space have the same number of elements; The dimensionality of a vector space; Every linear independent subset of vectors can be complemented by elements so that the collection forms a basis of the whole space; The rank of a system of vectors; The rank of a matrix; Grasmann's formula; The matrix of passing to a new basis; Transformations of coordinates of an element in transformation of the basis of a finite dimensional linear space; Substitution's lemma; Applications; Linear transformations; The factorization of an linear space by a subspace; The theorems of isomorphism for linear spaces; 3. Products and co-products of linear spaces; Direct co-products of linear spaces (subspaces); Direct co-products of linear transformations; 4. Invariant subspaces; Linear operator; Eigenvalues and eigenvectors of linear operators; The Cayley – Hamilton theorem; Diagonal forms of a matrix; 5. Topics on linear programming; The definition of linear programming; Solutions; Simplex algorithm; 6. Bilinear and quadratic forms; The canonical form of a bilinear form; Quadratic form; Reducing a quadratic form to the sum of squares (Lagrange's and Jacobi's methods); The orthogonal transformations method; The law of inertia of quadratic forms; Sylvester's criterion for the definiteness of a quadratic form.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MATHEMATICAL ANALYSIS 2
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course aim is to fixing some fundamental notions from mathematical analysis and to present some new ones: the euclidian space, bounded variation functions, rectificable curves, differentiable functions, partial derivatives.
COURSE CONTENTS: 1. The euclidean space; The euclidean scalar product; Cauchy-Schwarz's inequality, euclidean norm; The metric structure of the vectorial space RN; 2. Some elements of metric geometry on RN; The directors cosinus of a line; The vectorial product, the mixed product; The area of a triangle in 3D, the distance from a point to a line, the distance from a point to a plane, the canonical projections; 3. Topological notions on euclidean space; The topology associated to the euclidean metric; Open an closed sets, equivalent metrics, bounded sets in metric spaces; 4. The convergence of sequences in euclidean space; Bolzano-Weierstrass's theorem; The completeness of RN; Limit points and sequences in finite dimensional spaces; 5. The characterization of the closed sets by using the convergent sequences and the limits points; Compact sets and Borel-Lebesgue's theorem; 6. Continuous functions on metric spaces; The Heine criterion of continuity; Some class of continuous functions; 7. Operations with continuous functions; The limits of functions; Continuous functions on compact sets; The equivalence of the norms in the euclidean space; 8. Curves în euclidean space; Bounded variation functions; Rectificable curves; Smooth curves; The length of a curve, natural parametrization; 9. Linear and continuous functions on finite dimensional spaces; The norm of a linear an continuous map; Properties and examples; 10. Differentiable functions; The Jacobian matrix; The extension of Lagrange's theorem; Consequences; 11. The local inversion theorem; Implicit function theorem; The differentiability of superior order; 12. Schwarz's thereom; Taylor's formula; Convex differentiable functions; 13. The extremums of the function of multilple variables; Applications in optimization theory; 14. Extremums with links; Application in matematical-phisics;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ANALYTICAL GEOMETRY
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): We present the basic concepts, methods and results of affine and Euclidean geometry in the Euclidean plane and Euclidean space; The intrinsic connection between

linear algebra and analytic geometry is emphasized.
COURSE CONTENTS: 1. Geometric vector space; Geometric vector space; Scalar product, cross product, exterior product; Coordinates and frames; Euclidian line and plane; Perpendicularity, distances, angles and volumes; Convex sets; 2. Affine transformations of the Euclidian plane and Euclidean space; Affine applications; Affine transformations; Affine invariants; Affine Subgroups; Fixed points, invariant directions; Isometries; Similarities; 3. Quadratic Varieties in Euclidean space: conics and cuadrics; General characteristics: centers of symmetry, axes and planes of symmetry, tangents, asymptotes, rectilinear generators, polarity; Metric canonical form, the metric classification, orthogonal invariants.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MATHEMATICAL SOFTWARE
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Initiation into using Maple as a starting step in the discovery of the extensive area of mathematical software; Use of this software in solving various problems and exercises in the field of algebra, analysis or geometry.
COURSE CONTENTS: C_1: Introductory concepts; The working window (worksheet); C_2: Introductory concepts; Maple Documents; C_3: Calculations with integers and rational numbers; C_4: Calculations with floating point and complex numbers; C_5: Symbolic Computations; C_6: Working with polynomials; C_7: Types of Maple objects; The sequence, the list, the set, the table; C_8: Types of Maple objects; The array, the string, the matrix, the vectors; C_9: Determining the solutions to problems; Solving equations and systems of linear and nonlinear equations; C_{10}: Determining the solutions to problems; Finding integer solutions or solutions modulo an integer; C_{11}: Determining the solutions to problems; Solving recurrence relations; Solving equations and systems of differential equations; C_{12}: Mathematical Manipulations; The development of expressions into sums; Combining terms; Normal factored forms; Simplifying expressions; C_{13}: Programming Elements; Simple and structured instructions; C_{14}: Programming Elements; Functions and procedures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium and lab evaluation

COURSE TITLE: ALGORITHMS AND DATA STRUCTURES
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It intends to get familiarized the students with the main concepts from the theory of algorithms, with the methods of constructing algorithms, as well as classical data structures and techniques of searching and sorting.
COURSE CONTENTS: A. Elementary algorithms – C_1: Algorithms, structure of algorithms; C_2: The complexity of algorithms; B. Methods of making algorithms – C_3: Graphs, trees, binary trees; C_4: Greedy-type algorithms; C_5: Backtracking-type algorithms; C_6: Divide et Impera-type algorithms; C_7: Dynamic programming method; D. Generating subsets of a set – C_8: Algorithms for generating subsets of a set; C_9: Generating combinations; C_{10}: Generating permutations; E. Data Structures – C_{11}: Binary tree, binary tree traversal; C_{12}: Classical data structures; C_{13}: Single and double linked lists; E. Sorting and searching – C_{14}: Sorting and searching algorithms, examples.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

2ST YEAR, 1ST SEMESTER

COURSE TITLE: ALGEBRA III (ARITHMETICS IN RINGS; GALOIS THEORY)
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Presenting the arithmetical properties of rings; Study of euclidean domains, principal ideal domains and unique factorization domains; Study of extension fields;
COURSE CONTENTS: Arithmetical properties of rings; C_1; Divisibility in commutative rings; Association in divisibility; Greatest common divisor; Least common multiple; Irreducible elements and prime elements; C_2: Euclidean domain; Bézout relations; Linear equations in Euclidean rings; C_3: Principal rings; Factorial rings; C_4: Factoriality of polynomial rings; Irreducible polynomials; Irreducibility criterions; Extension of the fields; C_5: Subring generated by a set over a field; Adjunction field; Degree of an extension; Finite extensions; C_6: Algebraic elements and transcendental elements; Algebraic extensions and transcendental extensions; C_7: Properties of the roots of a polynomial; Splitting field of a polynomial; C_8: Algebraically closed fields; Algebraic closure of a field; Algebraic numbers field; Solvable groups; C_9: Solvable sequences; Solvable groups; Case of groups of permutations; Case of finite groups; Elements of Galois Theory; C_{10}: Galois group of extensions; Primitive roots of unity; Finite fields; C_{11}: Normal extensions; The fundamental theorem of Galois theory; Applications; C_{12}: Radical extensions; The Galois group of a radical extension; C_{13}: The solvability by radicals of algebraic equations; C_{14}: Constructions by rule and compasses;

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MATHEMATICAL ANALYSIS 3 (INTEGRAL CALCULUS OF RN)

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The main goal of the course is to introduce students to the theory of the Lebesgue integral with one or more variables, pointing out some applications in geometry, mechanics and physics;
COURSE CONTENTS: 1. Lebesgue integral on R^n; Elementary sets; The integral of step functions; Null measure sets; Integrable functions; Completeness of the space of integrable functions; Beppo-Levi Theorem; Fatou's Lemma; Dominated convergence theorem; Measurability; Integrability on measurable sets; $L^p(R^n)$ spaces (with $p=1, 2, \infty$); 2. Lebesgue's integral calculus; Fubini-Tonelli Theorem; Cavalieri's principle; Simple sets; Change of variable; Invariance of Lebesgue's measure; Dependence of parameters; Gamma and Beta functions; Applications of multiple integrals in Mechanics; 3. Convolution product and approximating functions; Fourier transform on $L^1(R^n)$ (optional); Applications of the Cauchy problem for the heat equation (optional); 4. Line integrals; Line integrals of the first type; Line integrals of the second type; Riemann-Green formula; Independence of the path for line integrals of the second order; 5. Differential forms; The integral of a differential form; Poincaré's theorem; Stokes' formula on chains; Applications to the 3-dimensional case: surface integrals; Gauss-Ostrogradski formula; Stokes' formula; Applications to the field theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: GEOMETRY OF CURVES AND SURFACES

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): We introduce the basic notions necessary for the study of differential geometry of curves and surfaces, we extend the knowledge concerning differential calculus from ^{n} to surfaces and we study curvature phenomena; Necessary techniques for implementing the above achievements for other subjects like Mechanics and Riemannian Geometry are practiced.
COURSE CONTENTS: A. Differential geometry of curves (4 lectures) – C_1: Parameterized curves; Length and natural parameterization; C_2: Tangent line and osculating plan; The curvature of a curve; C_3: Frenet trihedron; The torsion of a curve; The Frenet equations; C_4: The fundamental theorems from theory of curves; B; Differential geometry of surfaces (10 lectures) – C_5: Parameterized surfaces; Equivalent parameterizations; Examples; C_6: Tangent vector, normal vector on a surface; Tangent plane; The differential application of a surface mapping; C_7: First fundamental form; Calculus of length of a curve; calculus of area of a surface; C_8: Second fundamental form of a surface; The Gauss map; Gaussian curvature, normal curvature and mean curvature; C_9: The intrinsic geometry of a surface; Elements of tensorial calculus; The Gauss egregium theorem; C_{10}: Geodezic curves; The Darboux trihedron; C_{11}: Vector fields; Covariant derivative; Parallel displacement; C_{12}: The fundamental theorem of the theory of surfaces; C_{13}: Orientability; Orientable surfaces and non-orientable surfaces; Examples; C_{14}: Minimal surfaces; Examples.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

COURSE TITLE: COMPLEX ANALYSIS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The presentation of fundamentals results of complex analysis and related topics.
COURSE CONTENTS: 1. Preliminaries to Complex Analysis; 1.1. Complex numbers and the complex plane; 1.2. Topology of C and $\overline{C}$; Connectedness; Sequences and completeness; Compactness; Uniform convergence; 1.3. Elementary functions; Mobius transformations; The exponential function; The trigonometric and hyperbolic functions; The logarithmic function; Complex powers and inverse trigonometric functions; 2. Differential calculus in the Complex Plane; 2.1. Continuity; 2.2. C-diferentiability. Complex derivatives. The Cauchy-Riemann differential equations. Derivability. Olomorphy; 2.3. Harmonic functions; 3. Integral calculus in the Complex plane (Cauchy's theory); 3.1. Complex line integrals. Properties. Fundamental Theorem of Calculus for contour integrals; 3.2. Independence of path; 3.3. Goursat's theorem; 3.4. Homotopy and simple connectivity; 3.5. Cauchy's theorem; 3.6. Winding number; 3.7. Cauchy's integral formula; 3.8. Further applications: Cauchy's inequalities. Liouville's theorem. Morera's theorem; 3.9. Maximus modulus theorem. Schwarz lemma; 4. Sequences and Series of holomorphic functions (4 classes); 4.1. Uniform approximation; 4.2. Power series; 4.3. Taylor's theorem; 4.4. Laurent's series; 4.5. Classification of singularities. Casorati-Weierstrass theorem; 5. Residue theory and its Applications; 5.1. The residue theorem; 5.2.

Trigonometric integrals over $[0,2\pi]$; 5.3. Improper integrals of certain functions over $(-\infty,\infty)$; 5.4. Improper integrals involving trigomnometric functions; 5.5. Integrals involving multiple-valued functions; 5.6. The Argument Principle.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: DIFFERENTIAL EQUATIONS I
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Presentation of classical results of ordinary differential equations and systems of equations;
COURSE CONTENTS: C1: Differential equations in normal form: solution, smoothness, integral curves; Elementary integration methods for first order equations: the linear and homogenous equation; C2: Elementary integration methods for first order equations: separating variables; The Cauchy problem associated with an equation: uniqueness/ multiplicity for solutions; The Gronwall-Bellman lemma; C3: Elementary integration methods for first order equations: The homogenous equation; Equations that can be reduced to homogenous equations; Polar coordinates; The perturbation problem; C4: Elementary integration methods for first order equations: the linear and inhomogenous equation; Solution dependence on parameters and initial data; Equations with exact differential; The integrating factor; C5: Elementary integration methods for first order equations: the Bernoulli, Riccati equations; The Lie method, the Lagrange, Clairaut equations; C6: Differential systems : the Peano theorem, the Picard-Lindelöf theorem; The first variation systems; C7: Linear differential systems : fundamental matrix, constant variation method; C8: Linear differential systems: computation of fundamental matrices; Linear differential equations of n-th order; C9: Equations having solutions written as power series; The Bessel equation; C10: having solutions written as power series; Elliptic functions; C11: First integrals; Partial differential equations of first order; The method of characteristics; C12: Sturm-Liouville theory (zeros, boundary value problems, eigenvalues, series of orthonormal functions); C13: Integral equations: Fredholm, Volterra; C14: Differential equations in the complex domain;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: ALGEBRAIC NUMBER THEORY
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory for Mathematics/ optional for Mathematics and Informatics
COURSE OBJECTIVE(S): To have a knowledge of the ideas which lead to the development of modern algebra; to study: the rings of algebraic integers associated to a field extension; in particular, the integers of a number field (a finite extension of $\mathbb{Q}$)); the existence and the uniqueness of factoring integers and to transfer this problem to the factorization of ideals in product of prime ideals; integral ideals with geometrical methods using lattice points; to know: Minkovski theorem; some applications of Fermat's Great Theorem and to describe the structure of unit group of a ring of algebraic integers;
COURSE CONTENTS: Generally notions – C_1: Rings of polinomials; Field extensions; C_2: Free abelian groups; Subgroups of finitely generated abelian groups; Algebraic numbers and algebraic integers – C_3: Number fields; The discriminant of a basis; Algebraic integers; C_4: Integral basis; Field discriminant; Norms and traces in number fields; C_5: Computing rings of integers; Quadratic fields; Cyclotomic fields; Factoring algebraic integers – C_6: Invertible and irreducible elements; Algebraic integers and noetherian rings; Prime elements and factorial rings; Euclidean rings of algebraic integers; C_7: Applications of the unique factorization; The proof of Fermat's theorem for exponent 3; The factorization of ideals – C_8: Ideals in rings of algebraic integers; The group of fractional ideals; Each proper ideal can be factored uniquely in product of prime ideals; An example of factoring an ideal; C_9: The divizibility of ideals; Norms of ideals; The ring of algebraic integers of a number field is factorial if and only if it is principal; Rings of algebraic integers with non-unique factorization; Geometrical methods for studying algebraic numbers – C_{10}: Lattice points in the real vector space $\mathbb{R}^n$; Necessary and sufficient conditions for a subgroup of $\mathbb{R}^n$ to be a lattice; Minkovski's theorem; Applications to Fermat's theorem on sums of two squares and four squares; C_{11}: The space L^{st}. The ideal class group; The finiteness of the ideal class group; The class number – C_{12}: The factorization of prime rationals in rings of algebraic integers; Minkovski's bound; Examples of computing the class number; Dirichlet's unit theorem – C_{13}: The logarithmic space and the unit group; Completeness of lattice points; Dirichlet's unit theorem; Fermat's Theorem – C_{14}: History; The proof of Fermat's theorem for exponent $n = 4$; Prime regular numbers and Kummer's theorem.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: COMPUTATIONAL GEOMETRY AND COMPUTER GRAPHICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, optional for

Mathematics and Informatics
COURSE OBJECTIVE(S): We present the basic concepts, methods and techniques of computational geometry as well as elements of mathematical foundation of computer graphics; The algorithms presented in the course are implemented in programs written in C and/ or Maple; The graphics libraries of C and/ or Maple are studied.
COURSE CONTENTS: 1. Introduction to computational geometry: main topics, applications; 2. 2D convex hulls; Definitions; Properties; Algorithms for computing the convex hull of a finite set of points in the plane: Jarvis march, quick hull, Graham's scan, incremental algorithm, divide et impera algorithm; 3. Intersections: segment-segment intersection, segment-triangle intersection; Intersection of half planes; Intersection of convex polygons; 4. Polygon triangulation; Properties of triangulations; Art gallery problems; Algorithms and implementation; 5. Voronoi diagrams; Definitions and basic properties; Fortune's algorithm; Applications; 6. Delaunay triangulations; Definitions and basic properties; Algorithms; Applications; 7. Motion planning; Visibility graphs; Dijkstra's algorithm; Moving a disc, translating a convex polygon; Minkowski addition; 8. Geometric foundations of computer graphics; 2D transformations and viewing; Perspective and parallel projections; 3-D Viewing Pipeline; 9. Geometric modeling by Bezier curves and surfaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium
2ST YEAR, 2ND SEMESTER

COURSE TITLE: REAL ANALYSIS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course presents the fundamental principles, basic ideas and methods of the theory of measure and integral through the detailed study of specific topics with enough applications to help students to be able to specialize in this field; This course presents new knowledge necessary for other mathematical disciplines such as probability theory and functional analysis;
COURSE CONTENTS: 1. Families of sets; 2. Additive and countable additive set functions; 3. Outer measure; Measurable sets; 4. Regular measures; 5. Lebesgue measure; 6. Measurable functions; Measurability criteria; 7. Asymptotic convergence and convergence in measure; 8. Integrable functions; 9. Basic theorems of integral calculus; 10. Riemann integral and Lebesgue integral; 11. Lebesgue-Radon-Nikodym theorem; 12. Integration on product spaces; 13. Normed linear spaces; $L_p, 1 \le p < \infty$ spaces; 14. L_∞ space.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: THEORETICAL MECHANICS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Presentation of classical results of the Newtonian mechanics of the particle and the rigid body.
COURSE CONTENTS: C1: The mathematical model of the physical space: points, directions, vectors; The physical space geometry; C2: The particle kinematics: trajectory, velocity, acceleration; The geometry of a trajectory; C3: The Frenet frame, the Frenet-Serret formulas, the radius of curvature and the torsion as time functions; C4: Velocity and acceleration in the Frenet frame, circular motion, plane motion in polar coordinates; C5: The relative motion of the particle; Decomposing motions; C6: The principles of particle dynamics; The Newton differential equations; C7: Inertial frames; The relativity principle in classical mechanics; C8: Impulse (linear momentum), force momentum, angular (kinetic momentum); Their theorems; C9: Work, power, kinetic energy, potential energy, the conservation of mechanical energy; C10: Motion in a central field; The laws of Kepler; The two-body problem; C11: Translation and rotation of a rigid body; The pseudo-helicoidal motion; C12: The plane rigid motion, the velocity center, the acceleration center, the relative motion of a rigid body; C13: Rigid body dynamics: theorems of momentum, and of the mass center; C14: The rigid body having a fixed axis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: NUMERICAL ANALYSIS

CODE:
ECTS CREDITS: 7 for Mathematics; 5 for Mathematics and Informatics
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): We present the most important numerical approximation methods and their convergence and error analysis; We make programs for each of the studied methods and we discuss their efficiency.
COURSE CONTENTS: 1. Introduction - Errors: error sources; Representation of numbers in a computer; Truncation and rounding error; Absolute error and relative error; Propagation of errors; Numerically well conditioned problems; Numerical stability problems; 2. Solving equations and systems of linear equations – a. bisection method; b. fixed point method (successive approximations); c. Newton method (tangent) and secant method; d. Methods for polynomial equations: Horner's scheme and deflation; Lobacevski, Bairstow, Laguerre; 3. Interpolation – a. Lagrange interpolation polynomial; Neville's algorithm;

Divided differences; Newton interpolation polynomial; b. Chebyshev Polynomials and minimization of the rest; c. Hermite interpolation and interpolation by spline functions; 4. Numerical differentiation and integration – a. Numerical derivation: Formula of three and five points; Approximation of higher order derivatives; b. Numerical integration: Newton-Cotes formulas (closed and open); Trapezoidal, Simpson and mid-point rules; c. Gauss integration; 5. Solving ordinary differential equations – a. Euler method and variants; b. Runge-Kutta method; c. Multipas methods; Local errors and global errors.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination lab evaluation

COURSE TITLE: ELEMENTARY THEORY OF NUMBERS
CODE:
ECTS CREDITS: 5 for Mathematics; 4 for Mathematics and Informatics
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The presentation of the most important results from elementary theory of numbers (theorems regarding prime numbers, quadratic residue, continued fractions, and diophantine equations).
COURSE CONTENTS: A. Elements of arithmetic: C_1. The divisibility relation on N; The divisibility relation on Z; The fundamental theorem of arithmetic; Congruences in Z; The theorems of Euler, Fermat, Wilson; The Chinese reminder theorem; B. The set of prime numbers: C_2. Theorems relative to infinity of primes (particular cases of the Dirichlet theorem); The Eratostene sieve: C_3. The theorem Bertrand-Tehebycheff; Inequalities of Tehebycheff; The theorem of Scherk; The twin primes; C. Special classes of integers: C_4. Numbers of Fermat type; Numbers of Mersenne type; Numbers of Fibonacci type; Other special cases of numbers; D. Arithmetical functions: C_5. Generalities; Operations with arithmetical functions; Multiplicative functions; Complet multiplicative functions; E. Quadratic residues: C_6. Generalities; The Legendre symbol; The quadratic reciprocity law; C_7. Other particular cases of the Dirichlet theorem; F. Continued fractions: C_8. Elementary properties; Approximate of real numbers by rationals; C_9. Periodics and pure periodics fractions; Representing of irrational numbers of $\sqrt{D}$ ($D \in N$) form by continued fractions; G. Theorems of representation of integers: C_{10}. The representation of a natural number as sums of two squares of integers; C_{11}. The representation of a natural number as sums of four squares of integers; The representation of a natural number of form x^2+2y^2; Other theorems of representation of integers; H. Diophantine equations: C_{12}. The equation $ax+by+c=0$, $a,b,c \in Z$; The equation $x^2+y^2=z^2$; The equation $x^4+y^4=z^4$; C_{13}. The Pell equation: $x^2-Dy^2=\pm 1$, $D \in N$; The equations of type: $ax^2+by^2+cz^2=0$, $a,b,c \in Z$; The equation of Bachet type; I. Lattice points in plane and space(1 course): C_{14}. Lattice points in plane; Lattice points in space.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: DIFFERENTIAL EQUATIONS II
CODE:
ECTS CREDITS: 5 for Mathematics; 4 for Mathematics and Informatics
TYPE OF COURSE: fundamental, compulsory for Mathematics; optional for Mathematics and Informatics
COURSE OBJECTIVE(S): The goal of this course is to emphasize some complementary results from the theory of ordinary differential equations and some applications. The basic idea is to solve a lot of differential equations, and to present computational aspects of ordinary differential equations. Moreover, asymptotic estimates, perturbation methods and approximation of some linear/nonlinear ordinary differential equations are given. Fourier analysis and Laplace transform arguments are also used.
COURSE CONTENTS:
1. First order, variable coefficient, second order, linear ordinary differential equations (separable variable equations, homogenous equations, equations reductible to homogenous equations, exact equations, the method of reduction of order, the method of variation of parameters), higher order differential equations (homogeneous and inhomogenous); 2. Fourier series and the Fourier transform, Green's functions, solution of Laplace's equation using Fourier transforms, generalizations to higher dimensions; 3. Laplace transforms, definition and examples, properties of the Laplace transform, the solution of ordinary differential equations using Laplace transforms, the inversion formula for Laplace transforms; 4. Asymptotic methods, asymptotic sequences, uniform and non-uniform asymptotic expansions, the asymptotic evaluation of integrals, source of non-uniformity; 5. Perturbation methods, singular perturbation methods: the method of strained coordinates, the pendulum problem, Duffing's equation, Lindstedt Poincare technique, Lighthill's technique.
LANGUAGE OF INSTRUCTION: Romanian/ English
ASSESSMENT METHOD(S): Written test – 75% of the final grade; seminary – 25% of the final grade

COURSE TITLE: DATA BASES
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory (for Mathematics and Informatics)

COURSE OBJECTIVE(S): Proficiency in general concepts of databases; Presentation of different models of data description in particular of relational model; Knowledge of languages database query; Comprehensive integrity and technical restrictions to normalize relations; Knowledge of representation at the physical level of the data in a database; Signing of notions of integrity and data security.
COURSE CONTENTS: Concepts and database issues; Designing logic databases; Database with hierarchical and network structures; Relational databases; Data query languages for the relational model; Restriction of integrity in databases; Functional dependencies; Multivalue dependencies; Modelling relational databases; Normal forms in the database; Relations normalization techniques; Physical structure of databases; The integrity and security of databases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

3RD YEAR, 1ST SEMESTER

COURSE TITLE: PARTIAL DIFFERENTIAL EQUATIONS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The representation of the basis results related to the qualitative theory of linear partial differential equations;
COURSE CONTENTS: A. Elliptic equations : Classification of partial differential equations; Laplace's operator, fundamental integral formulae; The fundamental solution to Laplace equation; Harmonic functions; Mean formula for harmonic function; The weak maximum principle for harmonic functions; The method of variables separation; Harnack's formula; Liouville's Theorem for harmonic functions; Green-Riemann formula; The solution of Dirichlet problem; Green's formula; Green's function for the ball and semiplane; Poisson's formula; The strong maximum principle for harmonic functions; Dirichlet's Principle; B. Parabolic equation: Examples; The method of variables separation; Variational methods in the study of parabolic problems; The fundamental solution for heat equation; Cauchy problem; Mean formula for heat equation; The maximum principle for heat equation; C. Hyperbolic equations: Examples; The method of variables separation; Variational methods in the study of hyperbolic problems; Huygens's Principle; D'Alembert' formula; Cauchy-Darboux-Poisson equation; Kirkchoff' formula.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FUNCTIONAL ANALYSIS AND APPROXIMATION THEORY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Presentation of the main result of functional analysis on Hilbert or Banach spaces, with applications in approximation theory and partial differential equations.
COURSE CONTENTS: A. Normed spaces: The notion of norm; Banach spaces and Hilbert spaces; Examples; Finite dimensional spaces; Fundamental properties of the normed spaces: completeness, separability, reflexivity; Weakly convergent sequences; Uniformly convex spaces; Linear and continuous operators on normed spaces; The norm of an operator; The dual space; B. Hilbert spaces: Parallelogram law; Riesz's Theorem of representation of linear and continuous functionals; Thorem of projection on a closed and convex set of a Hilbert space; Applications to approximation and optimization problems; Stampacchia's Theorem and Lax-Milgram Lemma; Applications to differential equations; Orthogonal and orthonormal families; The Hilbertian basis; Expansion in Fourier series; Applications to the method of variables separation; Bessel's inequality and Parseval's identity; Applications to Lebesgue and Sobolev spaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: PROBABILITY THEORY AND MATHEMATICAL STATISTICS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory for Mathematics; optional for Mathematics and Informatics
COURSE OBJECTIVE(S): The purpose of this course is to introduce the basics of probability theory and mathematical statistics, in order to help students in establishing a solid theoretical background for their future professions. This course will explain the theoretical origins and the practical implications of probabilistic and statistical formulas and will build a series of techniques that will be useful in the study of mathematical models involving uncertainty. This course contains the most basic tools for a good initiation to statistical methods in applied mathematics.
COURSE CONTENTS: 1. Combinatorial Analysis; 2. Sample space and Events; Axioms of Probability; Conditional Probability; Multiplication rule; The total probability formula; Bayes's Formula; Independent Events; 3. Discrete Random Variables; Probability mass function; The cumulative distribution function; Expected value; Variance; The Bernoulli and binomial random variables; 4. The Poisson random variable; The Geometric Random

Variable; The Negative Binomial Random Variable; The Hypergeometric Random Variable; Expected Value of Sums of Random Variables; 5. Continuous Random Variables; Probability density function; The cumulative distribution function; Expectation and variance of continuous random variables; 6. The Uniform Random Variable; Normal Random Variables; The Normal Approximation to the Binomial Distribution;Exponential Random Variables; The Distribution of a Function of a Random Variable; 7. Jointly Distributed Random Variables; Joint Distribution Functions; Independent Random Variables; Sums of Independent Random Variables; Identically Distributed Uniform Random Variables; Conditional Distributions: Discrete Case; Conditional Distributions: Continuous Case; Joint Probability Distribution of Functions of Random Variables; 8. Expectation of Sums of Random Variables; Moments of the Number of Events that Occur; Covariance, Variance of Sums, and Correlations; 9. Conditional Expectation; Computing Expectations by Conditioning; Computing Probabilities by Conditioning; Conditional Variance; Conditional Expectation and Prediction; Moment Generating Functions; 10. Limit Theorems; Markov's inequality; Chebyshev's Inequality and the Weak Law of Large Numbers; 11. The Central Limit Theorem; The Strong Law of Large Numbers; 12. Point Estimation: Moment method, Maximum Likelihood Method, Bayesian method; 13. Testing hypotheses: concepts of hypothesis testing, Neyman – Pearson lemma, Likelihood ratio test, Confidence intervals; 14. Simple Linear Regression.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ADVANCED PROGRAMMING
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: complementary, compulsory for Mathematics and Informatics
COURSE OBJECTIVE(S): Learning basic concepts related to the Java programming language for students completing activity as professional skills necessary for a computer science graduate;
Students will be able to demonstrate that they understood the basic knowledge on Java technologies;
Students will be able to correctly apply theoretical concepts learned in the implementation of practical work and problem solving;
Students will be able to acquire Java application development methodology for specific Java technologies;
COURSE CONTENTS: 1. Introductory Elements: a) Java Technologies: Java; 2 Standard Edition (J2SE), Java 2 Enterprise Edition (J2EE), Java 2 Micro Edition (J2ME) ; b) Java basics: Character Set, Keywords, reserved words, identifiers, literals, separators, comments, operators, variables, expressions, instructions, Vectors, Strings, Arguments; 2. Classes and Objects in Java: a) Objects and classes; Relations between classes; Relationships between objects; b) Creating Objects, Destroying Objects; c) Subclasses and inheritance, Variables "shadow", Overriding methods; d) Data Hiding and Encapsulation; e) Abstract classes; Interfaces; 3. Exceptions and their handling: a) Exception handling, Throwing Exceptions; b) Class hierarchy exceptions, Special Exceptions; c) Advantage of exceptions handling; 4. Mini-applications (Applets): a) Basic concepts, restrictions, benefits; b) The structure of Java Applet; c) AWT graphics components; d) Handling events generated by AWT components; e) Java Applets: Tips & Tricks; 5. Graphical interfaces in Java: a) Graphical User Interfaces; b) Interfaces Development; c) Java Foundation Classes (JFC); d) The MVC (Model View Controller); e) Java Swing components and library packages; 6. Threads in Java: a) Java Thread state; b) Working with threads in Java: Extending Thread class, Runnable interface implementation; c) Threads Synchronization; 7. Java Database Connectivity-JDBC: a) JDBC Drivers; b) Accessing a database using JDBC; c) Example; 8. Java Servlets: a) Introduction; b) Working with servlets; c) Structure of Java Servlet; d) doGet and doPost methods; e) Example of implementation; 9. Java 2 Micro Edition (J2ME): a) Configuration, Profile; b) CLDC Configuration: CLDC virtual machine specification, CLDC class library; c) MIDP Profile: MIDP Java Applications; d) Java archive file – JAR (Java Archive); e) Application descriptor file – JAD (Java Application Descriptor); f) Developing MIDlets.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: ARCHITECTURES, OPERATING SYSTEMS, NETWORKS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The course provides concise introductions and noteworthy examples on fundamental topics concerning the interactions between the physical layer and the abstraction layers that describe how the contemporary computers work and communicate with each other. It is designed in such a way as to give the enrolled student a first glance to distinguished parts of the plethora of tools and trades from the modern SysOps' toolkit. Although the attendees will not be proficient in these topics after completing this course, they will have enough grasp of the knowledge involved as to be able to pursue easily more developed and specialised courses on such matters. A certain emphasis will be put on various flavours of Linux OS and on shell scripts.

COURSE CONTENTS: Part I: Architectures – 1. The computer architecture; The classification of *ISA*s; The *ARM* family; Cloud computing; 2. Microarchitectures; *SoC*; Microcontrollers; Machine code; *HLA*; *MASM*; *NASM*; 3. The MediaTek SoCs; The Arduino system: boards, sensors, *IDE*, sketches; 4. Basic electronic components; Arduino simple projects; *PCB* design; Part II: Operating Systems – 5. Installing OSes and deploying OS images; The container technology: Docker Community Edition; Installing and running: Alpine Linux in a virtual machine on Windows 10 Professional, Microsoft SQL Server 2017 as a Linux container on Ubuntu 16;04 LTS; 6. Installing and running Debian 9 via *chroot* on Android 4;4 KitKat; Configuring and starting emulators in Android Studio; 7. Main operating system concepts; System calls; Operating system structure; 8. Processes and threads; Memory management; File systems; Storage management; *I/O* system; 9. Tools of the trade in Windows: Debugging Tools for Windows, Windows Sysinternals, PowerShell; 10. Tools of the trade in Linux: *bash, vim*, *grep, awk, sed*; System administration using *bash* and Perl; Part III: Networks – 11. Installing and configuring a budget router: Edimax *BR-6324nL*; The *DHCP* server; Accessing *IIS* on *LAN* via *NAT* and private *IP* addresses; 12. Remote access on *LAN*: the *RDP* and *RFB* protocols; Client applications: *mstsc*, VNC Viewer; Running commands on Debian 9 via VNC Viewer; 13. Remote shells: *adb*, *PuTTY*; Tools of the trade: *wget, ping, traceroute, nslookup*; 14. The *OSI* model; *TCP/IP*: architecture and data delivery; Network services: *DNS*, e-mail, file sharing and print; *mutt*.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FORMAL LANGUAGES, COMPILERS, VIRTUAL MACHINES, AND ARTIFICIAL INTELLIGENCE

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional for Mathematics and Informatics
COURSE OBJECTIVE(S): The course provides concise introductions and noteworthy examples on topics beloging to a wide range of computer science domains. It is designed in such a way as to give the enrolled student a first glance to distinguished parts of the plethora of tools and trades from the modern developer's toolkit. Although the attendees will not be proficient in these topics after completing this course, they will have enough grasp of the knowledge involved as to be able to pursue easily more developed and specialised courses on such matters. A certain emphasis will be put on text-transforming toolchains and lightweight markup languages.
COURSE CONTENTS: Part I: Formal Languages – 1. Grammars and machine recognition; The Chomsky hierarchy; Finite state automata; Turing machines; 2. Recursion; Context-free languages; Undecidability; *P* and *NP*; 3. The Backus-Naur form and its extensions: *BNF, EBNF, ABNF*; The *JSON* format; Part II: Compilers – 4. The structure of a compiler; Core components of programming languages; 5. Tools of the trade: *Lex, Yacc, Flex, Bison*; 6. Lexical and syntactical analysis; Intermediate code generation; 7; Runtime environments; Garbage collectors; Code generation; 8. Transcompilers; Cross-compilers; *AOT* and *JIT* compilations; Linkers and loaders; 9. *WebAssembly*, *asm;js, Emscripten*; Interpreters; Classical text manipulators: *Perl, AWK*; 10. Lightweight markup languages: *Markdown, reStructuredText*; The *Sphinx* toolchain; Part III: Virtual Machines – 11. Computer architectures; Types of virtual machines; Emulators; 12. The Java virtual machine, *HotSpot*; The *.NET* virtual machine, Microsoft *CLR*; Hypervisors, Microsoft *Hyper-V*, Oracle VM *VirtualBox*; Containers, *Docker*; 13. Managed runtime environments: *Dalvik*, *ART*; Part IV: Artificial Intelligence – 14. Machine learning, *TensorFlow.js, ml5.js*; Neural networks, *textgenrnn*.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

3RD YEAR, 2ND SEMESTER

COURSE TITLE: ALGORITHMIC AND SIMULATION IN C++

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): We present the most important numerical approximation methods in linear algebra and optimization. Convergence and error analysis is provided for each studied method. Also, we make programs for each of the introduced method and we discuss their efficiency.
COURSE CONTENTS: 1. Matrix analysis: The spectrum of a matrix; Spectral radius; Special types of matrices; Matrix norms; Convergent matrices; 2. Solving systems of linear algebraic equations: a. Direct methods: Gauss method and LU factorization; Cholesky method; b. Iterative methods; Jacobi and Gauss-Seidel methods; Relaxation method; Error analysis; c. Conditioning number for a system of linear equations; d. Comparison of algorithms; 3. Optimization problems: a. Finite-dimensional optimization, optimality conditions, convex and elliptical functional; Coerciveness; b. Minimization in one dimension; c. Gradient method; Convergence d. Conjugate gradient method; e. Methods for minimum problems with restrictions: Lagrange multipliers, penalty, preconditioning; 4. Solving partial differential equations by finite differences: a. One and two-dimensional linear elliptic equations;

b. Parabolic and hyperbolic equations; Explicit and implicit schemes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: OPERATIONAL RESEARCHES

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring the main knowledges concerning the concepts of convexity in optimization theory and variational calculus.
COURSE CONTENTS: The definition of convex function, Jensen's inequality; Applications; Young's, Holder's and Minkowski's inequalities; Smoothness properties of convex functions, the subdifferential of a convex function, conjugate convex functions; Integral inequalities; An integral form of Jensen's inequality; Hermite-Hadamard's inequality; Consequences; Convex functions with respect to means, multiplicative convex functions, consequences for the case of Gamma and Beta functions; Convex sets in vectorial spaces; Convex and affine sets; The separation hyperplanes, separation theorems; Extremal points; Minkowski's theorem, orthogonal projection, Brunn-Minkowski's inequality, isoperimetrical inequalities; Convex functions on normed and vectorial spaces; Continuity properties; Positive omogene functions; The suport convex function; The subdiferential of a convex function; Rademacher's theorem; Differentiable class of functions; The Fenchel conjugate, the dual problem; Aspects of optimization theory; Extreme points convex functions theory; Mini-max type inequalities and theorems; Majorization concept, Hardy-Littlewood-Polya's inequality, Popoviciu's inequality; Schur-convex functions; Some class of inequalities given by Schur-convexity properties; Mean, baricenter and majorization concepts in global nonpositive curvature spaces; Hardy-Littlewood -Polya's inequality in probability spaces; Fixed point theorem (Brouwer, Schauder, Schaeffer); Applications into the game theory; The concept of Nash equilibrium; Lemke-Howson's algorithm; Applications into the financial mathematics; Linear programming; Simplex algorithm; Elements of convex programming; Variational problems and applications to PDE.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ALGORITHMS IN NUMBER THEORY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): To have a knowledge of the basic properties of congruences and their major applications; to use the new notions in solving applicative problems; to know the most important primality tests, their advantages and applicability; to be aware of the basic facts of public key cryptography; to achieve comparative programs that lead to an analogical study of several algorithms.
COURSE CONTENTS: 1. Congruences: C_1: Divizibility on $\mathbb{N}$ and $\mathbb{Z}$ (summing up the most important algorithms): Euclidean algorithm for computing the greatest common divisor for two integers; Lamé's theorem; extended Euclidean algorithm; solving linear diophantine equations; C_2: Congruences; Basic properties; Modular exponentiation (repeated square-and-multiply algorithm for modular exponentiation); Solving linear congruences; Computing multiplicative inverses in $\mathbb{Z}_n$; C_3: Systems of congruences; The Chinese Remainder Theorem; Gauss's algorithm; The inverse modulo m of a matrix; C_4: Applying congruences in: factoring numbers of particular form, divisibility tests, programming a competition; C_5: Arithmetic index; Definition; Properties; Universal exponents; Minimal universal exponent $\text{a}(n)$ and maximal ±1 exponent $\text{a}_0(n)$. Definition, computing algorithms for elements of order $\text{a}(n)$ or $\text{a}_0(n)$. Applications (generating pseudo-random numbers, connecting communication cables); 2. Primality tests: C_6: Deterministic primality tests; Trial division; $n-1$ tests; Pepin's test; $n+1$ tests; Lucas-Lehmer's test; AKS algorithm; C_7: Probabilistic primality tests; Fermat's test; Algorithm for computing Jacobi symbol; Solovay-Strassen primality test; Miller-Rabin primality test; 3. The integer factorization problem: C_8: Generalities; Trial division; Fermat's method of factorization; The rho method of factorization; The Pollard p-1 method; The factor base algorithm; C_9: The continued fraction method; Quadratic sieve factoring; Elliptic curve method; Number field sieve factoring; 4. The discrete logarithm problem (DLP): C_{10}: Generalities; Shanks' algorithm; The Silver-Pohlig-Hellman algorithm; C_{11}: Pollard-rho's algorithm; Index-calculus algorithm (for finding discrete logs in finite fields); 5. Square root modulo n problem: C_{12}: Algorithm for finding square roots modulo a prime p; Special cases: $p \equiv 3 (\mathrm{mod}\ 4)$, $p \equiv 5 (\mathrm{mod}\ 8)$, $p-1 = 2^s t$, where s is large; Finding square roots modulo $n = pq$, with p and q distinct primes; Flip coin; 6. The subset-sum problem and the knapsack problem: C_{13}: Basic notions; Algorithms for solving the computational version of the subset-sum problem; The L^3- lattice basis reduction algorithm; C_{14}: Solving subset-sum problems of low density; Simultaneous Diophantine approximations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: COMPLEMENTS OF MATHEMATICAL ANALYSIS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: optional
COURSE OBJECTIVE(S): The goal of this course is to emphasize some basic results from the theory of integral inequalities and some of their applications. The basic idea is to introduce the theory of integral inequalities using elementary arguments with no need of sophisticated function spaces (such as Sobolev or Orlicz spaces). The inequalities which will be presented during this course could be understood subsequently also in the context of function spaces just considering some simple density arguments.
COURSE CONTENTS: Lecture 1. Coaria formula [Kesavan [4], pp. 28-29]; Chain rule [Gilbarg & Trudinger [3], Lemma 7.14]; Applications [Radulescu & Radulescu [8]]; Lectures 2-3. Lebesgue spaces. Inequalities on Lebesgue spaces (Holder's inequality; interpolation inequality; Minkowski's inequality; Clarkson's inequality) [Brezis [2], Chapter 4; Willem [6], Lemma 1.32; Radulescu & Radulescu [8], Problema 3.16; Willem [6], Lemma 1.32]; Lecture 4. Poincare's inequality [Balinsky et al. [1], Proposition 1.3.1; Willem [7], Theorem 6.4.7]; Poincare-Wirtinger's inequality [Balinsky et al. [1], Proposition 1.3.2; Willem [7], Theorem 6.4.9]; Lectures 5-6. Sobolev-Galiardo-Nirenberg's inequality and some of its applications. Morrey's inequality [Brezis [2], Chapter 9]; Lecture 7. Caccioppoli-type inequalities [Han & Lin [10], Chapter 1, p. 23; Lindqvist & Manfredi [11]]; Lecture 8. Hardy's inequality on the real line [Balinsky et al. [1], Theorem 1.2.1 and Corollary 1.2.2]; Lecture 9. Hardy's inequality on R^N when N>1 [Balinsky et al. [1], Theorem 1.2.5 and Corllary 1.2.6]; Lecture 10. A Hardy-type inequality with weight; The Caffarelli-Kohn-Nirenberg inequality. Applications; [Balinsky et al. [1], Theorem 1.2.8 and Corollary 1.2.9; Willem [5], Theoreme 20.7 and Corollaire 20.8]; Lecture 11. Trudinger's inequality [Gilbarg & Trudinger [3], Theorem 7.15]; Lecture 12. The Brunn-Minkowski inequality [Gardner [12]].
LANGUAGE OF INSTRUCTION: Romanian/ English
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: FOUNDATION OF GEOMETRY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): The students will be inform about the important chapters and problems in geometry, problems that had not been yet considered in the prior courses on geometry, but will become very useful in the future teaching or analyst programming activities.
COURSE CONTENTS: Axiomatic systems for Euclidean geometry; Hilbert axiom system, Birkhoff axiom system; Algebraic foundations of geometry; Real vector spaces; Real affine spaces; Euclidean vector spaces; Euclidean point spaces; Principles of linking theory of groups with geometry; Elements of projective geometry (projective transformations, duality principle, projective plane geometry, projective interpretation of Euclidean geometry, Riemannian geometry and Lobacevski geometry); Models of non-Euclidean geometric space (hyperbolic plane geometry, spherical geometry).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: SPECIAL CHAPTERS OF PARTIAL DIFFERENTIAL EQUATIONS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): To familiarize the students with Sobolev's spaces; To solve a class of elliptic boundary value problems by a variational technique.
COURSE CONTENTS: 1. Preliminaries of functional analysis: C_1: Riesz representation theorem, Lax-Milgram lemma, Stampacchia's theorem; Lebesgue spaces, Holder's inequality, Fundamental lemma of variational calculus; 2. Sobolev spaces: C_2: The spaces $W^1{}_p(I)$; definition, properties; C_3: The space $H^1{}_0(I)$; definition, properties; C_4: The space $V(I)$; definition, properties; C_5: The spaces $W^1{}_p(\Omega)$; definition, properties; C_6: The space $H^1{}_0(\Omega)$; definition, properties; C_7: The space $V(\Omega)$; definition, properties; 3. Weak solutions for 1-D boundary value problems: C_8: Dirichlet boundary value problems; C_9: Neumann boundary value problems; 4. C_{10}: Mixed boundary value problems: Weak solutions for N-D boundary value problems (N>1); C_{11}: Dirichlet boundary value problems; C_{12}: Neumann boundary value problems; C_{13}: Mixed boundary value problems; C_{14}: Nonstandard boundary value problems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium

COURSE TITLE: MATHEMATICAL STATISTICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The purpose of this course is to develop statistics for mathematicians, emphasising both its underlying mathematical structure and its application to the logical interpretation of scientific data. Advances in theoretical statistics are generally driven by the need to analyse new and interesting data which come from all walks of life.
COURSE CONTENTS: 1. Sampling Distributions

Associated with the Normal Population; Chi-square distribution; Student's t-distribution; 2. Some Techniques for Finding Point Estimators of Parameters; Moment Method; Maximum Likelihood Method; Bayesian Method; 3. Criteria for Evaluating the Goodness of Estimators; The Unbiased Estimator; The Relatively Efficient Estimator; The Minimum Variance Unbiased Estimator; 4. Criteria for Evaluating the Goodness of Estimators; Sufficient Estimator; Consistent Estimator; 5. Some Techniques for Finding Interval Estimators of Parameters; Interval Estimators and Confidence Intervals for Parameters; Pivotal Quantity Method; Confidence Interval for Population Mean; 6. Confidence Interval for Population Variance; Confidence Interval for Parameter of some Distributions not belonging to the Location-Scale Family; Criteria for Evaluating Confidence Intervals; 7. Test of Statistical Hypotheses; A Method of Finding Tests; 8. Methods of Evaluating Tests; Examples of Likelihood Ratio Tests; 9. Simple Linear Regression; Least Squared Method; 10. Normal Regression Analysis; The Correlation Analysis; 11. Analysis of Variance; Analysis of Variance with Equal Sample Sizes; Analysis of Variance with Unequal Sample Sizes; 12. Goodness of Fits Tests; Chi-Squared test.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

FIELD: INFORMATICS
PROGRAMME TITLE: INFORMATICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: CALCULUS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Applications presentation to make learning theoretical concepts presented in the course; Develop clear thinking in order to process data from different areas and take better decisions; Algorithms development and their implementation in popular programming languages.
COURSE CONTENTS: 1. Normed spaces: 1.1 Normed vector spaces; 1.2. Metric spaces; 1.3. Functions: real functions of real variable, vector functions of real variable, real functions of several real variables, vector functions of several real variables; direct image of a set by a function; 2. String convergence in metric spaces: 2.1. String convergence; 2.2. Cauchy sequence; 2.3. Strings of real numbers; 2.4. Complete metric space; 2.5. The convergence of numerical series: series with positive terms, absolute convergent series, alternating series; approximate amount of series; 2.6. Series of functions; 3. Limits of functions: 3.1. Limits of functions; 3.2. Continuous and uniformly continuous functions; 3.3. Curves; 4. Differentials real variable functions: 4.1. Differentials real variable functions; 4.2. Real functions of real variable: derived a point, a point differential; higher order derivatives; 4.3. Power series, development in power series of common functions. Vector functions of real variable; 4.4. Differentials real functions of several variables: partial derivatives, gradient, Jacobean matrix, higher order partial derivatives; 4.5. Extremes; 5. Riemann integral: 5.1. Riemann integral: definition, properties, the length of a curve; 5.2. Improper integrals; 5.3. Multiple integrals: integrals calculation double, triple; changing variable in multiple integrals.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written test; 30% of the final grade – laboratory)

COURSE TITLE: COMPUTERS ARCHITECTURE
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Mathematical and logical foundations of computing; Knowledge of issues specific to the construction and operation of computers; Theory and practice of computer architecture; Modern technologies of communication between computer systems.
COURSE CONTENTS: 1. Data representation in computer systems; 2. Boolean algebra and digital logic; 3. Classical von Neumann architecture; 4. Alternative architectures; 5. System Software; 6. Organization and architecture of computer networks.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium (written test)

COURSE TITLE: ALGEBRAIC FOUNDATIONS OF INFORMATICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The presentation of fundamentals results in: ordered sets, lattices, Boolean algebras, groups, rings, fields, vectorial spaces according to the necessity for informatics. Necessary background: all courses of algebra from the elementary school.
COURSE CONTENTS: A. Ordered sets: 1. Sets: Operations on sets; The Boolean ring $(P(M), \Delta, \cap)$; Binary relations on a set; General properties; Equivalence relations; The factorization of a set by an equivalence relation; The product and co-product of a family of sets; General properties; 2. Relations of (pre) order on a set; Total ordered set (chain); Special elements in an ordered set (prime, bottom, top, minimal, maximal, atom, etc.); Inductive sets; Zorn's lemma; 3. Semilattices; Lattices; Filters; Ideals; Morphismes of (semi-lattices) lattices; Latici Modular lattices; Distributive lattices; 4. The complement of an element in a bounded distributive; Boole algebras; The connections between Boole algebras and Boolean rings; Morphismes of Boole algebras; 5. The factorization of a Boole algebra by a filter; Ultrafilters in a Boole algebra; B. Groups: 6. Algebraically operations; Semigroups; Monoids; Morphisms of monoids; The monoids $(\mathbb{N}, +)$, $(\mathbb{N}, \cdot)$; Group; Subgroup; Calculus in a groups; The subgroup generated by a set; Cyclic groups; The order of an element in a group; The lattice of subgroups of a group; The index of a subgroup in a group; Lagrange theorem; 7. Normal subgroups; Factor group; Morphisms of groups; Isomorphisms of groups; The transport of subgroups by morphisms of groups; The group $(\mathbb{Z},+)$; The Subgroups of the group $(\mathbb{Z}, +)$; The monoid $(\mathbb{Z},\cdot)$; The Kernel of a morphisms of groups; Theorems of isomorphisms for groups; Direct product of groups; Chinese remainder theorem; 8. Groups of permutations; Cayley theorem; Transpositions; Cycles; The decomposition of a permutation in a product of disjoint cycles; C. Rings and fields: 9. Ring; Calculus in a ring; Specials elements in a ring: zero divisors, unit elements, nilpotent elements; Subring; Subring generated by a set; The

lattice of subrings of a ring; The Gauss ring of integers $\mathbb{Z}[i]$; The finite ring of classes modulo n : $(\mathbb{Z}_n, +, \cdot)$; Integral domain; The integral domain $(\mathbb{Z}, +, \cdot)$; Left (right, bilateral) ideal; Ideal generated by a set; Principal ideal; The lattice of ideals of a ring; Operations with ideals; Prime ideals; Maximal ideals; Factorization of a ring by a bilateral ideal; Morphisms of rings; The transport of ideals and subrings by morphisms of rings; Theorems of isomorphism for rings; 10. Field; Subfield; Prime subfield; Calculus in a field; Morphisms of fields; The characteristic of a field; The field $(\mathbb{Q}, +, ;)$ of rationals numbers; The fields of reals $(\mathbb{R}, +, \cdot)$, complex numbers $(\mathbb{C}, +, \cdot)$ and quaternions $(\mathbb{H}, +, \cdot)$; 11. Rings of polynomials; Rings of polynomials in one variable with coefficients in a commutative unitary ring; Construction; Universal property; Rings of polynomials in many variables; Construction; Universal property; Symmetric polynomials; The fundamental theorem of symmetric polynomials; The fundamental theorem of algebra (D'Alembert – Gauss); D. Vectorial spaces: 12. Determinants and Systems of linear equations; Matrix; The definition of a determinant of order n; The expansion of a determinant according to a row (column); Laplace's rule of expansion of a determinant according more rows (columns); Applications; Inverse matrix; Systems of linear equations over a commutative field; Homogeneous systems; 13. Vector spaces; Vector subspaces; Calculus in a vector spaces; Operations with vector subspaces; Vector subspace generated by a set (linear closure); The lattice of subspaces of a vector space; System of generators; Linear independent (dependent) elements; Base; The coordinates of an element with respect to a basis; Every nontrivial linear space has a basis; Every two finite basis for a vector space have the same number of elements; The dimensionality of a vector space; Every linear independent subset of vectors can be complemented by elements so that the collection forms a basis of the whole space; The rank of a system of vectors; The rank of a matrix; Grasmann's formula; The matrix of passing to a new basis; Transformations of coordinates of an element in transformation of the basis of a finite dimensional linear space; Substitution's lemma; Applications; The factorization of a linear space by a subspace; 14. Linear transformations; The theorems of isomorphism for linear spaces; Linear operator; Eigenvalues and eigenvectors of linear operators; The Cayley – Hamilton theorem.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (written test and optional oral test)

COURSE TITLE: COMPUTATIONAL LOGIC
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): The presentation of the main concepts about propositional logic and the connection with natural language; The presentation of the main concepts about predicate logic; Using the concepts for constructing correct proofs; Provide a base for Artificial Intelligence.
COURSE CONTENTS: 1. Introduction; 2. Propositional Logic; 3. Propositional Equivalences; 4. Semantic Reasoning; 5. Natural Deduction; 6. Predicate logic; 7. Inference Rules; 8. Proofs – methods and strategies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written test, 50% of the final grade – laboratory)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ARTIFICIAL INTELLIGENCE
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Problem solving using informed and uninformed search; Understanding basics about evolutionary computation; Solving game-type problems, where the environment assumes the existence of a hostile agent.
COURSE CONTENTS: 1. Intelligent Agents: a. How Agents Should Act; b. Structure of Intelligent Agents; c. Properties of Intelligent Agents Environments; 2. Problem-Solving Agents: a. Formulating Problems; b. Search Strategies; c. Informed Search Methods; 3. Characteristics and Constraints: a. Constraint Satisfaction Problems; b. Generate-and-test Algorithms; c. Consistency Algorithms; d. Local Search Algorithms; 4. Modern Methods for Solving Problems: a. Evolutionary Algorithms; b. Artificial Ant Colony Optimization; c. Artificial Immune Systems; 5. Game Playing: a. Minimax Algorithm; b. Robocode – a Multi-agent Environment; c. Reinforcement Learning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written test, 50% of the final grade – laboratory work)

COURSE TITLE: OBJECT ORIENTED PROGRAMMING
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: mandatory specialty
COURSE OBJECTIVE(S): understanding of object oriented programming principles; learning C++ programming language; offer the skills to design applications using object oriented programming principles.
COURSE CONTENTS: 1. Introduction to Object Oriented Programming: Basic concepts in object oriented programming; Classes and Objects; Access specifiers; 2. Creating and destroying

objects: Constructors. Types of constructors; Destructors; 3. Dynamic memory allocation; 4. Static Data Members and Methods; 5. Friend functions and classes; 6. Operators overloading: Overloading operators using friend functions, Overloading operators using member functions; Overloading special operators; 7. Representing classes using UML diagrams; 8. Techniques for code reuse: Composition; Inheritance. Poly-morphism – virtual functions and classes; Template functions and classes; 9. Exception handling in C++ language; 10. I/O Operations. Streams; 11. Standard Template Library – STL; 12. Design Patterns
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written test, 50% of the final grade – laboratory)

COURSE TITLE: OPERATING SYSTEMS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory specialty
COURSE OBJECTIVE(S): understanding the theoretical aspects of operating systems; learning the functional role of the operating systems components; understanding the interactions between the operating system and the user and between the operation system and the hardware; offer the practical skills to utilize and configure the main operating systems (Windows, Linux).
COURSE CONTENTS: 1. Introduction to Operating Systems: The structure; Main functions and responsibilities; OS for modern applications; 2. OS File system: File system structure; Folder hierarchy; Windows/Linux commands; Files, folders, paths, links; File systems types; 3. User management: Main operations; User rights management; Windows/Linux users management; 4. Processes: Inspection and management of processes; Communication between processes; Background running; 5. User interfaces: Command line interface; Shell facilities, variables, escaping, expanding; 6. Hardware components; Booting process; 7. Introduction to networking: Equipment, protocols, addresses; Sub-networks; Network configurations on operating systems; 8. Network communication: TCP/IP; Client-server architecture, network services; SSH, e-mail, WWW; 9. Virtualisation: types and solutions; 10. OS security: Basic security principles: Passwords considerations; Networks security; 11. Internet; Feedback; Netiquette.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written test, 50% of the final grade – laboratory)

COURSE TITLE: DATA STRUCTURES AND TECHNIQUES FOR DEVELOPING ALGORITHMS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Understanding the theoretical aspects of Data Structures and their use in developing certain algorithms; Understanding of classical algorithms, Learning techniques for analysing algorithms.
COURSE CONTENTS: 1. Introduction to Introductory notions; The complexity of Algorithms; 2. Algorithms; Recursion; Divide et Impera; Greedy. Backtracking; Dynamic programming; 3. Data structures: single linked lists, double linked lists, stacks, queues; 4. Sorting methods: Selection Sort, Insertions Sort, Shell Sort, Bubble Sort, Merge Sort, QuickSort; 5. Graphs. Trees. Binary Search Trees; 6. HashTable
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (written exam and laboratory exam)

COURSE TITLE: ENGLISH FOR INFORMATICS
CODE:
ECTS CREDITS: 3+3
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): 1. Teaching the grammar structures and the vocabulary necessary in the IT domain; 2. Reviewing general English grammar and vocabulary; 3. Improving the four language skills, i.e. improving listening, reading, writing, speaking skills; 4. Enhancing communication skills; 5. Raising cultural awareness.
COURSE CONTENTS: 1. Grammar Points: The Indicative Mood: The Present Tense, The Past Tense, The Present Perfect, The Past Perfect, The Future; Nouns; Articles; Quantifiers and Demonstratives; Pronouns and Numerals; Adjectives; Adverbs; Modal Verbs; Questions; Negatives; Direct and Reported Speech; The Subjunctive Mood; The Conditional Mood; The Infinitive; The ING Verb Forms; The Passive Voice; Relative Clauses; Conjunctions and Linking Phrases; 2. Vocabulary Themes: An Introduction to Informatics; The Age of (R)evolution in a Computer-Oriented World; Computers and Computer Systems: The Machine, Its Parts and Its Programmes; The Internet; Networking Multimedia; Security Online; ICT; Students in Informatics; The IT Business World; Careers; Philosophical and Sociological Perspectives on the Computer World; Ambiguity in language; Everyday Life; Travelling; 3. Communication Items: Argumentative Essays; Presentations; Agendas and Teleconferences; Emails; Small Talk and Other Conversations; Minutes; Dissertations; Documents; CVs and Cover Letters; Culture Concepts; Types of Intelligence.
LANGUAGE OF INSTRUCTION: English

ASSESSMENT METHOD(S): Verification (50% of the final grade – written exam; 50% of the final grade – seminar activity)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: COMPUTER NETWORKS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, mandatory
COURSE OBJECTIVE(S): In the last few years we can easily see a remarkable growth in the global network/communication infrastructure. This course will address subjects as: network infrastructure functioning and design principles, how should Internet applications be written, internetworking philosophies, traffic shaping, congestion control, network quality of service, network-aware applications, and performance issues.
COURSE CONTENTS: 1. Introduction; History, architecture, topology; Protocols stack; Levels design issues; Interfaces and services; The relationship between services and protocols; Standards; 2. Reference models; ISO-OSI reference model; TCP/IP reference model; Comparison with ISO-OSI model; 3. Physical level; Shannon's Law; Particularities of various physical environments; 4. Data Link layer; Detecting and correcting errors; Flow control; Elementary Data Link protocols; MAC Sub-level; Ethernet network; Packet switching; 5. Switches; Virtual networks (VLAN); 6. Network level; Routing algorithms; Congestion Control; IP protocol; IP addresses; IPv6 protocol; ICMP protocol; 7. Configuration via DHCP; ARP protocol; 8. Transport layer; Transport layer services; Communication primitives; Transport layer protocols; 9. Communication sockets; 10. Application level; Domain Name System (DNS); 11. Securing computer networks; Firewalls; Security models;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade – written exam; 40% of the final grade – laboratory)

COURSE TITLE: PROBABILITIES AND MATHEMATICAL STATISTICS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: obligatory, complementary
COURSE OBJECTIVE(S): The purpose of this course is to introduce the basics of probability theory and mathematical statistics, in order to help students in establishing a solid theoretical background for their future professions; This course will explain the theoretical origins and the practical implications of probabilistic and statistical formulas and will build a series of techniques that will be useful in the study of mathematical models involving uncertainty; This course contains the most basic tools for a good initiation to statistical methods in applied mathematics.
COURSE CONTENTS: 1. Combinatorial Analysis;; 2. Sample space and Events; Axioms of Probability; Conditional Probability; Multiplication rule; The total probability formula; Bayes's Formula; Independent Events; 3. Discrete Random Variables; Probability mass function; The cumulative distribution function; Expected value; Variance; The Bernoulli and binomial random variables; 4. The Poisson random variable; The Geometric Random Variable; The Negative Binomial Random Variable; The Hyper-geometric Random Variable; Expected Value of Sums of Random Variables; 5. Continuous Random Variables; Probability density function; The cumulative distribution function; Expectation and variance of continuous random variables; 6. The Uniform Random Variable; Normal Random Variables; The Normal Approximation to the Binomial Distribution; Exponential Random Variables; The Distribution of a Function of a Random Variable; 7. Jointly Distributed Random Variables; Joint Distribution Functions; Independent Random Variables; Sums of Independent Random Variables; Identically Distributed Uniform Random Variables; Conditional Distributions: Discrete Case; Conditional Distributions: Continuous Case; Joint Probability Distribution of Functions of Random Variables; 8. Expectation of Sums of Random Variables; Moments of the Number of Events that Occur; Covariance, Variance of Sums, and Correlations; 9. Conditional Expectation; Computing Expectations by Conditioning; Computing Probabilities by Conditioning; Conditional Variance; Conditional Expectation and Prediction; Moment Generating Functions; 10. Limit Theorems; Markov's inequality; Chebyshev's Inequality and the Weak Law of Large Numbers; 11. The Central Limit Theorem; The Strong Law of Large Numbers; 12. Point Estimation: Moment method, Maximum Likelihood Method, Bayesian method; 13. Testing hypotheses: concepts of hypothesis testing, Neyman - Pearson lemma, Likelihood ratio test, Confidence intervals; 14. Simple Linear Regression.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

2ND YEAR, 2ND SEMESTER

COURSE TITLE: FUNDAMENTALS OF DATABASES

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Proficiency in general concepts of databases; Presentation of different models of data description in particular of relational model; Knowledge of languages database query; Comprehensive integrity and

technical restrictions to normalize relations; Knowledge of representation at the physical level of the data in a database; Signing of notions of integrity and data security.
COURSE CONTENTS: 1. Concepts and database issues; 2. Designing logic databases; 3. Database with hierarchical and network structures; 4. Relational databases; 5. Data query languages for the relational model; 6. Restriction of integrity in databases: 6.1. Functional dependencies; 6.2. Multi-value dependencies; 7. Modelling relational databases: 7.1. Normal forms in the database; 7.2. Relations normalization techniques; 8. Physical structure of databases; 9. The integrity and security of databases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the final grade – written exam; 40% of the final grade – laboratory)

COURSE TITLE: OPERATING SYSTEMS DESIGN
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, mandatory
COURSE OBJECTIVE(S): Understanding particular aspects related to design and implementation of operating systems; How the theoretical concepts are mapped on real implementation; Interaction with hardware layer; Algorithms used for solving standard modules of operating systems.
COURSE CONTENTS: 1. Operating systems concepts; Structures: monolithic, microkernel, exokernel; Layered operating systems, virtual machines, client-server; Comparison; 2. System calls: processes management, signalling, files and folders management; MINIX internal structure; 3. Processes; Management; IPC; Scheduling; Implementation; System initialization; 4. Deadlocks; 5. System calls FORK, EXIT, WAIT, and EXEC; 6. Interrupts handling; Hardware support; I/O; Principles of I/O hardware; 7. Memory management; Concepts; Memory map; Messages handling; 8. File systems; Concepts; Protection mechanisms; 9. Implementation considerations; Header files, global data structures; Tables management; Operation with files, folders, and paths.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam (60% of the final grade – written exam; 40% of the final grade – laboratory)

COURSE TITLE: WEB TECHNOLOGIES
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): knowledge of the services offered by the Internet; study methodologies, standards and techniques for developing Web applications; offer the skills to design complex Web sites and applications; capacity to achieve interactive Web sites.
COURSE CONTENTS: 1. Introduction to Internet: 1.1. Web Characteristics; 1.2. Web Clients and Servers; 1.3. Formatting models for Web Documents; 2. Client/Server Model. HTTP Protocol; 3. Design web pages using X(HTML) language: 3.1. (X)HTML Tags; 3.2. Structure of (X)HTML documents; 3.3. Using tables, frames and forms; 4. Formatting Web pages using Cascading Style Sheets (CSS); 5. eXtended Markup Language (XML): 5.1. XML Document Syntax: elements, attributes, comments; 5.2. XML Document Validation; 5.3. Document Object Model (DOM); 5.4. Processing XML documents; 6. Formatting XML documents using XSLT; 7. WEB Applications Programming: 7.1. Server-Side: CGI (Common Gateway Interface). PHP Language; 7.2. Client-side: JavaScript, AJAX; 7.3. Publishing databases on the Web; 8. Architecture, organization and maintenance of Web sites; 9. Web application security; 10. Search engine optimization (SEO); 11. Web Services.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam (60% of the final grade – written exam; 40% of the final grade – laboratory)

3RD YEAR, 1ST SEMESTER

COURSE TITLE: METHODS OF ALGORITHMS ANALYSIS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, mandatory
COURSE OBJECTIVE(S): Capability of analysing the performance of an algorithm; Capability of evaluating the complexity of a problem implementation.
COURSE CONTENTS: 1. Introduction to algorithms design; Methods for designing algorithms; The concept of algorithm; Features of algorithms; 2. Turing machine; Variants of the Turing machine model; Deterministic and non-deterministic Turing machine; Turing machines and formal languages; 3. Correctness of algorithms; Validate/verify algorithm correctness; 4. Analyse the algorithms efficiency; Complexity analysis of algorithms; Execution time; The order of growth; 5. Analysis of non-recursive algorithms; Estimate the time of execution (best-case, average-case, worst-case); 6. Asymptotic analysis and asymptotic notations: o, O, W, w, Q; Properties of asymptotic notations; Complexity classes; 7. Analysis of recursive algorithms; Forward/backward substitution method; Iteration method; Master method; Trees recurrence method; 8. Analysis of algorithms; Case Study: Towers of Hanoi; Correctness and complexity analysis; 9. Inefficiency and incomputable algorithms; 10. NP-Completeness; Deterministic

algorithms; P and NP classes; NP-complete problems
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam (70% of the final grade – written exam; 30% of the final grade – laboratory)

COURSE TITLE: GENETIC ALGORITHMS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): Understanding the principles of functioning of genetic algorithms; Knowledge of various types of genetic algorithms and their main applications.
COURSE CONTENTS: 1. Introduction to evolutionary computation: evolutionary computation specificity, fundamentals, areas of applicability; 2. Search space and fitness function: coding search space (data structures, encoding rules: binary, integer, real, specific), building fitness function; 3. Selection methods: selection by rank, roulette method, proportionate fitness method, universal stochastic selection, truncation selection, local selection, tournament selection, comparison of selection methods; 4. Crossover operator: binary crossover, real crossover, adjacent crossover, path crossover, ordinal crossover, matrix crossover; 5. Mutation operator: binary mutation, real mutation, integer mutation, specific mutation; 6. Reinsertion: local reinsertion, global reinsertion; 7. Applications of genetic algorithms: optimization problems, NP-complete problems, applications in algebra; 8. Schemes and blocks: definitions, characteristics, scheme theorem, blocks; 9. Types of genetic algorithms: convergence problems, modified genetic algorithms, hill climbing algorithm, simulated annealing algorithm, algorithms with variable size population, constrained algorithm, qualitative study.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – written exam; 30% of the final grade – laboratory)

COURSE TITLE: KNOWLEDGE BASES
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): Proper description of programming paradigms and specific language mechanisms, as well as the identification of the difference between the semantic and syntactic aspects; Interpretation of mathematical and computational models (formal).
COURSE CONTENTS: 1. Aspects of knowledge representation: classes of knowledge, methods for knowledge representation and reasoning, knowledge bases, systems of knowledge representation and processing; 2. Structured knowledge representation and processing: knowledge bases with frames, queries; 3. Rewriting systems: Systems Lindenmayer, rewriting mechanisms: nodes rewriting and arcs rewriting, FASS curves; 4. Semantic Networks: labelled graphs, semantic schemas, WordNet semantic network; 5. Systems of knowledge representation and processing with production rules: Formalism. Inference Engine, Expert Systems; 6. Knowledge representation in natural language processing: Classes of grammars and languages, grammars in Prolog representation, dependency grammars, text analysis with syntactic constituents, meaning of words - automatic disambiguation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – written exam; 30% of the final grade – laboratory)

COURSE TITLE: ELECTRONIC COMMERCE
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: optional complementary
COURSE OBJECTIVE(S): Internet bussiness management; B2B, B2C, and C2C technology and business models; User privacy, values-sensitive design, and related policy issues.
COURSE CONTENTS: 1. Electronic business transactions; 2. Web Services to Internet Business; 3. E-commerce business models; 4. Identity Management; 5. The Open-source movement; 6. Internet Portals and Virtual Business; 7. Webhosting; 8. Site's Administration.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium (project and written test)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: PARALLEL AND DISTRIBUTED ALGORITHMS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): The course presents numerical algorithms primarily for solving systems of equations or optimization problems; Will study algorithms that recognize high parallelization, relaxation methods such as Jacobi type and Gauss-Seidel, and we will address broader issues of communication and synchronization. We will discuss algorithms for inter-processor communication and provide a comprehensive analysis of asynchronous iterative methods to convergence; We implement algorithms known programming languages
COURSE CONTENTS: 1. Parallel and distributed architectures: 1.1. Examples of distributed architectures parallel; 1.2. Parallel computing

systems and their classification; 1.3. Synchronization problems in parallel and distributed algorithms; 2. Synchronous algorithms: 2.1. Algorithms for systems of linear equations and matrix inversion; 2.2. Iterative methods for nonlinear problems; 2.3. Unconstrained optimization – algorithms nonlinear; 2.4. Parallelization optimization problems; 2.5. Projection Algorithms; 3. Asynchronous algorithms: 3.1. Totally asynchronous iterative methods; 3.2. Partially asynchronous iterative methods; 3.3. Gradient type methods; 4. Organizing a network processor asynchronous distributed computing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: NUMERICAL COMPUTATION

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): Study of basic methods for numerical approximations in the linear and nonlinear algebra, numerical analysis and differential equations; Applications presentation to make learning theoretical concepts presented in the course; Algorithms development and their implementation in popular programming languages (C ++, Java)
COURSE CONTENTS: 1. Equations and systems of linear equations: 1.1. Newton's method; 1.2. Method of successive approximations; 1.3. Gradient method; 1.4. Numerical methods for algebraic equations: Lobacevski method, Bairstow method, Bernoulli method, Steffenson method, calculating the limits and the number of real roots; 2. Matrix. Systems of linear equations: 2.1. Matrix triangularization procedures; 2.2. Matrix factorization procedure: LR, QR; 2.3. Direct methods for solving linear systems; 2.4. Iterative methods for solving linear systems; 2.5. Determinants and matrix inversion calculation; 2.6. Characteristic polynomial. 3. Vectors and eigenvalues: 3.1. Numerical methods for calculating the characteristic polynomial; 3.2. Jacobi and Givens methods for calculating and eigenvectors for symmetric matrices; 3.3. Method of power, LR and QR methods for calculating matrix and eigenvectors for some; 4. Interpolation and approximation: 4.1. Procedures interpolation: Lagrange, Newton; 4.2. Interpolation by spline functions; 5. Finite differences. Numerical derivation: 5.1. Finite differences: ascending, descending, central; 5.2. Numerical derivation methods; 6. Numerical integration: 6.1. Newton methods for simple integrals; 6.2. Numerical methods for multiple integrals.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: FORMAL LANGUAGES, AUTOMATA AND COMPILERS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, mandatory
COURSE OBJECTIVE(S): Theoretical and practical foundations study underlying the design of a compiler; Explaining the stages and techniques of designing a compiler.
COURSE CONTENTS: 1. Grammars and languages: definitions, Chomsky classification, properties, recursion; 2. Finite automata: definition, representation, completely deterministic finite automata, finite automata minimization, finite automata and regular languages; 3. Context-free languages: properties, representation, simplification of the context free; 4. Pushdown automata: definition, operation, accepted languages by pushdown automata, equivalence with context-free languages accepted by pushdown automata; 5. Special classes of context-free grammars: grammars in Chomsky normal form, non-recursive grammars, LL grammars, LR grammars, precedence grammars; 6. Translation of languages: structure of a compiler, syntax-directed translation, finite translators, pushdown translators; 7. Lexical analysis: overview, design of a lexical analyser; 8. Syntactic analysis: general algorithms, LL analysis, LR analysis, precedence analysis; 9. Semantic analysis: semantic specification, semantic analysis model; 10. Intermediate code generation: syntax trees, intermediate code with three addresses; 11. Intermediate code optimization: simple optimization, global optimization, local optimization; 12. Object code: types of object code, code optimization; 13. Symbol table: types of tables, tree tables, hash tables; 14. Error handling: error sources, correction techniques.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30% of the final grade – laboratory)

COURSE TITLE: WEB APPLICATION DEVELOPMENT

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: optional speciality
COURSE OBJECTIVE(S): understanding and learning the Java EE technologies; learn the skills to install and configure a Web Server with Servlets support; learn to use the languages and the Web technologies necessary to develop Web Applications; get the ability to use modern frameworks that speed up the development of Web Applications.

COURSE CONTENTS: 1. Introduction to JSP and Tomcat: 1.1. The HTTP protocol; 1.2. General description of JSP pages, examples, JSP to Servlet translation; 1.3. Installing and configuring the Tomcat Server; 2. Java Servlet Technology: 2.1. Servlet lifecycle; 2.2. Sharing Information; 2.3. Initializing a Servlet; 2.4. Service Methods; 2.5. Filtering; 2.6. Invoking Other Resources; 2.7. Web Context; 2.8. Client State (Sessions); 2.9. Finalizing a Servlet; 3. JSP Technology: 3.1. JSP Page Lifecycle; 3.2. Creating static/ dynamic contents; 3.3. Unified Expression Language; 3.4. JavaBeans Components; 3.5. Reusing contents; 3.6. Control Transfer to Another Web Component; 3.7. Groups of JSP Pages; 3.8. JSP Documents; 4. Scripting in JSP Pages: 4.1. Using and configuring scripting; 4.2. JSP declarations; 4.3. JSP Scriptlets; 4.4. JSP Expressions; 5. JSTL and Custom tags in JSP pages: 5.1. Using JSTL; 5.2. Core/ XML/ I18N/ SQL/ Functions libraries; 5.3. Customizing tags in JSP; 6. JSF Technology: 6.1. User Interface Component Model; 6.2. Navigation Model; 6.3. Backing Beans; 6.4. JSF Page Lifecycle; 7. Using JSF technology: 7.2. Core tags; 7.3. Localization; 7.4. Convertors; 7.5. Listeners; 7.6. Validators; 7.7. Bindings; 7.8. Configuring JavaServer Faces Applications; 8. Java Persistence API: 8.1. Entities; Managing Entities; 8.2. Persistence in the WebTier.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 30% of the final grade – laboratory)

COURSE TITLE: NON-PROCEDURAL PROGRAMMING

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, optional
COURSE OBJECTIVE(S): To learn the basic schemes of non-procedural programming; To understand the meaning of this type of programming in the more general programming development framework; Highlight the differences between logic programming, the functional one and the manner of choosing between them depending on the treated problem.
COURSE CONTENTS: 1. Introduction: 1.1. Logic programming vs. functional programming; Examples; 2. Logic programming. Prolog language: 2.1. Data structure in Prolog; 2.2. Built-in predicates; 2.3. Unification and recursion; 2.4. Lists in Prolog; 2.5. Compound terms in Prolog; 2.6. I/O in Prolog; 2.7. Backtracking and cut in Prolog; 2.8. Graphs and trees in Prolog; 2.9. Characters and strings; 2.10. Dynamic databases; 3. Functional programming; Lisp language: 3.1. Numbers in Lisp; 3.2. Lists; 3.3. Arithmetic; 3.4. Strings and characters; 3.5. Symbols; 3.6. Packages; 3.7. Basic processing in Lisp; 3.8. Function definition; 3.9. Predicate functions; 3.10. Conditional expressions; 3.11. Recursion; 3.12. Recursion with lists
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium (written test)

FIELD: PHYSICS
PROGRAMME TITLE: MEDICAL PHYSICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS

CODE: D2FML101
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): The course's main goal is for students to acquire a mathematical background and of some computational skills required at the assimilation of specialized information and at solving various practical problems.
COURSE CONTENTS: I. Differential calculus: 1. Elements of set theory; Basic structures of mathematical analysis; 2. Sequences and series of numbers; 3. Power series; Taylor series; 4. Limit of a function at a point; Continuity; 5. First-order partial derivatives and first-order differentials; 6. Second-order partial derivatives and second-order differentials; Unconditioned extrema for functions of several variables; 7. Implicit functions and conditioned extrema; II. Integral calculus: 1. Integral of simple functions; 2. Improper integral; 3. Line integral (of first and second kind); 4. Double integral; Triple integral; 5. Surface integral (of first and second kind); 6. Integral formulas; 7. Elements of vector calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: FUNDAMENTAL MODELS IN CLASSICAL PHYSICS

CODE: D2FML102
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Introduction of some fundamental physical models necessary at the description of various processes and phenomena specific to classical physics.
COURSE CONTENTS: 1. Introduction; Physics – a fundamental science of Nature; 2. Scalar and vector physical quantities; Cartesian coordinate systems; Elements of vector algebra; 3. The single point particle model; Kinematics of a point particle: velocity and acceleration; The principles, theorems and main laws of the dynamics of a point particle; Simple motions of a point particle; 4. The two-particle system model; Particle scattering and disintegration; 5. The ideal gas model; Kinetic molecular theory of an ideal gas; Elements of thermodynamics of ideal gases; 6. Vector calculus in classical physics; Scalar and vector fields: equipotential surfaces, field lines, circulation and flux of a vector field, gradient of a scalar field, divergence and curl of a vector field; 7. The electric field; Elementary notions of electrostatics; 8. The magnetic field; Elementary notions of magnetostatics; 9. Direct (electric) current; Fundamentals of direct current circuits; 10. The ray model of light; Elements of geometrical optics; Description and optical modelling of the human eye.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: MOLECULAR PHYSICS AND HEAT

CODE: D2FML103
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Macroscopic description of thermal phenomena and kinetic molecular properties of matter.
COURSE CONTENTS: I. Thermodynamics (Heat): 1. Introduction. Fundamentals: thermodynamic systems and specific notions; 2. Clausius–Thompson–Planck–Caratheodory (CTPC) principles of equilibrium thermodynamics; The general law of equilibrium thermodynamics; The zeroth law of thermodynamics; Empirical temperature; Properties of thermodynamic equilibrium; 3. The first law of thermodynamics; Equivalent formulations; 4. The second law of thermodynamics; Reversible bi-thermal cyclic processes; Carnot's theorem; Absolute thermodynamic temperature; On the Clausius's equality; Efficiency of the Carnot cycle; Equivalent formulations of the second law of thermodynamics; 5. Reversible poly-thermal cyclic processes; Thermal machines; Refrigerating machines; 6. Entropy; Clausius's equality; Clausius's inequality; Irreversible cyclic processes; The law of increase of entropy; 7. The third law of thermodynamics; Equivalent formulations; Consequences; 8. Empirical information needed at the CTPC construction of equilibrium thermodynamics; 9. Thermodynamics of the equilibrium states of fluids; Ideal gases; The laws of thermodynamics applied to ideal gases; Mixtures of ideal gases; II. Molecular physics: 1. Introduction; The molecular and kinetic representation of matter; The atomic structure of matter; 2. Kinetic molecular theory of ideal gases; The fundamental formula of the kinetic molecular theory of ideal gases; 3. The kinetic molecular significance of temperature; The equation of state of an ideal gas; The ideal gas laws; 4. Brownian motion; The barometric formula; Boltzmann's law; Statistical distributions; 5. Transport phenomena in gases; Diffusion in gases; The fundamental law of diffusion (Fick's law); Caloric conductibility; Fourier's law; 6. Real gases; The Van der Waals equation.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: NEWTONIAN MECHANICS

CODE: D2FML104
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Newtonian description of mechanic motion.
COURSE CONTENTS: 1. Introduction; 2. Vectors; Vector calculus; 3. Description of position; Description of motion; Velocity; Acceleration; 4. Examples of motion of a single point particle; 5. The composition law of position vectors, velocities and accelerations; 6. The laws of Newtonian mechanics; 7. Galilean transformations; Galilei's law of relativity (in Newtonian mechanics); 8. Theorems and conservation laws for a single point particle: momentum, angular momentum, kinetic energy; 9. Conservative forces; One-particle potential energy; 10. Total energy theorem and conservation law for a single point particle; 11. Theorems and conservation laws for a system of point particles: momentum, angular momentum, kinetic energy; 12. Two-particle potential energy; 13. Total energy theorem and conservation law for a system of point particles; 14. Motion in a central force field; 15. The two-body problem; 16. The gravitational interaction in Newtonian mechanics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: LANGUAGE COURSE I

CODE: D2FML105
ECTS CREDITS: 2
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): To improve the students' communication skills in English in the event of: cultural exchanges, participation in international scientific events, etc.; To improve the students' reading, writing and oral skills in English such that they will be able to understand a specialized scientific text, to follow an oral presentation of a specialized scientific subject, and also to write and speak in English on various themes within their scientific expertise domain.
COURSE CONTENTS: 1. General aim of scientific language and an overview of the means to reach it: objectivity, impersonal style, rhetorics of scientific argumentation, hedging and boosting, etc.; 2. Nominal style, passive voice, use of the tenses in English scientific discourse; 3. The use of modalities in English scientific discourse; 4. Linguistic elements that structure the English scientific discourse; 5. Rule to be taken into consideration when writing a scientific text in English; 6. The use of argumentative strategies in English scientific debates.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: LINEAR ALGEBRA

CODE: D2FML206
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): Familiarization of students with elementary notions of algebra and linear algebra necessary at the study of Physics.
COURSE CONTENTS: 1. Groups and subgroups; Equivalent definitions of the notion of group; Computation rules within a group; Subgroups; Lagrange's theorem; Cyclic subgroup; Order of an element in a group; Centre of a group; Examples; 2. Normal subgroup; Equivalent definitions; Factor group; Examples; 3. Group morphisms; Group morphisms and isomorphisms; Morphism kernel and morphism image; Examples; 4. Rings and subrings; Ring; Definition; Elements with inverse; Zero divisors; Computation rules within a ring; Subring; Examples; 5. Ideal and ring factor; Definition; Operations with ideals; Ring morphisms and isomorphisms; Kernel and image; Ring factor of a ring by one of its bilateral ideals; Examples; 6. Fields and subfields; Equivalent definitions; The field of complex numbers, the field of quaternions; Field morphisms and isomorphisms; Examples; 7. Vector spaces; Real/ complex vector spaces; Definitions; Linear combinations; Linear independence, linear dependence; Examples; 8. Vector subspaces; Definitions; Examples; 9. Generator systems and bases; Generator systems; Basis; Dimension; Linear transformation matrix; Change of vector components upon a change of basis; The substitution lemma and its applications; Examples; 10. Euclidean vector spaces; Scalar product; Euclidean norm; Orthonormal bases; The Gram-Schmidt process; Examples; 11. Linear operators; Definitions; Examples; 12. Eigenvectors and eigenvalues; Definitions; Computation of eigenvectors and eigenvalues; Applications to matrix diagonalization; Examples.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: INTRODUCTION TO MATHEMATICAL PHYSICS

CODE: D2FML207
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty

COURSE OBJECTIVE(S): Approach to simple physical models that are exactly solvable by means of differential equations.
COURSE CONTENTS: 1. Introduction; 2. Ordinary differential equations; General concepts; Existence and uniqueness theorems; 3. First-order ordinary differential equations; Separable first-order ordinary differential equations; Linear first-order ordinary differential equations; Ordinary differential equations reducible to linear first-order ordinary differential equations; 4. Second-order ordinary differential equations; Linear second-order ordinary differential equations, fundamental system of solutions; Homogeneous linear second-order ordinary differential equations with constant coefficients, general solutions, solutions to associated Cauchy problems; Non-homogeneous linear second-order ordinary differential equations with constant coefficients, general solutions, solutions to associated Cauchy problems; 5. Partial differential equations; General concepts; Existence and regularity theorems; 6. First-order partial differential equations; Integration of homogeneous linear first-order partial differential equations; Integration of non-homogeneous linear first-order partial differential equations; 7. Linear second-order partial differential equations; Fundamental solution of the Laplace equation; Fundamental solution of the heat conduction equation; Wave equation, the d'Alembert formula.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: ELECTRICITY AND MAGNETISM
CODE: D2FML208
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Description of electric, magnetic and electromagnetic phenomena via the fundamental laws of electrostatics, magnetostatics and electrodynamics.
COURSE CONTENTS: 1. Introduction; 2. Electrostatics; The electrostatic interaction; Electric charge (quantization, conservation, relativistic invariance); Coulomb's law; Electrostatic field in vacuum; Strength (intensity) of the electric field; The superposition principle; Continuous electric charge distributions; Applications; 3. Electrostatics; Field lines; Electric flux; Gauss's law; Applications of Gauss's law to the computation of the intensity of the electric field; 4. Electrostatics; Electric potential; Applications: continuous electric charge distributions; electric dipole; 5. Electrostatics; Divergence of an electrostatic field; Local form of Gauss's law; Curl of an electrostatic field and the electric potential; The fundamental equations of vacuum electrostatics; Poisson's equation and Laplace's equation; The fundamental problem of electrostatics and boundary conditions; 6. Electrostatics; Work and energy in electrostatics; Energy of a discrete electric charge distribution; Energy of a continuous electric charge distribution; Applications; 7. Electrostatics; Conductors in an electrostatic field; Electrostatic pressure; Electric capacitors; Special techniques for solving the fundamental problem of electrostatics, the uniqueness theorem; The method of image (mirror) charges; 8. Electrostatics; Localized electric charge distributions – the dipole approximation; An electric dipole in an external electrostatic field; Application: the electrostatic dipole-dipole interaction; 9. Electrostatics; Electric fields in material media; Dielectrics; Atomic and molecular dipoles; Induced and permanent dipoles; The electric polarization vector; The electric field due to a polarized medium; Electrical induction and Gauss's law in the presence of dielectrics; Electrical susceptibility and permittivity; The fundamental equations of electrostatics in dielectric media; Coulomb's law and energy in dielectric media; 10. Basics of electro-kinetics; Electric currents; Intensity of an electric current; Electric current density; Conservation law of the electric charge and the continuity equation; Movement of charged particles in a uniform electrostatic field; Steady electric currents; Electric generators; The electromotive force; Ohm's law and Joule's law (in local and respectively global form); The classical theory of electric conduction in metals (Drude-Lorentz); Electric circuits and Kirchhoff's laws; 11. Magnetostatics; The magnetic interaction; Magnetostatic fields; Induction of a magnetic field; The Lorentz force; Application: movement of charged particles in electric and magnetic fields; The Hall effect; 12. Magnetostatics; The magnetic field created by a steady electric current; Ampère's circuital law; The curl of a magnetic field and Ampère's law in local form; The divergence of a magnetic field; The fundamental equations of vacuum magnetostatics; Boundary conditions; 13. Magnetostatics; The vector potential; The Biot-Savart-Laplace law; Applications: the magnetic field created by various current distributions; Electrodynamical forces; 14. Magnetostatics; The dipole approximation of a magnetic field; Dipolar magnetic moment; A magnetic dipole in an external magnetic field; 15. Magnetostatics; Magnetic fields in material media; Atomic and molecular magnetization; Diamagnetism, paramagnetism, ferromagnetism; Magnetization vector; The magnetic field created by a magnetized medium; The strength of the magnetic field and Ampère's law; Magnetic susceptibility and permeability; The fundamental equations of magnetostatics in magnetic media; 16. Electromagnetic induction; Faraday's law; The differential form of Faraday's law; Inductance; Mutual inductance; Self-induction; Applications;

Energy in a magnetic field; 17. Introduction to electrodynamics; Maxwell's equations; Electromagnetic waves in vacuum; Conservation law of the electric charge and the continuity equation; The conservation law of the electromagnetic energy (Poynting's theorem); 18. AC circuits; The study of AC circuits by means of the phasor, analytical and complex number methods; The series and parallel RLC circuits; AC power; Resonance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (60% of the final grade), global exam (40% of the final grade)

COURSE TITLE: OPTICS
CODE: D2FML209
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Description of physical phenomena specific to optics.
COURSE CONTENTS: 1. Introduction; Principles of geometrical optics: Light ray equation; Fermat's principle; General stigmatism conditions; Concave and convex mirrors; 2. Centred optical systems: spherical dioptres, transfer matrix, cardinal elements, spherical lenses, lens systems, diaphragms; The prism; 3. Aberrations: chromatic and geometrical; 4. Elements of photometry; 5. Wave (physical) optics; Huygens's principle; Plane waves; Phase velocity; 6. Interference; Young's experiment; Fresnel's mirrors; Fresnel's bi-prism; Billet's split lenses; 7. Multiple beam interference; Fringes at infinity; Fringes of equal inclination; 8. Diffraction; The Huygens-Fresnel principle; 9. Diffraction at a rectangular slit; Diffraction at a circular slit; Diffraction at two rectangular slits; The diffraction grating; 10. Light polarization; Malus's law; Brewster's law; Birefringence; Biaxial crystals; Elliptically polarized light; 11. Electromagnetic waves: Maxwell's equations in vacuum and in material media, Maxwell's equations in the case of electromagnetic waves, spherical and plane waves, Poynting vector and energy flux; 12. Reflection and refraction of electromagnetic waves: the laws of reflection and refraction, Fresnel's formulas, total internal reflection and phase relations for total internal reflection, reflection and refraction in absorbent media; 13. Dispersion theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (70% of the final grade), global exam (30% of the final grade)

COURSE TITLE: GENERAL CHEMISTRY
CODE: D2FML210
ECTS CREDITS: 2
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): The main purpose of this subject is to familiarize the students with the basic knowledge of chemistry – a science related to physics (the emphasis being set on physical chemistry knowledge, useful for a deeper understanding of some aspects of physics, and also later for them as future specialists).
COURSE CONTENTS: 1. The atom; Quantum model of the atom; Quantum numbers; Atomic orbitals; 2. The periodic table of the elements; Electronic configurations of atoms and ions; Periodic variation of some of their properties; 3. The ionic bond; Ionic crystal lattices; Ionic bond formation; Ionic crystal lattices; The Haber-Born cycle; 4. The metallic bond; Metal crystal lattices; Metallic bond formation; Metal crystal lattices; The electronic band structure model; 5. The covalent bond; Formation of molecules; Covalent bond formation; Molecular orbital energy diagrams; Stability of molecules; Magnetic properties; Bonding order; 6. Examples of molecules; Representative molecules of inorganic chemistry – applications to medical physics and environmental physics; Representative molecules of organic chemistry – applications to medical physics and environmental physics; 7. Geometry of molecules; The VSEPR model; Standard geometry of a molecule; Real geometry of a molecule; 8. Symmetry of molecules; Symmetry transformations; Symmetry elements of a molecule; Point groups; Molecular properties due to the symmetry (polarity and chirality); Molecular vibrations and their symmetry; 9. Chemical kinetics; Reaction rates; Rate laws; Rate constants; First-order reactions and second-order reactions; 10. Thermochemistry; Endothermic and exothermic chemical reactions; The Lavoisier–Laplace law; The Hess law; 11. Chemical equilibrium; Le Chatelier's principle; Equilibrium constants; 12. Electrochemistry; Electrodes and electrolytes; Galvanic cells; Electrolysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: THEORETICAL MECHANICS
CODE: D2FML301
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Lagrangian and Hamiltonian formulations of classical dynamics.
COURSE CONTENTS: Introduction; I. Lagrangian formalism: 1. The Euler–Lagrange equations; Solutions to the Euler–Lagrange equations; Variational principle; 2. Newton's equations for conservative forces; 3. Constraints; Newton's equations in the presence of constraints; 4. Generalized coordinates; The Lagrange equations; Action principle in Lagrangian form; 5. Integrals of motion in Lagrangian formalism; Symmetry

transformations; The Noether theorem; General consequences of the Noether theorem; II. Hamiltonian formalism: 1. The (canonical) Hamilton equations; Action principle in Hamiltonian form; 2. The phase-space; The Poisson bracket; 3. Integrals of motion in Hamiltonian formalism; The Poisson theorem; 4. Arbitrary coordinate transformations on the phase-space; 5. Canonical transformations; Generating functions of canonical transformations Infinitesimal canonical transformations; 6. The Hamilton-Jacobi method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: THERMODYNAMICS

CODE: D2FML302
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Macroscopic description of thermal phenomena.
COURSE CONTENTS: 1. Introduction; 2. The laws of the Clausius-Thompson-Planck-Caratheodory (CTPC) formulation of equilibrium thermodynamics; Empirical information needed at the construction of the CTPC formulation; 3. The fundamental problem of equilibrium thermodynamics; The laws of the Gibbs formulation of equilibrium thermodynamics (in the entropic representation); Work and heat in the Gibbs formulation; 4. Conditions for thermodynamic equilibrium; Evolution towards thermodynamic equilibrium; 5. Primary equations of state; The Euler equation; The Gibbs–Duhem equation; 6. Legendre transforms of internal energy: thermodynamic potentials; Examples: the Helmholtz potential, the Gibbs potential, the grand-canonical potential, the enthalpy; The fundamental property of thermodynamic potentials; 7. General stability conditions of thermodynamic systems; General consequences of the stability conditions; 8. Planck and Nernst formulations of the third law of thermodynamics; Isothermal derivatives of entropy; General consequences of the third law of thermodynamics; Behaviour of heat capacities in the limit $T \rightarrow 0$; 9. Types of phase transitions; Classifications; Gibbs's phase rule; First-order phase transitions; The Clapeyron–Clausius equation; Second-order phase transitions; The Ehrenfest equations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: ELECTRODYNAMICS

CODE: D2FML303
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE: Formation of cognitive and applicative competences concerning the electromagnetic phenomena.
COURSE CONTENTS: 1. Special relativity theory: laws of special relativity; Relativistic kinematics; Relativistic dynamics: the free relativistic particle; 2. Charged particle in an electromagnetic field: action, equations of motion, conservation laws; 3. Covariant formulation of the electromagnetic field: the tensor of the electromagnetic field, significance, transformation laws, invariants of the electromagnetic field; 4. The Maxwell equations in vacuum; 5. The electromagnetic field in material media; General form of the Maxwell equations in material media; 6. Energetic description of the electromagnetic field; The Noether theorem; Conservation laws; 7. Electrostatics; The Poisson equation; Electrostatics of dielectrics and conductors; 8. Steady magnetic fields; The fundamental equations of magnetostatics; Multipole expansions; 9. Electromagnetic fields generated by steady or quasi-steady electric currents; The Hall effect; Thermoelectric effects; 10. Electromagnetic waves; Monochromatic electromagnetic plane waves; Spectral decomposition of waves; Waves in material media; 11. Theory of electromagnetic radiation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: QUANTUM MECHANICS I

CODE: D2FML304
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Non-relativistic description of the kinematics and dynamics of micro-systems.
COURSE CONTENTS: 1. Elements of algebra and topology; The Dirac formalism; 2. The axiomatic basis of quantum kinematics; 3. Time evolution of quantum systems; The central problem of quantum mechanics; 4. Alternative descriptions of the evolution of quantum systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: ELECTRONICS AND MEDICAL EQUIPMENT

CODE: D2FML305
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Description of physical phenomena specific to electronics.
COURSE CONTENTS: 1. Introduction; 2. Crystal structure; Intrinsic semiconductors; Extrinsic semiconductors; Carrier transport in semiconductors; 3. Introduction to the p-n junction

layer; The p-n junction layer at thermal equilibrium; Direct and inverse polarization of the p-n junction layer; 4. The current–voltage curves of semiconductor diodes; Rectifiers based on semiconductor diodes; The Fourier analysis of the rectified signal; 5. Applications of semiconductor diodes; Circuits with semiconductor diodes; 6. Bipolar transistors; Static characteristics of bipolar transistors; 7. Junction Field Effect Transistors (J-FET and MOS-FET); 8. Optical sensors in medical devices; 9. Diagnostic and monitoring equipment based on optoelectronic devices; 10. Optoelectronic devices used to generate and analyse medical information.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: PHYSICS OF THE ATOM AND MOLECULE

CODE: D2FML406
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Developing the students' abilities to explain various phenomena specific to the atomic and molecular physics and to interpret diverse experimental results arising within this context.
COURSE CONTENTS: 1. The concept of atom; Atomic constituents of matter (The electron – an atomic constituent of matter; Determination of atomic weights; Isotopes; The nuclear structure of atoms); 2. Thermal radiation (Laws of thermal radiation; Hypothesis of energy quanta; Planck's law); 3. Atomic spectra; Bohr's atomic model (Empirical rules in spectroscopy; Bohr's atomic model; Energy levels; Atomic magnetic moments; The Stern-Gerlach experiment; The correspondence principle); 4. The wave-particle duality (The wave-particle duality for the photon; The photoelectric effect; The Compton effect; Creation and annihilation of the electron-positron pair; The wave-particle duality for matter particles: the de Broglie waves, the Davisson-Germer experiment, the Thomson experiment; Statistical interpretation of the de Broglie waves; Uncertainty relations); 5. Notions of quantum mechanics (Wave functions; The Schrödinger equation; One-dimensional systems; Orbital angular momentum; Spin angular momentum); 6. One-electron atoms in quantum mechanics (Levels of energy; Hydrogen-like wave functions; Cloud probability distribution); 7. The interaction of electromagnetic radiation with one-electron atoms (Transition probability for stimulated emission, absorption of radiation and spontaneous emission; Electric dipole transitions; Selection rules; Characteristics of spectral lines); 8. Atoms with one electron: spin corrections (Fine structure corrections; Atoms in an external magnetic field); 9. Two-electron atoms (Systems of identical particles; Energy level diagram; Wave functions and Pauli's exclusion principle; The model of independent particles; The fundamental (ground) state of Helium; Singly excited states of Helium; The Auger effect); 10. Molecular structure of matter (The Born–Oppenheimer approximation; Electronic states of diatomic molecules; Rotations and vibrations of diatomic molecules; Molecular spectra).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

COURSE TITLE: PHYSICS OF SEMICONDUCTORS WITH APPLICATIONS TO MEDICINE

CODE: D2FML407
ECTS CREDITS: 7
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): The aim of this discipline is to offer information about the baseline characteristics of different types of solids: metals and semiconductors. The properties, theoretical models, and experimental results related to these materials are also investigated, along with the main phenomena and effects occurring in solids. This course points out the significant role of semiconductors in medical devices.
COURSE CONTENTS: 1. Solid state; Introduction; Crystal classification; Symmetries of the crystal lattice; Two-dimensional and three-dimensional lattices; Crystallographic notations: nodes, directions, planes; The reciprocal lattice and its properties; 2. Experimental methods in crystallography; X-ray diffraction (the Laue method, the rotating crystal method, the Debye-Scherrer method); Electron and neutron diffraction; 3. Defects in crystals; Point defects (vacancies – Schottky defects, interstitial – Frenkel defects); Line defects – dislocations; Two-dimensional and three-dimensional defects; 4. Vibrations of the crystal lattice; The continuum approximation; The coupled oscillator model: vibration modes for lattices with one kind and two kinds of atoms; Statistics of lattice vibrations; 5. Theory of specific heats of solids; The classical theory; Einstein's model; Debye's theory; 6. Motion of electrons in a periodic potential; General concepts; Bloch functions; Properties of the Bloch functions; Shape of the energy spectrum; Velocity and acceleration of electrons in a periodic potential; 7. Approximations used at the study of motion of electrons in crystal lattices; The free-electron model of metals; The statistics of electrons in metals; 8. Emission phenomena in metals; Thermo-electronic emission; The influence of electric fields on the thermo-electronic emission; The Schottky effect; Self-emission of electrons from metals; 9. The nearly-free electron approximation;

Study of the one-dimensional case and generalization to three-dimensional case; The tight-binding approximation; Study of the one-dimensional case and generalization to the three-dimensional case; 10. Semiconductors; Generalities; Intrinsic semiconductors; Charge carrier statistics for intrinsic degenerate and non-degenerate semiconductors, respectively; 11. Extrinsic semiconductors; Energy of additional levels in extrinsic semiconductors; Charge carrier statistics in extrinsic semiconductors (n-type and p-type); Bipolar junction transistors; Semiconductor lasers and photo-devices; 12. Heterostructures; Optical properties of heterostructures; Transport properties of heterostructures; Metal-semiconductor devices; Applications of semiconductor heterostructures; 13. Basic properties of semiconductor detectors; Generalities; Principles of direct semiconductor detectors; Semiconductor detectors for medical imaging.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): current (30%), global (70%)
EVALUATION FORM: exam

COURSE TITLE: PHYSICS OF THE NUCLEUS

CODE: D2FML408
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Students should understand and apply the fundamental theoretical notions of nuclear physics and also be familiar with their experimental bases.
COURSE CONTENTS: 1. General nuclear properties; Structure of nucleons; (Nuclear binding energy; Nuclear size; Nuclear moments; Hyperfine interactions; Nuclear reactions); 2. General properties of nuclear radioactive decays; 3. Alpha decay (Energy of alpha particles; Dynamics of alpha-decay processes; Gamow factor; Penetration (tunnelling) through the Coulomb barrier; The Geiger–Nutall law); 4. Beta decay (Dynamics of beta-decay processes; Classification of beta decays; Neutrino in beta decay); 5. Gamma decay; 6. Interaction of radiation with matter; 7. Nuclear structure (The liquid drop model; The Fermi-gas model; The nuclear shell model); 8. Nuclear fission power plants; Nuclear fusion reactors; The ITER project.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: QUANTUM MECHANICS II

CODE: D2FML409
ECTS CREDITS: 3
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Solving some standard quantum systems: the harmonic oscillator and hydrogen-like ions.
COURSE CONTENTS: 1. The energy levels and stationary states of the harmonic oscillator; 2. Rotations; Mathematical aspects; 3. Quantum theory of angular momentum; Spherical harmonics; 4. The energy levels and stationary states of hydrogen-like ions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

COURSE TITLE: STATISTICAL PHYSICS

CODE: D2FML410
ECTS CREDITS: 4
TYPE OF COURSE: mandatory/fundamental
COURSE OBJECTIVE(S): Microscopic description of thermal phenomena.
COURSE CONTENTS: 1. Introduction; 2. Microscopic states, statistical states and macroscopic states of classical and quantum particle systems; 3. The phase-space; The Liouville measure; 4. Classical statistical ensembles; Evolution of classical statistical ensembles: the Liouville theorem and the Liouville equation; 5. Equilibrium classical statistical ensembles; Average of observables on the statistical ensembles and their properties; Statistical entropy; Variational principle of equilibrium statistical physics; 6. The classical microcanonical ensemble; 7. Massieu functions; Relationship between Massieu functions and thermodynamic potentials; 8. The classical canonical ensemble; 9. The classical grand canonical ensemble; 10. The von Neumann formulation of quantum mechanics; Density operator; 11. Quantum statistical ensembles; Evolution of quantum statistical ensembles: global and local form of the Liouville-von Neumannn equations; 12. Equilibrium quantum statistical ensembles; The fundamental principle of equilibrium quantum statistical physics; 13. The quantum microcanonical ensemble; 14. The quantum canonical ensemble; 15. The quantum grand canonical ensemble; 16. Quantum statistics of identical particle systems; Occupation number representation; The Bose-Einstein statistics; The Fermi-Dirac statistics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

3RD YEAR, 1ST SEMESTER

COURSE TITLE: HUMAN ANATOMY AND PHYSIOLOGY

CODE: D2FML501
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Assimilation of basic anatomic knowledge necessary at analysing the human motion in a complex manner, by means of an interdisciplinary approach involving anatomy, biomechanics and medical imaging.
COURSE CONTENTS: 1. Introduction to anatomy (Definition, Branches, Basic anatomic terminology); Tissues (Definition; Classification; Elements of ontogenesis); 2. Introduction to osteology; 3. Introduction to arthrology; 4. Introduction to myology; 5. Introduction to the study of the nervous system: neurons, spinal cord, spinal nerves, plexuses; 6. Introduction to the study of the central nervous system; 7. Head, neck and trunk: topographic regions; bones, muscles, joints, nerves and blood supply; 8. Upper limb: topographic regions; bones, muscles, joints, nerves and blood supply; 9. Lower limb: topographic regions; bones, muscles, joints, nerves and blood supply; 10. The thoracic cavity; The respiratory system; 11. The cardiovascular (circulatory) system; 12. The abdominal cavity; The digestive system; 13. The genitourinary system; 14. Growth and development: definition, anatomical basis, influence factors.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: GENERAL BIOPHYSICS

CODE: D2FML502
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Physics-based description of some biological processes; study of biophysical laws and phenomena specific to the human body.
COURSE CONTENTS:
1. Cell architecture; Cell types; Organelles of eukaryotic cells; Animal cells and plant cells; Molecules found in living cells; Nucleic acids; 2. Thermodynamic bases of biochemical reactions; 3. Diffusion; Applications of diffusion equations to biology; 4. Fluid dynamics; Microscopic behaviour; Hemodynamics; Fluid dynamics in plants; 5. Ionic and aqueous equilibrium; Osmotic pressure; 6. Water structure; Hydration effects; 7. Thermodynamics of flow processes in biological systems; 8. Cell membranes: functional and structural aspects; 9. Transport across cell membranes; 10. Excitable cells and bioelectric signals; 11. Animal locomotion; 12. Experimental methods and techniques used in biophysics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: DETECTORS, DOSIMETRY AND RADIOPROTECTION

CODE: D2FML503
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Familiarization of students with the basic notions of medical dosimetry, quantities, units, equipment, measurement techniques, protocols, etc.
COURSE CONTENTS: 1. Introduction (Dual character of radiation; Notion of radiation dose; Uses of radiation); 2. Protection against radiation (Problem statement; Types of ionizing particles; Quantities and units); 3. Dose estimate calculations (Dose from heavy charged ionizing particles; Dose from neutral ionizing particles; Dose from radionuclides placed inside the human body; Absorbed dose for gamma emitting particles placed inside the human body); 4. Principles of dosimetry; Quantities and units (Photon beam fluence and photon energy fluence; Kinetic energy released per unit mass – KERMA; Converted energy per unit mass – CEMA; Absorbed dose; Stopping power; Relationships among various dosimetric quantities); 5. General characteristics of ionizing radiation detection instruments (Sensitivity; Detection efficiency; Energy resolution; Time resolution; Charge collection; Detection principles and measurement methods); 6. Ionizing radiation detector types (Gaseous ionization detectors; Solid-state ionization detectors; Scintillation detectors; Neutron detection systems); 7. Contamination measurement; 8. National and European legislation on radiation protection and ionizing radiation hygiene; 9. Present radiation exposure of human population (Natural background radiation levels; Artificial background radiation levels; The concept of genetically significant radiation dose – GSRD).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

COURSE TITLE: CLASSICAL DESCRIPTION OF FIELD THEORIES

CODE: D2FML504
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Relativistic approach to elementary particles and fundamental interactions via the classical aspects of different field sectors in the Standard Model; solving specific partial differential equations by various numerical methods

and using standard symbolic computation software for developing some field theory applications.
COURSE CONTENTS: 1. Field theories on 4-dimensional Minkowski spaces; Variational principles for field theories; Lagrangian formalism; The Euler–Lagrange equations; 2. Variational principles for field theories; Hamiltonian formalism; The Hamilton equations; Examples; 3. Numerical methods for solving some specific partial differential equations; 4. Conserved quantities in field theories; Rigid symmetries of the Lagrangian action; Noether's theorem; 5. Classical Lagrangian and Hamiltonian theory of a free, real scalar field; 6. Classical Lagrangian and Hamiltonian theory of a free, complex scalar field; 7. Classical Lagrangian and Hamiltonian theory of the free electromagnetic field (Maxwell's theory); 8. Classical theory of the free Dirac field; 9. Elements of computer algebra and symbolic computation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: SYMMETRIES IN MOLECULAR SYSTEMS
CODE: D2FML505
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): To introduce and apply the mathematical tools appropriate for the study of molecular symmetries and to understand the consequences of the existence of molecular symmetries
COURSE CONTENTS: 1. Introduction; The importance of symmetries in Physics; 2. Basics of group theory; Groups; Subgroups; The rearrangement lemma; Classes and invariant subgroups; Factor groups and direct product groups; Group homomorphisms and isomorphisms; 3. Point groups and molecular symmetry; Symmetry elements and symmetry operations; Point groups, low symmetry point groups, intermediate symmetry point groups, high symmetry point groups; Determining the point group of a molecule; Molecular symmetry and physico-chemical properties of a molecule; 4. Basics of representation theory; Representations, equivalent representations, matrix representations; Reducible and irreducible representations, unitary representations; The character of a group representation, characters and symmetry classes; Schur's lemmas; The great and little orthogonality and completitude theorems; The regular representation of a group; Character tables; Direct product representations, reduction of reducible representations; Projection operators, change of basis, symmetry adapted linear combinations; 5. Applications to molecular vibrations; Normal coordinates and normal vibrations, internal coordinates; Determining the normal modes of vibration; Selection rules for infrared (IR) spectroscopy and Raman spectroscopy; 6. Applications to atomic orbital theory and molecular orbital theory; The problem of hybridization of atomic orbitals; The Hückel approximation in molecular orbital theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: NUCLEAR MEDICINE
CODE: D2FML506
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Accommodate the students with the two-fold aspects of nuclear medicine: imaging and therapy, along with radiation safety practice rules and quality assurance protocols of radiopharmaceuticals.
COURSE CONTENTS: 1. General introduction; 2. Instrumentation (Imaging equipment; Single photon imaging – Single Photon Emission Computed Tomography [SPECT]; Dual photon imaging – Positron Emission Tomography [PET and PET/CT]; Other instrumentation; Computers and networking); 3. Guidelines for general imaging (Nuclear cardiology; Central nervous system; Nephrology and urology; Respiratory system; Liver and gastrointestinal system; Nuclear medicine imaging studies in endocrinology; Musculoskeletal system; Special procedures in oncology; Hematology; Inflammation and infection; Radioimmunoassay protocols; Molecular methods – use of radionuclides in molecular biology); 4. Radionuclide therapy (Safety principles; Dosimetry and mathematical models in radiopharmaceutical therapy; Radioiodine therapy for thyrotoxicosis; Iodine-131 therapy in thyroid cancer; Palliative treatment of metastatic bone pain; Iodine-131 meta iodobenzylguanidine therapy; Phosphorus-32 therapy in polycythemia rubra vera; Radiosynovectomy; Iodine-131 Lipiodol; Intracoronary radionuclide therapy using the Re-188 DTPA balloon system; Radiopeptide therapy for cancer; Radioimmunotherapy); 5. Quality assurance and quality control protocols for radiopharmaceuticals (Radionuclidic activity; Radionuclidic purity; Radiochemical purity; Chemical purity; Determination of particle size; Particulate contamination; Control of pH; Sterility and apyrogenicity); 6. Radiation safety practice in nuclear medicine (Radiation safety aspects of radiopharmaceutical preparation; Safety precautions: Ward and other non-nuclear medical staff; Disposal of radioactive waste; Administration of radionuclides to women of child bearing age or pregnant patients; Breast feeding patients; Typical radiation doses from diagnostic studies;

Monitoring); 7. Nuclear medicine: future trends (Electronic data transfer; Radioimmunoassay and molecular biology; Imaging and therapy; Competence and education).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: LASERS. APPLICATIONS TO MEDICINE

CODE: D2FML507
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Understanding of the laser-tissue interaction mechanisms and of the main applications of lasers techniques to medicine.
COURSE CONTENTS: 1. Lasers for biophotonics; 2. Properties of the laser radiation: coherence, monochromaticity, directionality, irradiance, brightness, radiant exposure; 3. Optics of tissues: propagation of light in tissues, elements of tissue optics; 4. Laser-tissue interactions: interaction regimes, photo-chemical effects, photo-thermal effects, photo-ablative effects, photo-mechanical effects; 5. Medical laser systems: laser surgery equipment, therapeutic laser equipment; 6. Medical applications: low-power laser therapy, interstitial laser thermotherapy, laser tissue welding, therapy of blood-stained stars, applications to medical specialties; 7. Laser diagnosis: in-situ spectroscopy, optical biopsy, glucose monitoring, cardiac monitoring.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (40% of the final grade), global colloquium (60% of the final grade)

COURSE TITLE: RADIOLOGY AND MEDICAL IMAGING

CODE: D2FML508
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Application of notions related to physical processes and phenomena to biological systems, with emphasis to the human body; Correct use of physical principles and quantities in view of an efficient and secure manipulation of medical equipment and instrumental methods by healthcare staff specialized in analyses and investigations; Correct data analysis, interpretation and processing.
COURSE CONTENTS:
1 Goals and importance of medical physics; 2. Elements of atomic and molecular physics: structure, molecular bonds and interactions, applications to biophysics and medical physics; 3. Equipment used in medical imaging; 4. Lasers and medical applications; Effects of laser radiation on living matter; 5. Ionizing radiation and non-ionizing radiation: characteristics, interaction with living tissues, radioprotection, medical applications; 6. Physical principles of medical imaging: radiography, echography, computed tomography (CT), magnetic resonance imaging (MRI), scintigraphy, positron emission tomography (PET); 7. Medical imaging; Echography; Interaction of ultrasounds with living tissues; 8. X-ray diagnostic imaging; Radiography; Computed tomography; 9. Applications of nuclear magnetic resonance to medical imaging: magnetic resonance imaging; 10. Nuclear imaging; 11. Notions of low-coherence interferometry; Parameters of an optical coherence tomography (OCT) system; 12. OCT medical imaging.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL AND ANALOGUE MODELLING OF BIOLOGICAL PROCESSES

CODE: D2FML609
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Construction of mathematical models for various biological processes and analysis of the predictions arising from these models.
COURSE CONTENTS: 1. Modelling: procedures and limitations; 2. Ordinary differential equations; Stability; 3. Elements of numerical analysis; 4. Classes of biological processes that can be modelled by ordinary differential equations; 5. Classes of biological processes that can be modelled by difference equations; 6. Differential equations – a source of difference equations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

COURSE TITLE: BIOELECTROMAGNETISM

CODE: D2FML610
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Formation of cognitive and applicative outcomes regarding electromagnetic phenomena occurring in biological tissues.
COURSE CONTENTS: 1. Microscopic electric and magnetic phenomena; Electric conduction, electric polarization, magnetization; Motion of charged particles in electric and magnetic fields; 2. Electric and magnetic macroscopic properties of biological media; 3. The Maxwell equations in material media; Electric conductivity and permittivity; Magnetic permeability; 4. Electric and magnetic phenomena at the level of the cell membrane; 5.

Carrier transport across membranes; 6. Electric polarization and magnetization domains at the level of the cell membrane; 7. Waves and impulses for various cell types; 8. Transport across membranes; 9. Cell models; Electric schemes and characterization of circuit elements; 10. Electric phenomena associated with the functioning of the nervous system; 11. Electric phenomena associated with muscular contractions; 12. Elementary electric field sources within living organisms; The far field approximation of the electric/ magnetic field.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (60% of the final grade), global exam (40% of the final grade)

COURSE TITLE: ULTRASOUND DIAGNOSTIC AND THERAPHY TECHNIQUES

CODE: D2FML611
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): An overview of ultrasound imaging for diagnosis, covering its use in image-guided interventions and ultrasound-based therapy.
COURSE CONTENTS: I. Fundamental principles of ultrasonography: 1. Gray-scale ultrasonography (B-mode); 2. Basic physics of Doppler ultrasound; 3. Physical principles of colour-coded duplex ultrasound; 4. Factors affecting colour duplex imaging – pitfalls; 5. Ultrasound contrast agents; 6. Safety of diagnostic ultrasound; 7. Hemodynamic principles; II. Ultrasound instrumentation: 1. Array transducers and beamformers; 2. Three-dimensional ultrasound imaging; 3. Ultrasound velocity imaging; III. Diagnostic ultrasound imaging: 1. Ultrasound elastography; 2. Quantitative ultrasound techniques for diagnostic imaging and monitoring of therapy; 3. Ultrasound tomography; 4. Task-based design and evaluation of ultrasonic imaging systems; 5. Acoustic radiation force-based elasticity imaging; 6. Ultrasound vascular diagnosis; IV. Ultrasound therapy: 1. Three-dimensional ultrasound-guided prostate biopsy; 2. Ultrasound applications in the brain; 3. High-intensity focused ultrasound (HIFU) therapy (lithotripsy, cancer treatment, neurological disorders, cosmetic medicine).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: INFORMATION TECHNOLOGIES

CODE: D2FML612
ECTS CREDITS: 5
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): To provide the students with the informational support required for: 1. acquiring basic and detailed computer science notions to be used across all specialty disciplines within their curriculum whose syllabuses are correlated to informational applications, and 2. developing skills for usage of computer, specialized programs, and Internet.
COURSE CONTENTS: 1. Elements of information and communications technology (ICT) and information processing: computer systems, operating systems, programming languages, applicative programs, operating/ navigation media, computer networks, expert systems, intelligent systems, the Internet system; 2. Architecture and hardware structure of computer systems: central processing unit, microprocessors, internal memory, external memory, Input/ Output (I/O) devices, multimedia systems, network technologies; 3. Architecture and software structure of computer systems: operating systems, utility software, operating/ computational media, graphical interfaces, text/ image processing, communication software, Email services, Web services, applied/ specialised software; 4. Microsoft Windows Operating System: functions, kernel, interface, menus, windows, buttons, panels, icons, files, folders, documents and programs, processing, file management, file operations; 5. Microsoft Word: fonts, text/ image editing operations and techniques, formatting, table creation and editing, sorting data and organizing lists of information, drawing tools; 6. Microsoft Excel: worksheets, workbooks, cells, formulas, function tables, charts and graphs, data and data analysis tools, applications to problem-solving in Mathematics, Physics, Chemistry; 7. Internet – the global system: Internet network organization; Internet browsers; Electronic mail; Site organization; Specialized utility software; SPSS Statistics software package; STELLA programming language applied to Physical Chemistry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (40% of the final grade), global colloquium (60% of the final grade)

COURSE TITLE: PROGRAMMING LANGUAGES

CODE: D2FML613
ECTS CREDITS: 5
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): Development of application design skills using the principles of computer programming.
COURSE CONTENTS: 1. Introduction to Object-Oriented Programming; 2. Object creation and destruction; 3. Dynamic Memory Allocation; 4. Exception Handling in C++; 5. Input/ Output (I/O) operations and streams; 6. Java programming language: classes and objects; 7. Exceptions and Exception Handling in Java; 8. Java applets; 9. Java threads.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Current colloquium (40% of the final grade), global colloquium (60% of the final grade)

COURSE TITLE: INTRODUCTION TO MATHEMATICAL BIOLOGY

CODE: D2FML614
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Introduction to the main mathematical concepts, techniques and results required by the construction of complex biological processes.
COURSE CONTENTS: 1. Introduction; 2. Difference equations; Discrete population growth models; 3. Ordinary differential equations. Continuous population growth models; 4. Stochastic equations; Stochastic models.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: ELEMENTS OF MATHEMATICAL ONCOLOGY

CODE: D2FML615
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Introduction to biological, medical and mathematical approaches necessary for understanding tumour initiation, evolution, proliferation and inhibition processes and mechanisms.
COURSE CONTENTS: 1. Nature of cancer; Tumour origin; Main tumour classification; Progressive development of cancer; Different cancer occurrence frequencies in different human populations; Influence of lifestyle on cancer risk; Mutagenic action of carcinogenic physical and chemical agents; 2. Tumour suppressor genes; Cell fusion experiments proving the recessive behaviour of malignant cell phenotype; Genetic explanation of this recessive behaviour; The retinoblastoma tumour; Incipient cancer cells; The *Rb* gene; Discovery of tumour suppressor genes – the loss-of-heterozygosity method; Tumour suppressor genes – protein code; The Von Hippel-Lindau disease; 3. Organism invasion; Metastases; Colonization; Metastasis cascade; Epithelial-mesenchymal transition; Extracellular proteases; Control of cell processes – adhesion, cell shape, cell motility; Dispersion through lymphatic vessels; Metastasis localization factors; Subversion of osteoblasts and osteoclasts in bone metastases; 4. Cancer initiation: stochastic models and scenarios; Moran processes – constant populations; A Moran model with two cell species; A Moran model with three cell species; Modelling non-constant populations; 5. Cellular origins of cancer and tissue renewal scenarios; Stem cells, tissue renewal and cancer; The basic tissue renewal model; Various renewal scenarios: mathematical analysis, implications and data; 6. DNA damage and genetic instability; Competition dynamics and cancer evolution; Quasi-species models; Strong and weak apoptosis; Selection for genetic instability; Genetic instability and apoptosis; Main mathematical results; 7. Basic models of tumour inhibition and promotion; Angiogenesis inhibition models (linear stability analysis of the associated ordinary differential equations – ODEs); Spatial spread of tumours (dynamic-control stability analysis, stationary periodic solutions and numeric simulations); Somatic cancer evolution and progression; Clinical implications; 8. Therapeutic approaches: virus-based elimination of tumour cells; Virus-induced killing of tumour cells; Effects of virus-specific cytotoxic T lymphocytes (CTLs); Virus infection and the induction of tumour-specific CTLs; Virus-based treatment strategies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: SCIENTIFIC AND PROFESSIONAL EDITING AND COMMUNICATION

CODE: D2FML616
ECTS CREDITS: 5
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): Developing the students' scientific editing and communication skills; enhancing the students' abilities of synthesizing scientific information and of communicating scientific ideas or concepts in a compact, clear and accurate manner.
COURSE CONTENTS: 1. Scientific publications: types and structure; 2. Notions of intellectual property and copyright; 3. Using and citing information from various bibliographic sources; 4. How to elaborate a scientific book or monograph; 5. How to elaborate a scientific paper; 6. How to elaborate a scientific communication; 7. Notions of scientific editing. Specific software packages.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

COURSE TITLE: PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY

CODE: D2FML617
ECTS CREDITS: 5
TYPE OF COURSE: optional/ complementary
COURSE OBJECTIVE(S): Enhancing the students' understanding on the necessity and correct application of the principles and regulations concerning professional ethics and copyright.
COURSE CONTENTS: 1. Principles of scientific research ethics; 2. Intellectual property rights in science; 3. Documentation in scientific research; 4.

Scientific research performance indicators; 5. Basic rules for the elaboration of a scientific paper; 6. Basic rules for the elaboration of a research project.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

FIELD: PHYSICS
PROGRAMME TITLE: COMPUTATIONAL PHYSICS
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: MATHEMATICAL ANALYSIS

CODE: D2FIL101
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): The course's main goal is for students to acquire a mathematical background and of some computational skills required at the assimilation of specialized information and at solving various practical problems.
COURSE CONTENTS: I. Differential calculus: 1. Elements of set theory; Basic structures of mathematical analysis; 2. Sequences and series of numbers; 3. Power series; Taylor series; 4. Limit of a function at a point; Continuity; 5. First-order partial derivatives and first-order differentials; 6. Second-order partial derivatives and second-order differentials; Unconditioned extrema for functions of several variables; 7. Implicit functions and conditioned extrema; II. Integral calculus: 1. Integral of simple functions; 2. Improper integral; 3. Line integral (of first and second kind); 4. Double integral; Triple integral; 5. Surface integral (of first and second kind); 6. Integral formulas; 7. Elements of vector calculus.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: FUNDAMENTAL MODELS IN CLASSICAL PHYSICS

CODE: D2FIL102
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Introduction of some fundamental physical models necessary at the description of various processes and phenomena specific to classical physics.
COURSE CONTENTS: 1. Introduction; Physics – a fundamental science of Nature; 2. Scalar and vector physical quantities; Cartesian coordinate systems; Elements of vector algebra; 3. The single point particle model; Kinematics of a point particle: velocity and acceleration; The principles, theorems and main laws of the dynamics of a point particle; Simple motions of a point particle; 4. The two-particle system model; Particle scattering and disintegration; 5. The ideal gas model; Kinetic molecular theory of an ideal gas; Elements of thermodynamics of ideal gases; 6. Vector calculus in classical physics; Scalar and vector fields: equipotential surfaces, field lines, circulation and flux of a vector field, gradient of a scalar field, divergence and curl of a vector field; 7. The electric field; Elementary notions of electrostatics; 8. The magnetic field; Elementary notions of magnetostatics; 9. Direct (electric) current; Fundamentals of direct current circuits; 10. The ray model of light; Elements of geometrical optics; Description and optical modelling of the human eye.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: MOLECULAR PHYSICS AND HEAT

CODE: D2FIL103
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Macroscopic description of thermal phenomena and kinetic molecular properties of matter.
COURSE CONTENTS: I. Thermodynamics (Heat): 1. Introduction. Fundamentals: thermodynamic systems and specific notions; 2. Clausius–Thompson–Planck–Caratheodory (CTPC) principles of equilibrium thermodynamics; The general law of equilibrium thermodynamics; The zeroth law of thermodynamics; Empirical temperature; Properties of thermodynamic equilibrium; 3. The first law of thermodynamics; Equivalent formulations; 4. The second law of thermodynamics; Reversible bi-thermal cyclic processes; Carnot's theorem; Absolute thermodynamic temperature; On the Clausius's equality; Efficiency of the Carnot cycle; Equivalent formulations of the second law of thermodynamics; 5. Reversible poly-thermal cyclic processes; Thermal machines; Refrigerating machines; 6. Entropy; Clausius's equality; Clausius's inequality; Irreversible cyclic processes; The law of increase of entropy; 7. The third law of thermodynamics; Equivalent formulations; Consequences; 8. Empirical information needed at the CTPC construction of equilibrium thermodynamics; 9. Thermodynamics of the equilibrium states of fluids; Ideal gases; The laws of thermodynamics applied to ideal gases; Mixtures of ideal gases; II. Molecular physics: 1. Introduction; The molecular and kinetic representation of matter; The atomic structure of matter; 2. Kinetic molecular theory of ideal gases; The fundamental formula of the kinetic molecular theory of ideal gases; 3. The kinetic molecular significance of temperature; The equation of state of an ideal gas; The ideal gas laws; 4. Brownian motion; The barometric formula; Boltzmann's law; Statistical distributions; 5. Transport phenomena in gases; Diffusion in gases; The fundamental law of diffusion (Fick's law); Caloric conductibility; Fourier's law; 6. Real gases; The Van der Waals equation.
LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: NEWTONIAN MECHANICS

CODE: D2FIL104
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Newtonian description of mechanic motion.
COURSE CONTENTS: 1. Introduction; 2. Vectors; Vector calculus; 3. Description of position; Description of motion; Velocity; Acceleration; 4. Examples of motion of a single point particle; 5. The composition law of position vectors, velocities and accelerations; 6. The laws of Newtonian mechanics; 7. Galilean transformations; Galilei's law of relativity (in Newtonian mechanics); 8. Theorems and conservation laws for a single point particle: momentum, angular momentum, kinetic energy; 9. Conservative forces; One-particle potential energy; 10. Total energy theorem and conservation law for a single point particle; 11. Theorems and conservation laws for a system of point particles: momentum, angular momentum, kinetic energy; 12. Two-particle potential energy; 13. Total energy theorem and conservation law for a system of point particles; 14. Motion in a central force field; 15. The two-body problem; 16. The gravitational interaction in Newtonian mechanics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: LANGUAGE COURSE I

CODE: D2FIL105
ECTS CREDITS: 2
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): To improve the students' communication skills in English in the event of: cultural exchanges, participation in international scientific events, etc.; To improve the students' reading, writing and oral skills in English such that they will be able to understand a specialized scientific text, to follow an oral presentation of a specialized scientific subject, and also to write and speak in English on various themes within their scientific expertise domain.
COURSE CONTENTS: 1. General aim of scientific language and an overview of the means to reach it: objectivity, impersonal style, rhetorics of scientific argumentation, hedging and boosting, etc.; 2. Nominal style, passive voice, use of the tenses in English scientific discourse; 3. The use of modalities in English scientific discourse; 4. Linguistic elements that structure the English scientific discourse; 5. Rule to be taken into consideration when writing a scientific text in English; 6. The use of argumentative strategies in English scientific debates.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: LINEAR ALGEBRA

CODE: D2FIL206
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): Familiarization of students with elementary notions of algebra and linear algebra necessary at the study of Physics.
COURSE CONTENTS: 1. Groups and subgroups; Equivalent definitions of the notion of group; Computation rules within a group; Subgroups; Lagrange's theorem; Cyclic subgroup; Order of an element in a group; Centre of a group; Examples; 2. Normal subgroup; Equivalent definitions; Factor group; Examples; 3. Group morphisms; Group morphisms and isomorphisms; Morphism kernel and morphism image; Examples; 4. Rings and subrings; Ring; Definition; Elements with inverse; Zero divisors; Computation rules within a ring; Subring; Examples; 5. Ideal and ring factor; Definition; Operations with ideals; Ring morphisms and isomorphisms; Kernel and image; Ring factor of a ring by one of its bilateral ideals; Examples; 6. Fields and subfields; Equivalent definitions; The field of complex numbers, the field of quaternions; Field morphisms and isomorphisms; Examples; 7. Vector spaces; Real/ complex vector spaces; Definitions; Linear combinations; Linear independence, linear dependence; Examples; 8. Vector subspaces; Definitions; Examples; 9. Generator systems and bases; Generator systems; Basis; Dimension; Linear transformation matrix; Change of vector components upon a change of basis; The substitution lemma and its applications; Examples; 10. Euclidean vector spaces; Scalar product; Euclidean norm; Orthonormal bases; The Gram-Schmidt process; Examples; 11. Linear operators; Definitions; Examples; 12. Eigenvectors and eigenvalues; Definitions; Computation of eigenvectors and eigenvalues; Applications to matrix diagonalization; Examples.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: INTRODUCTION TO MATHEMATICAL PHYSICS

CODE: D2FIL207
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty

COURSE OBJECTIVE(S): Approach to simple physical models that are exactly solvable by means of differential equations.
COURSE CONTENTS: 1. Introduction; 2. Ordinary differential equations; General concepts; Existence and uniqueness theorems; 3. First-order ordinary differential equations; Separable first-order ordinary differential equations; Linear first-order ordinary differential equations; Ordinary differential equations reducible to linear first-order ordinary differential equations; 4. Second-order ordinary differential equations; Linear second-order ordinary differential equations, fundamental system of solutions; Homogeneous linear second-order ordinary differential equations with constant coefficients, general solutions, solutions to associated Cauchy problems; Non-homogeneous linear second-order ordinary differential equations with constant coefficients, general solutions, solutions to associated Cauchy problems; 5. Partial differential equations; General concepts; Existence and regularity theorems; 6. First-order partial differential equations; Integration of homogeneous linear first-order partial differential equations; Integration of non-homogeneous linear first-order partial differential equations; 7. Linear second-order partial differential equations; Fundamental solution of the Laplace equation; Fundamental solution of the heat conduction equation; Wave equation, the d'Alembert formula.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: ELECTRICITY AND MAGNETISM

CODE: D2FIL208
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Description of electric, magnetic and electromagnetic phenomena via the fundamental laws of electrostatics, magnetostatics and electrodynamics.
COURSE CONTENTS: 1. Introduction; 2. Electrostatics; The electrostatic interaction; Electric charge (quantization, conservation, relativistic invariance); Coulomb's law; Electrostatic field in vacuum; Strength (intensity) of the electric field; The superposition principle; Continuous electric charge distributions; Applications; 3. Electrostatics; Field lines; Electric flux; Gauss's law; Applications of Gauss's law to the computation of the intensity of the electric field; 4. Electrostatics; Electric potential; Applications: continuous electric charge distributions; electric dipole; 5. Electrostatics; Divergence of an electrostatic field; Local form of Gauss's law; Curl of an electrostatic field and the electric potential; The fundamental equations of vacuum electrostatics; Poisson's equation and Laplace's equation; The fundamental problem of electrostatics and boundary conditions; 6. Electrostatics; Work and energy in electrostatics; Energy of a discrete electric charge distribution; Energy of a continuous electric charge distribution; Applications; 7. Electrostatics; Conductors in an electrostatic field; Electrostatic pressure; Electric capacitors; Special techniques for solving the fundamental problem of electrostatics, the uniqueness theorem; The method of image (mirror) charges; 8. Electrostatics; Localized electric charge distributions – the dipole approximation; An electric dipole in an external electrostatic field; Application: the electrostatic dipole-dipole interaction; 9. Electrostatics; Electric fields in material media; Dielectrics; Atomic and molecular dipoles; Induced and permanent dipoles; The electric polarization vector; The electric field due to a polarized medium; Electrical induction and Gauss's law in the presence of dielectrics; Electrical susceptibility and permittivity; The fundamental equations of electrostatics in dielectric media; Coulomb's law and energy in dielectric media; 10. Basics of electro-kinetics; Electric currents; Intensity of an electric current; Electric current density; Conservation law of the electric charge and the continuity equation; Movement of charged particles in a uniform electrostatic field; Steady electric currents; Electric generators; The electromotive force; Ohm's law and Joule's law (in local and respectively global form); The classical theory of electric conduction in metals (Drude-Lorentz); Electric circuits and Kirchhoff's laws; 11. Magnetostatics; The magnetic interaction; Magnetostatic fields; Induction of a magnetic field; The Lorentz force; Application: movement of charged particles in electric and magnetic fields; The Hall effect; 12. Magnetostatics; The magnetic field created by a steady electric current; Ampère's circuital law; The curl of a magnetic field and Ampère's law in local form; The divergence of a magnetic field; The fundamental equations of vacuum magnetostatics; Boundary conditions; 13. Magnetostatics; The vector potential; The Biot-Savart-Laplace law; Applications: the magnetic field created by various current distributions; Electrodynamical forces; 14. Magnetostatics; The dipole approximation of a magnetic field; Dipolar magnetic moment; A magnetic dipole in an external magnetic field; 15. Magnetostatics; Magnetic fields in material media; Atomic and molecular magnetization; Diamagnetism, paramagnetism, ferromagnetism; Magnetization vector; The magnetic field created by a magnetized medium; The strength of the magnetic field and Ampère's law; Magnetic susceptibility and permeability; The fundamental equations of magnetostatics in magnetic media; 16. Electromagnetic induction; Faraday's law; The differential form of Faraday's law; Inductance; Mutual inductance; Self-induction; Applications;

Energy in a magnetic field; 17. Introduction to electrodynamics; Maxwell's equations; Electromagnetic waves in vacuum; Conservation law of the electric charge and the continuity equation; The conservation law of the electromagnetic energy (Poynting's theorem); 18. AC circuits; The study of AC circuits by means of the phasor, analytical and complex number methods; The series and parallel RLC circuits; AC power; Resonance.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (60% of the final grade), global exam (40% of the final grade)

COURSE TITLE: OPTICS
CODE: D2FIL209
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Description of physical phenomena specific to optics.
COURSE CONTENTS: 1. Introduction; Principles of geometrical optics: Light ray equation; Fermat's principle; General stigmatism conditions; Concave and convex mirrors; 2. Centred optical systems: spherical dioptres, transfer matrix, cardinal elements, spherical lenses, lens systems, diaphragms; The prism; 3. Aberrations: chromatic and geometrical; 4. Elements of photometry; 5. Wave (physical) optics; Huygens's principle; Plane waves; Phase velocity; 6. Interference; Young's experiment; Fresnel's mirrors; Fresnel's bi-prism; Billet's split lenses; 7. Multiple beam interference; Fringes at infinity; Fringes of equal inclination; 8. Diffraction; The Huygens-Fresnel principle; 9. Diffraction at a rectangular slit; Diffraction at a circular slit; Diffraction at two rectangular slits; The diffraction grating; 10. Light polarization; Malus's law; Brewster's law; Birefringence; Biaxial crystals; Elliptically polarized light; 11. Electromagnetic waves: Maxwell's equations in vacuum and in material media, Maxwell's equations in the case of electromagnetic waves, spherical and plane waves, Poynting vector and energy flux; 12. Reflection and refraction of electromagnetic waves: the laws of reflection and refraction, Fresnel's formulas, total internal reflection and phase relations for total internal reflection, reflection and refraction in absorbent media; 13. Dispersion theory.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (70% of the final grade), global exam (30% of the final grade)

COURSE TITLE: GENERAL CHEMISTRY
CODE: D2FIL210
ECTS CREDITS: 2
TYPE OF COURSE: mandatory, complementary
COURSE OBJECTIVE(S): The main purpose of this subject is to familiarize the students with the basic knowledge of chemistry – a science related to physics (the emphasis being set on physical chemistry knowledge, useful for a deeper understanding of some aspects of physics, and also later for them as future specialists).
COURSE CONTENTS: 1. The atom; Quantum model of the atom; Quantum numbers; Atomic orbitals; 2. The periodic table of the elements; Electronic configurations of atoms and ions; Periodic variation of some of their properties; 3. The ionic bond; Ionic crystal lattices; Ionic bond formation; Ionic crystal lattices; The Haber-Born cycle; 4. The metallic bond; Metal crystal lattices; Metallic bond formation; Metal crystal lattices; The electronic band structure model; 5. The covalent bond; Formation of molecules; Covalent bond formation; Molecular orbital energy diagrams; Stability of molecules; Magnetic properties; Bonding order; 6. Examples of molecules; Representative molecules of inorganic chemistry – applications to medical physics and environmental physics; Representative molecules of organic chemistry – applications to medical physics and environmental physics; 7. Geometry of molecules; The VSEPR model; Standard geometry of a molecule; Real geometry of a molecule; 8. Symmetry of molecules; Symmetry transformations; Symmetry elements of a molecule; Point groups; Molecular properties due to the symmetry (polarity and chirality); Molecular vibrations and their symmetry; 9. Chemical kinetics; Reaction rates; Rate laws; Rate constants; First-order reactions and second-order reactions; 10. Thermochemistry; Endothermic and exothermic chemical reactions; The Lavoisier–Laplace law; The Hess law; 11. Chemical equilibrium; Le Chatelier's principle; Equilibrium constants; 12. Electrochemistry; Electrodes and electrolytes; Galvanic cells; Electrolysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: THEORETICAL MECHANICS
CODE: D2FIL301
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Lagrangian and Hamiltonian formulations of classical dynamics.
COURSE CONTENTS: Introduction; I. Lagrangian formalism: 1. The Euler–Lagrange equations; Solutions to the Euler–Lagrange equations; Variational principle; 2. Newton's equations for conservative forces; 3. Constraints; Newton's equations in the presence of constraints; 4. Generalized coordinates; The Lagrange equations; Action principle in Lagrangian form; 5. Integrals of motion in Lagrangian formalism; Symmetry

transformations; The Noether theorem; General consequences of the Noether theorem; II. Hamiltonian formalism: 1. The (canonical) Hamilton equations; Action principle in Hamiltonian form; 2. The phase-space; The Poisson bracket; 3. Integrals of motion in Hamiltonian formalism; The Poisson theorem; 4. Arbitrary coordinate transformations on the phase-space; 5. Canonical transformations; Generating functions of canonical transformations Infinitesimal canonical transformations; 6. The Hamilton-Jacobi method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: THERMODYNAMICS
CODE: D2FIL302
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Macroscopic description of thermal phenomena.
COURSE CONTENTS: 1. Introduction; 2. The laws of the Clausius-Thompson-Planck-Caratheodory (CTPC) formulation of equilibrium thermodynamics; Empirical information needed at the construction of the CTPC formulation; 3. The fundamental problem of equilibrium thermodynamics; The laws of the Gibbs formulation of equilibrium thermodynamics (in the entropic representation); Work and heat in the Gibbs formulation; 4. Conditions for thermodynamic equilibrium; Evolution towards thermodynamic equilibrium; 5. Primary equations of state; The Euler equation; The Gibbs–Duhem equation; 6. Legendre transforms of internal energy: thermodynamic potentials; Examples: the Helmholtz potential, the Gibbs potential, the grand-canonical potential, the enthalpy; The fundamental property of thermodynamic potentials; 7. General stability conditions of thermodynamic systems; General consequences of the stability conditions; 8. Planck and Nernst formulations of the third law of thermodynamics; Isothermal derivatives of entropy; General consequences of the third law of thermodynamics; Behaviour of heat capacities in the limit $T \to 0$; 9. Types of phase transitions; Classifications; Gibbs's phase rule; First-order phase transitions; The Clapeyron–Clausius equation; Second-order phase transitions; The Ehrenfest equations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: ELECTRODYNAMICS
CODE: D2FIL303
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE: Formation of cognitive and applicative competences concerning the electromagnetic phenomena.
COURSE CONTENTS: 1. Special relativity theory: laws of special relativity; Relativistic kinematics; Relativistic dynamics: the free relativistic particle; 2. Charged particle in an electromagnetic field: action, equations of motion, conservation laws; 3. Covariant formulation of the electromagnetic field: the tensor of the electromagnetic field, significance, transformation laws, invariants of the electromagnetic field; 4. The Maxwell equations in vacuum; 5. The electromagnetic field in material media; General form of the Maxwell equations in material media; 6. Energetic description of the electromagnetic field; The Noether theorem; Conservation laws; 7. Electrostatics; The Poisson equation; Electrostatics of dielectrics and conductors; 8. Steady magnetic fields; The fundamental equations of magnetostatics; Multipole expansions; 9. Electromagnetic fields generated by steady or quasi-steady electric currents; The Hall effect; Thermoelectric effects; 10. Electromagnetic waves; Monochromatic electromagnetic plane waves; Spectral decomposition of waves; Waves in material media; 11. Theory of electromagnetic radiation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: QUANTUM MECHANICS I
CODE: D2FIL304
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Non-relativistic description of the kinematics and dynamics of micro-systems.
COURSE CONTENTS: 1. Elements of algebra and topology; The Dirac formalism; 2. The axiomatic basis of quantum kinematics; 3. Time evolution of quantum systems; The central problem of quantum mechanics; 4. Alternative descriptions of the evolution of quantum systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: ELECTRONICS
CODE: D2FIL305
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Description of physical phenomena specific to electronics.
COURSE CONTENTS: 1. Introduction; 2. Crystal structure; Intrinsic semiconductors; Extrinsic semiconductors; Carrier transport in semiconductors; 3. Introduction to the p-n junction layer; The p-n junction layer at thermal equilibrium;

Direct and inverse polarization of the p-n junction layer; 4. The current-voltage curves of semiconductor diodes; Rectifiers based on semiconductor diodes; The Fourier analysis of the rectified signal; 5. Applications of semiconductor diodes; Circuits with semiconductor diodes; 6. Bipolar transistors; Static characteristics of bipolar transistors; 7. Applications of bipolar transistors; 8. Junction Field Effect Transistors (J-FET and MOS-FET); 9. Optoelectronic devices; Solar cells; Photo-detectors; Electroluminescent diodes; Laser diodes; 10. Amplifiers; Oscillators.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: PHYSICS OF THE ATOM AND MOLECULE

CODE: D2FIL406
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Developing the students' abilities to explain various phenomena specific to the atomic and molecular physics and to interpret diverse experimental results arising within this context.
COURSE CONTENTS: 1. The concept of atom; Atomic constituents of matter (The electron – an atomic constituent of matter; Determination of atomic weights; Isotopes; The nuclear structure of atoms); 2. Thermal radiation (Laws of thermal radiation; Hypothesis of energy quanta; Planck's law); 3. Atomic spectra; Bohr's atomic model (Empirical rules in spectroscopy; Bohr's atomic model; Energy levels; Atomic magnetic moments; The Stern-Gerlach experiment; The correspondence principle); 4. The wave-particle duality (The wave-particle duality for the photon; The photoelectric effect; The Compton effect; Creation and annihilation of the electron-positron pair; The wave-particle duality for matter particles: the de Broglie waves, the Davisson-Germer experiment, the Thomson experiment; Statistical interpretation of the de Broglie waves; Uncertainty relations); 5. Notions of quantum mechanics (Wave functions; The Schrödinger equation; One-dimensional systems; Orbital angular momentum; Spin angular momentum); 6. One-electron atoms in quantum mechanics (Levels of energy; Hydrogen-like wave functions; Cloud probability distribution); 7. The interaction of electromagnetic radiation with one-electron atoms (Transition probability for stimulated emission, absorption of radiation and spontaneous emission; Electric dipole transitions; Selection rules; Characteristics of spectral lines); 8. Atoms with one electron: spin corrections (Fine structure corrections; Atoms in an external magnetic field); 9. Two-electron atoms (Systems of identical particles; Energy level diagram; Wave functions and Pauli's exclusion principle; The model of independent particles; The fundamental (ground) state of Helium; Singly excited states of Helium; The Auger effect); 10. Molecular structure of matter (The Born–Oppenheimer approximation; Electronic states of diatomic molecules; Rotations and vibrations of diatomic molecules; Molecular spectra).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

COURSE TITLE: SOLID STATE PHYSICS AND SEMICONDUCTORS

CODE: D2FIL407
ECTS CREDITS: 7
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): The aim of this discipline is to offer information about the baseline characteristics of different types of solids: metals, semiconductors, dielectrics, magnetic solids, and superconducting solids. The properties, theoretical models, and experimental results related to these materials are also investigated, along with the main phenomena and effects occurring in solids.
COURSE CONTENTS: 1. Solid state; Introduction; Crystal classification; Symmetries of the crystal lattice; Two-dimensional and three-dimensional lattices; Crystallographic notations: nodes, directions, planes; The reciprocal lattice and its properties; 2. Experimental methods in crystallography; X-ray diffraction (the Laue method, the rotating crystal method, the Debye-Scherrer method); Electron and neutron diffraction; 3. Defects in crystals; Point defects (vacancies – Schottky defects, interstitial – Frenkel defects); Line defects – dislocations; Two-dimensional and three-dimensional defects; 4. Vibrations of the crystal lattice; The continuum approximation; The coupled oscillator model: vibration modes for lattices with one kind and two kinds of atoms; Statistics of lattice vibrations; 5. Theory of specific heats of solids; The classical theory; Einstein's model; Debye's theory; 6. Motion of electrons in a periodic potential; General concepts; Bloch functions; Properties of the Bloch functions; Shape of the energy spectrum; Velocity and acceleration of electrons in a periodic potential; 7. Approximations used at the study of motion of electrons in crystal lattices; The free-electron model of metals; The statistics of electrons in metals; 8. Emission phenomena in metals; Thermo-electronic emission; The influence of electric fields on the thermo-electronic emission; The Schottky effect; Self-emission of electrons from metals; 9. The nearly-free electron approximation; Study of the one-dimensional case and generalization to three-dimensional case; The tight-binding approximation; Study of the one-

dimensional case and generalization to the three-dimensional case; 10. Semiconductors; Generalities; Intrinsic semiconductors; Charge carrier statistics for intrinsic degenerate and non-degenerate semiconductors, respectively; 11. Extrinsic semiconductors; Energy of additional levels in extrinsic semiconductors; Charge carrier statistics in extrinsic semiconductors (n-type and p-type); 12. Magnetic properties of solids; Generalities; Classification of magnetic materials; Paramagnetism; The Langevin theory of paramagnetism; The quantum theory of paramagnetism; 13. Diamagnetism; The Langevin theory of diamagnetism; The quantum theory of diamagnetism; Ferromagnetism; The Weiss theory; The quantum theory of ferromagnetism; The exchange interaction; The theory of technical magnetization curve; Exchange energy; Antiferromagnetism; 14. Dielectrics; Polarizability; Dielectrics in static and dynamic electric fields; Ferroelectricity; Superconductivity; Generalities; Superconducting materials; Modern theory of superconductivity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: PHYSICS OF THE NUCLEUS
CODE: D2FIL408
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Students should understand and apply the fundamental theoretical notions of nuclear physics and also be familiar with their experimental bases.
COURSE CONTENTS: 1. General nuclear properties; Structure of nucleons; (Nuclear binding energy; Nuclear size; Nuclear moments; Hyperfine interactions; Nuclear reactions); 2. General properties of nuclear radioactive decays; 3. Alpha decay (Energy of alpha particles; Dynamics of alpha-decay processes; Gamow factor; Penetration (tunnelling) through the Coulomb barrier; The Geiger–Nutall law); 4. Beta decay (Dynamics of beta-decay processes; Classification of beta decays; Neutrino in beta decay); 5. Gamma decay; 6. Interaction of radiation with matter; 7. Nuclear structure (The liquid drop model; The Fermi-gas model; The nuclear shell model); 8. Nuclear fission power plants; Nuclear fusion reactors; The ITER project.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: QUANTUM MECHANICS II
CODE: D2FIL409
ECTS CREDITS: 3
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Solving some standard quantum systems: the harmonic oscillator and hydrogen-like ions.
COURSE CONTENTS: 1. The energy levels and stationary states of the harmonic oscillator; 2. Rotations; Mathematical aspects; 3. Quantum theory of angular momentum; Spherical harmonics; 4. The energy levels and stationary states of hydrogen-like ions.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

COURSE TITLE: STATISTICAL PHYSICS
CODE: D2FIL410
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, fundamental
COURSE OBJECTIVE(S): Microscopic description of thermal phenomena.
COURSE CONTENTS: 1. Introduction; 2. Microscopic states, statistical states and macroscopic states of classical and quantum particle systems; 3. The phase-space; The Liouville measure; 4. Classical statistical ensembles; Evolution of classical statistical ensembles: the Liouville theorem and the Liouville equation; 5. Equilibrium classical statistical ensembles; Average of observables on the statistical ensembles and their properties; Statistical entropy; Variational principle of equilibrium statistical physics; 6. The classical microcanonical ensemble; 7. Massieu functions; Relationship between Massieu functions and thermodynamic potentials; 8. The classical canonical ensemble; 9. The classical grand canonical ensemble; 10. The von Neumann formulation of quantum mechanics; Density operator; 11. Quantum statistical ensembles; Evolution of quantum statistical ensembles: global and local form of the Liouville-von Neumannn equations; 12. Equilibrium quantum statistical ensembles; The fundamental principle of equilibrium quantum statistical physics; 13. The quantum microcanonical ensemble; 14. The quantum canonical ensemble; 15. The quantum grand canonical ensemble; 16. Quantum statistics of identical particle systems; Occupation number representation; The Bose-Einstein statistics; The Fermi-Dirac statistics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

3RD YEAR, 1ST SEMESTER

COURSE TITLE: COMPUTER PROGRAMMING

CODE: D2FIL501
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Computer practical applications are necessary for obtaining skills on using computers at solving various physics problems (information organization and processing, data analysis, computations, graphical processing, communication, documentation, etc.).
COURSE CONTENTS: 1. Computing systems (Definition; Classification; Composition; Hardware and software); Algorithms (Representation of algorithms; Pseudo-code; Fundamental structures); 2. On the structure of C and C++ programming languages (The first program in C++; Header files; Creating and running a program; The grammar of C++; Displaying data on the screen [*cout* function]; Reading data from the keyboard [*cin* function]); 3. Data types (Declaring the variables; Assignment statements; Constants, variables, expressions); 4. C++ instructions (Conditional structure: *if*; Selection structure: *switch*); 5. Repetitive structures (Overview in pseudo-code and in C++; Repetitive instructions: *for*, *while*, *do-while*; Applications); 6. Arrays in C++ (Declaring one-dimensional arrays; Initializing a vector from the declaration; Reading and displaying a vector; Applications); 7. Two-dimensional arrays (Array tables; Declaring; Reading and displaying; Applications); 8. Character sequences (Initialization character sequences; Handling functions of character sequences); 9. Structures (Bit fields; Unions); 10. Functions (Function prototype; Mathematical functions; Jump instructions: *break*, *continue, goto, return*; The *exit* function; Applications); 11. Functions (Function call by value; Function call by reference); 12. C files (Standard files; Reading from and writing in a file; Case of numeric variables); 13. Streams in C++ (Case of character sequences; Formatting writing and reading with C++ streams; Text files stored on an external support); 14. Pointers (Sorting and searching algorithms; Passing vectors, arrays and structures to functions).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: DATABASES

CODE: D2FIL502
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Proficiency of database design and usage.
COURSE CONTENTS: 1. Database concepts and issues (Aspects of data organization; Defining a database; Standardized architectures of databases; Data definition languages, data manipulation languages, database query languages; Advantages of using databases; Classification of databases); 2. Aspects of database design (Design of the conceptual schema; Design of the external schema; Design of the internal schema; Advantages of using databases); 3. Logical database design (Introduction; Logical data models; The entity-relationship model); 4. Hierarchical and network databases (The hierarchical model and hierarchical databases; The network model and network databases); 5. Relational databases (General considerations; Relations, domains, attributes and relational schema; Representation of relations via tables; Relational and Boolean operations; Integrity constraints of relations); 6. Data query languages for relational databases (Relational algebra and its extensions; Tuple relational calculus; Domain relational calculus; Equivalence of relational algebra and relational calculus; Query optimization criteria); 7. Data integrity restrictions (Functional dependencies; Definition and inference axioms; Multi-valued dependencies; Generalized dependencies); 8. Relational database design (Database normalization [FN1, FN2, FN3, FNBC, FN4, FN5]; Normalization techniques: the decomposition method, the synthesis method); 9. Database physical structure (File structure; Types of file organization; File search techniques; Storage methods of variable-length records); 10. Database integrity and security (Aspects of data integrity; Database security).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: ADMINISTRATION OF COMPUTER NETWORKS

CODE: D2FIL503
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Understanding fundamental notions concerning the communication, information transfer, topology and protocol stacks of computer networks as well as the principles of computer networking.
COURSE CONTENTS: 1. Introduction; History, architecture, topology; Protocol stack; Level design issues; Interfaces and services; The relationship between services and protocols; Standards; 2. Reference models; ISO-OSI reference model; TCP/IP reference model; Comparison with the ISO-OSI model; 3. Physical level; Shannon's Law; Particularities of various physical environments; 4. Data Link layer; Detecting and correcting errors; Flow control; Elementary Data Link protocols; MAC Sub-level; Ethernet network; Packet switching; 5. Switches; Virtual networks (VLAN); 6. Network level;

Routing algorithms; Congestion Control; IP protocol; IP addresses; IPv6 protocol; ICMP protocol; 7. Configuration via DHCP; ARP protocol; 8. Transport layer; Transport layer services; Communication primitives; Transport layer protocols; 9. Communication sockets; 10. Application level; Domain Name System (DNS); 11. Securing computer networks; Firewalls; Security models.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

COURSE TITLE: CLASSICAL THEORY OF SYSTEMS WITH INFINITELY MANY DEGREES OF FREEDOM

CODE: D2FIL504
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Relativistic approach to elementary particles and fundamental interactions via the classical aspects of different field sectors in the Standard Model; solving specific partial differential equations by various numerical methods and using standard symbolic computation software for developing some field theory applications.
COURSE CONTENTS: 1. Field theories on 4-dimensional Minkowski spaces; Variational principles for field theories; Lagrangian formalism; The Euler–Lagrange equations; 2. Variational principles for field theories; Hamiltonian formalism; The Hamilton equations; Examples; 3. Numerical methods for solving some specific partial differential equations; 4. Conserved quantities in field theories; Rigid symmetries of the Lagrangian action; Noether's theorem; 5. Classical Lagrangian and Hamiltonian theory of a free, real scalar field; 6. Classical Lagrangian and Hamiltonian theory of a free, complex scalar field; 7. Classical Lagrangian and Hamiltonian theory of the free electromagnetic field (Maxwell's theory); 8. Classical theory of the free Dirac field; 9. Elements of computer algebra and symbolic computation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: DYNAMICAL SYSTEMS WITH GAUGE INVARIANCE

CODE: D2FIL505
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Hamiltonian formalism of degenerate dynamical systems with a finite as well as an infinite number of degrees of freedom; main characteristics and properties; using standard symbolic computation software for developing some applications to the case of constrained dynamical systems.
COURSE CONTENTS: 1. Variational principles for non-degenerate dynamical systems; 2. Systems with an infinite number of degrees of freedom; 3. Degenerate systems; Primary constraints; Regularity conditions; 4. Secondary constraints; Dirac's algorithm; 5. Separation of constraints into first- and second-class subsets; 6. Irreducible and reducible constraint sets; 7. Variational principles for degenerate systems; 8. Second-class constraints; The Dirac bracket; 9. First-class constraints; Gauge transformations; 10. Elements of computer algebra and symbolic computation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: MODELLING OF NONLINEAR PROCESSES

CODE: D2FIL506
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Modelling nonlinear physical phenomena.
COURSE CONTENTS: 1. Introduction; The pendulum; 2. Stability of the solutions to ordinary differential equations; Linear systems; Nonlinear systems; 3. Main discretization methods of PDEs (partial differential equations); Approximation methods for equations (Method of finite differences; Method of finite volumes); Approximation methods for solutions (Finite element method; Spectral methods); 4. Conservative and dissipative dynamical systems (General remarks; Conservation of the volume in the phase-space of an un-damped oscillator; Phase portrait for a damped oscillator); 5. Damped oscillators and limit cycles (General remarks; The Van der Pol equation; Energy balance for a small £ ; Limit cycle for a big £); 6. Forced oscillators: linear and nonlinear resonance; 7. Fourier transforms; 8. Poincaré sections (Construction of Poincaré sections; Types of Poincaré sections); 9. Bifurcation theory for nonlinear systems (Types of bifurcations for nonlinear systems; Bifurcations diagrams); 10. Fluid dynamics and the Rayleigh-Bénard convection (The continuum concept, mass conservation, momentum conservation; The Navier-Stokes equations; The Rayleigh-Bénard convection; The Rayleigh-Bénard equations).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: OPERATING SYSTEMS

CODE: D2FIL507
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty

COURSE OBJECTIVE(S): Understanding the theoretical aspects of operating systems; comprehending the role and functions of operating system components.
COURSE CONTENTS: 1. Structural description of a computing system; Hierarchical relationships in a computer system; Hardware as the basic system generator; Information flow in computer systems; 2. Functional description of the processor; Functional description of memory; Functional description of link units and of peripheral devices; 3. Structure of operating systems; Concepts of operating systems; Operating systems models; 4. Processes and threads; The processes model; Creating and terminating processes; Hierarchy of processes; The states of the processes; Implementation of processes; 5. Threads; Inter-process communication; Race condition; Critical sections; The producer-consumer problem; 6. Mutual exclusion via "Busy waiting"; Sleep and Wakeup; Semaphores; Message passing; Classical problems of inter-process communication; 7. Process scheduling; Round robin scheduling; 8. Scheduling based on priorities; Scheduling with multiple queues; 9. Deadlocks; Deadlock modelling; Deadlock detection; Deadlock elimination; 10. Memory management; Basic memory management; Swapping; Virtual memory; Memory paging; Page tables; Translation lookaside buffers; 11. Inverted page tables; Page replacement algorithms; The LRU algorithm; The FIFO algorithm; The second chance algorithm; 12. Segmentation; Implementation of segmentation; Segmentation with paging; 13. Input/Output; Principles of I/O hardware: I/O devices and controllers; 14. Input/ Output; Principles of I/O software: goals of I/O software; programmed I/O; I/O operation driven by interrupts; I/O communication by Direct Memory Access (DMA).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (30% of the final grade), global colloquium (70% of the final grade)

COURSE TITLE: NUMERICAL METHODS IN ATOMIC AND MOLECULAR SPECTROSCOPY
CODE: D2FIL508
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Knowledge and comprehension of various numerical methods used in atomic and molecular spectroscopy.
COURSE CONTENTS: 1. Spectral data acquisition and processing; 2. Resolution of spectra; 3. Atomic spectra computation and interpretation; 4. The variational method and its applications to the Helium atom; 5. The perturbation method and its application to the Helium atom; 6. Approximation methods for study of atoms with several electrons; 7. Factor analysis methods in molecular spectroscopy; 8. Quantitative analysis in molecular spectroscopy; 9. Reflectance spectroscopy; 10. Numerical analysis methods of RES spectra; 11. Numerical methods in NMR spectroscopy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL METHODS AND SIMULATION IN PHYSICS
CODE: D2FIL609
ECTS CREDITS: 4
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): Broadening the horizon of knowledge and understanding of physical processes through specific methods of using computational interfaces.
COURSE CONTENTS: 1. Methods of conditioned and unconditioned minimization; 2. Applications of minimization methods to elliptic variational problems; 3. Global minimization; 4. Neuronal networks; 5. Classical dynamical systems, methods of integration; 6. The Poincaré application; 7. Stability problems, differential chaotic dynamics; 8. Elements of ergodic theory; 9. The finite difference method; 10. The finite element method; 11. The Monte Carlo method in equilibrium statistical physics; 12. The molecular dynamics method.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

COURSE TITLE: PERTURBATIVE METHODS IN ASTRONOMY
CODE: D2FIL610
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Approaching the problem of describing the motion of celestial bodies on the celestial sphere.
COURSE CONTENTS: 1. Introduction; 2. The celestial sphere; 3. Time scales used in astronomy; 4. Planetary motions; 5. The two body problem; 6. Computation of an ephemeris; 7. Photographic astrometry; 8. Calculation of orbital elements; 9. General perturbation theory; 10. The dynamics of systems with more than two bodies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: PERTURBATIVE METHODS FOR HAMILTONIAN SYSTEMS WITH SYMMETRIES
CODE: D2FIL611
ECTS CREDITS: 5

TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Approach to the Hamiltonian quantization of gauge systems with a finite and respectively infinite number of degrees of freedom from the perspective of the Becchi-Rouet-Stora-Tyutin (BRST) method based on path integrals and use of standard symbolic computation software for developing some specific applications.
COURSE CONTENTS: 1. Hamiltonian formalism for constrained dynamical systems: a brief review; 2. Algebraic structure of the BRST symmetry; Graded differential algebras; 3. Algebraic structure of the BRST symmetry; Homological resolutions; 4. Algebraic structure of the BRST symmetry; Elements of homological perturbation theory; 5. Construction of the Hamiltonian BRST symmetry in the irreducible case; The Koszul-Tate differential; 6. Construction of the Hamiltonian BRST symmetry in the irreducible case; The exterior derivative along the gauge orbits; 7. Construction of the Hamiltonian BRST symmetry in the irreducible case; The extended phase-space; 8. Construction of the Hamiltonian BRST symmetry in the irreducible case; The BRST symmetry as a canonical transformation; 9. Construction of the Hamiltonian BRST symmetry in the irreducible case; The canonical generator of the Hamiltonian BRST symmetry – the BRST charge; 10. BRST cohomology and the Poisson bracket; 11. Dynamics of the ghosts; The gauge-fixing procedure; 12. Non-minimal variables; Non-minimal BRST charges; 13. The gauge-fixed action; The gauge-fixed path integral; 14. Elements of computer algebra and symbolic computation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: INFORMATION TECHNOLOGIES
CODE: D2FIL612
ECTS CREDITS: 5
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): To provide the students with the informational support required for: 1. acquiring basic and detailed computer science notions to be used across all specialty disciplines within their curriculum whose syllabuses are correlated to informational applications, and 2. developing skills for usage of computer, specialized programs, and Internet.
COURSE CONTENTS: 1. Elements of information and communications technology (ICT) and information processing: computer systems, operating systems, programming languages, applicative programs, operating/ navigation media, computer networks, expert systems, intelligent systems, the Internet system; 2. Architecture and hardware structure of computer systems: central processing unit, microprocessors, internal memory, external memory, Input/ Output (I/O) devices, multimedia systems, network technologies; 3. Architecture and software structure of computer systems: operating systems, utility software, operating/ computational media, graphical interfaces, text/ image processing, communication software, Email services, Web services, applied/ specialised software; 4. Microsoft Windows Operating System: functions, kernel, interface, menus, windows, buttons, panels, icons, files, folders, documents and programs, processing, file management, file operations; 5. Microsoft Word: fonts, text/ image editing operations and techniques, formatting, table creation and editing, sorting data and organizing lists of information, drawing tools; 6. Microsoft Excel: worksheets, workbooks, cells, formulas, function tables, charts and graphs, data and data analysis tools, applications to problem-solving in Mathematics, Physics, Chemistry; 7. Internet – the global system: Internet network organization; Internet browsers; Electronic mail; Site organization; Specialized utility software; SPSS Statistics software package; STELLA programming language applied to Physical Chemistry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (40% of the final grade), global colloquium (60% of the final grade)

COURSE TITLE: PROGRAMMING LANGUAGES
CODE: D2FIL613
ECTS CREDITS: 5
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): Development of application design skills using the principles of computer programming.
COURSE CONTENTS: 1. Introduction to Object-Oriented Programming; 2. Object creation and destruction; 3. Dynamic Memory Allocation; 4. Exception Handling in C++; 5. Input/ Output (I/O) operations and streams; 6. Java programming language: classes and objects; 7. Exceptions and Exception Handling in Java; 8. Java applets; 9. Java threads.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (40% of the final grade), global colloquium (60% of the final grade)

COURSE TITLE: PERTURBATIVE APPROACHES TO THE GRAVITATIONAL FIELD
CODE: D2FIL614
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Relativistic description of the gravitational field and of the gravitational interaction.
COURSE CONTENTS: 1. Geometric aspects of special relativity; 2. Curved spaces and geometric objects; 3. General theory of relativity; 4.

Perturbative expansions in the Hilbert–Einstein gravity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: NUMERICAL SIMULATIONS IN THE PHYSICS OF TURBULENCE

CODE: D2FIL615
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): Knowledge of the main turbulence models and equations describing turbulent flows.
COURSE CONTENTS: 1. Concept evolution in turbulence description; Fundamental concepts; 2. Statistical description of turbulent flows; Reynolds-averaged Navier-Stokes equations; 3. Kolmogorov's theory of turbulence; Turbulent length scales; 4. Main characteristics of the direct numerical simulation method; 5. Turbulent-viscosity models; 6. PDF methods; Langevin-type equations; 7. Large eddy simulation (LES); Filtering; 8. Filtered conservation equations; 9. LES in wavenumber space.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current exam (50% of the final grade), global exam (50% of the final grade)

COURSE TITLE: SCIENTIFIC AND PROFESSIONAL EDITING AND COMMUNICATION

CODE: D2FIL616
ECTS CREDITS: 5
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): Developing the students' scientific editing and communication skills; enhancing the students' abilities of synthesizing scientific information and of communicating scientific ideas or concepts in a compact, clear and accurate manner.
COURSE CONTENTS: 1. Scientific publications: types and structure; 2. Notions of intellectual property and copyright; 3. Using and citing information from various bibliographic sources; 4. How to elaborate a scientific book or monograph; 5. How to elaborate a scientific paper; 6. How to elaborate a scientific communication; 7. Notions of scientific editing; Specific software packages.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

COURSE TITLE: PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY

CODE: D2FIL617
ECTS CREDITS: 5
TYPE OF COURSE: optional/ complementary
COURSE OBJECTIVE(S): Enhancing the students' understanding on the necessity and correct application of the principles and regulations concerning professional ethics and copyright.
COURSE CONTENTS: 1. Principles of scientific research ethics; 2. Intellectual property rights in science; 3. Documentation in scientific research; 4. Scientific research performance indicators; 5. Basic rules for the elaboration of a scientific paper; 6. Basic rules for the elaboration of a research project.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Current colloquium (60% of the final grade), global colloquium (40% of the final grade)

FIELD: CHEMISTRY
PROGRAMME TITLE: CHEMISTRY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): acquiring fundamental notions of chemistry; the explanation and the understanding of the principles and the phenomena which control the reactivity of elements and of chemical combinations.
COURSE CONTENTS: Fundamental Laws of the Chemistry; Fundamental Notions in Chemistry; The; Periodic Table of Elements; The Structure of the Atom; Interatomic and Intermolecular Chemical Bonds; The Aggregation States of Matter; Solvents and Solutions; Types of Solutions Concentrations; Chemical Thermodynamics; Chemical Kinetics; Electrochemistry and the Electrochemical Conversion of Energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: INFORMATICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The course focuses on initiating students in computer science: the fundamentals of using computers in scientific purposes; the fundamentals of description and design of algorithms; knowledge of Excel spread sheet environment; knowledge of Word document editing environment; using computers to solve problems in chemical engineering related subjects.
Practical applications are to obtain computer skills for using computers to solve various problems (organization and processing of information, data analysis, calculations, graphics processing, communications, documentation, etc.).
COURSE CONTENTS: 1. Elements of information and communication technology (ICT) and knowledge processing: computer systems, operating systems, programming languages, software applications, operating environments/ navigation computer networks, expert systems, intelligent systems, the Internet; 2. Architecture and hardware structure of computing systems: central processing unit, microprocessor, internal memories, external memories, I/O devices, multimedia systems, networking technologies; 3. Architecture and software structure of computing systems: operating systems, utilities, operating environments/ resolution, navigation environments, programming environments, graphical interfaces, processors text/ images, programs, communications, e-mail services, Web services, application programs/ specialized; 4. Windows: functions, kernel, interface, menus, windows, buttons, boxes, icons, files, folders, documents and programs operating, organizing files, operations with files; 5. Word: fonts, editing techniques and operations text/ images, formatting, create and edit tables, sorting information, elements Drawing; 6. Excel: spread sheets, agendas, cells, formulas, spread sheet functions, charts and graphs, data and analysis, applications and problem solving of mathematics, physics, chemistry; 7. The Internet: communications software, e-mail services, Web services, Web pages, e-learning, multimedia technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (written and oral exam)

COURSE TITLE: PHYSICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): It is one of the complementary subjects of the curriculum to familiarize students with basic physical concepts needed in next semester and beyond to understand disciplines. Basically, students learn how to systematize concepts of mechanics, electromagnetism, thermodynamics, optics, atomic physics and nuclear physics encountered in the disciplines of chemistry.
COURSE CONTENTS: Notions complementary to general physics course; Vectors; Operations with vectors; Integral operation; Integral theorems; Notions of vector algebra; Notions of mechanics; Fundamentals of mechanics; Newton's laws; Conservative forces; Types of movements; Mechanical work; Mechanical energy; Mechanical power; Conservation laws; Notions relativistic mechanics; Notions of thermodynamics; Fundamentals of thermodynamics; Zero principle of thermodynamics; The concept of temperature; Temperatures scales; Particular processes of ideal gas; First principle of thermodynamics; The heat capacity; The latent heat; Polytrope processes; The second principle of thermodynamics; Thermal machines; Thermodynamic cycles; Notions of electricity and magnetism; The electric charge; Electromagnetic interactions; Electric field; Electrostatic potential; The flow of electric field; Gauss's theorem under vacuum; Electric current; Circuits; Instruments for measuring electrical quantities; The magnetic field of electricity; Constant magnetic field equations; Electromagnetic induction; Notions of optic; Electromagnetic waves; Nature and propagation of light (light sources, wave fronts, velocity of light); Interference and

diffraction of light; Reflection and refraction of light; Refractive index; Total reflection; Absorption; Dispersion; Rainbow; Lenses and optical instruments; Notions of Atomic and Nuclear Physics; Exclusion principle; The atomic structure; Diatomic molecules; Molecular spectra; Structure of solids; Nucleus of the atom; Natural radioactivity; The radioactive transformations; Nuclear reactions; Nuclear fission and fusion; Physical relationship with other sciences.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: FUNDAMENTALS OF ORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: Fundamental, compulsory
COURSE OBJECTIVE(S): Provide students with a basic understanding of the structure of organic compounds, electronic and quantum theories of chemical bonds, isomerism, electronic effects, speed of reactions, the natural state, the obtaining and the reactivity of hydrocarbons.
COURSE CONTENTS: Structure of organic compounds: Representation formulas of organic molecules; Electronic theory of chemical bonds; Hydrogen bonds; Electronics and quantum theories of chemical bonds in organic compounds: Quantum theory of chemical bonds; Molecular orbital method; Resonance method; sp^3 , sp^2 and sp hybridization; Isomerism of organic compounds: Constitutional isomers: chain, position, function, and valence; Stereoisomerism: geometrical isomers; Stereoisomers: conformation isomers of butane; Stereoisomerism: conformation isomers of cyclohexane; Stereoisomerism: symmetry elements of molecules; Stereoisomers: enantiomers, nomenclature of enantiomers; Stereoisomers: diastereoisomers, meso forms, axial and planar chirality; Electronic and steric effects in organic molecules: Inductive effect; Electromeric effect: static and dynamic; Influence of electromeric effects on the properties of molecules; Groups of atoms with electromeric and inductive effects (-I,-E), (-I, + E), (+ I, + E); Hyperconjugation, steric effects; Spectroscopic methods in organic chemistry: UV-VIS electronic spectroscopy; IR absorption spectroscopy; NMR spectroscopy; Mass spectroscopy; Reactants, intermediates and reaction types in organic chemistry: Types of reagents; Carbocations; Carbanions; Radicals; Carbenes; Rate of reaction: transition state theory and the theory of molecular collisions; Organic reactions of order I; Organic reactions of order II Competing organic reactions; Parallel organic reactions; Catalysts; Isotope effects; Hydrocarbons: Alkanes (paraffins); Cycloalkanes (cycloparaffins); Alkenes; Dienes and polienes; Alkyne (acetylene); Aromatic hydrocarbons;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam paper at the end of the course)

COURSE TITLE: STRUCTURE AND PROPERTIES OF THE MOLECULES

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The students have the opportunity to familiarize and deepen the theoretical basis of molecular structure. These elements, in addition to those related to symmetry, are used to understand the nature of the chemical bonds and molecular properties. A special importance is given to the study of the molecular spectra. Directly connected with the theoretical support, the laboratory works and seminars contribute to a better understanding of the theoretical concepts related to molecular structure, creating and developing research skills in the field.
COURSE CONTENTS: Fundamentals of quantum mechanics; Quantum theory; Particle-wave duality; Wave function; Schrödinger equation; Principles of quantum mechanics; The atomic structure; The structure and spectra of hydrogenous atoms; Atomic orbitals and their energies; Spectroscopic transitions and selection rules; Polyelectronic atoms Structure; Molecular structure; Electrovalence theory, covalence theory; Quantum mechanics theory; Orbital approximation; Valence bond method; Diatomic molecules, polyatomic molecules; Molecular orbital method; Structure of diatomic molecules; Semiempirical methods to calculate energy and molecular orbital coefficients; Molecular orbitals in polyatomic molecules; Hückel approximation; Molecular symmetry; Elements, symmetry operations and groups; Molecules symmetry classification; Consequences of symmetry; Character tables and symmetry symbols; Properties of the molecules; Electrical properties; Magnetic properties; Molecular spectra; Intensity of spectral lines; Selection rules; Energy status of the molecule; Rotational spectra (Microwave); Vibration-rotation spectra; IR spectroscopy; Raman spectra of rotation; Electronic spectra; Electronic magnetism; ESR spectra; Nuclear magnetism; Nuclear magnetic resonance (NMR).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written and oral exam on course content; individual projects, laboratory work)

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry, Biochemistry and Environmental Chemistry Technology specialisations. The seminar is designed

to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests; Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: PHYSICAL EDUCATION
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orienteering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and physical education means in actions optimizing

physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MATHEMATICS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The acquisition of fundamental concepts of mathematical analysis and differential equations, the development of skills in handling with these concepts and setting connexions between mathematics and chemistry.
COURSE CONTENTS: Linear spaces; Linear dependence and linear independence; Base; Linear operator; Linear functional; Norm; Distance; The n-dimensional space; Sequences and series; Numerical sequences; Convergence; Numerical series; Convergence; Sequences and series of functions; Power series ;Taylor's series; Taylor's expansions; Functions; Functions of real and vectorial variables; Limits; Continuous functions; Differentiable functions; Partial derivatives; The derivatives of composed functions; Extreme points of vectorial variable functions; Conditioned extreme points; Implicit functions; Integrals; Ordinary integrals; Integrals with parameters; Improper integrals; Curvilinear integrals; Multiple integrals; Integral of surface; Differential equations; Equations of first order; Linear equations of higher order with constant coefficients; Differential equations systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (summative evaluation by two tests during the semester)

COURSE TITLE: BASIC INORGANIC CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Familiarizing students with the modern way of approaching theoretical inorganic chemistry; Investigating the structure of substances by modern methods, by using appropriate computer programs.
COURSE CONTENTS: The atom; Quantum model of the atom; Quantum numbers; Atomic orbitals; Periodic table of the elements; Electronic configurations of atoms and ions; Periodic variation of some of their properties; Ionic bond; Ionic crystal lattices; Formation of an ionic bond; Ionic crystal lattices; Haber-Born cycle; Metallic bond; Metal crystal lattices; Formation of a metallic bond; Metal crystal lattices; The electronic band structure model; Covalent bond; Formation of molecules; Formation of a covalent bond; Molecular orbital energy diagrams; Stability of molecules; Magnetic properties; Bonding order; Molecular geometry; The VSEPR model; Standard geometry of a molecule; Real geometry of a molecule; Molecular symmetry; Symmetry transformations; Symmetry elements of a molecule; Symmetry point groups; Molecular properties due to the symmetry (polarity and chirality); Molecular vibrations and their symmetry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 30% of the final grade – continuous assessment and final discussion)

COURSE TITLE: QUALITATIVE-ANALYTICAL CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring basic principles of analytical chemistry, appropriate terminology, understanding and operating with concepts about various types of chemical equilibrium.
COURSE CONTENTS: Overview of analytical chemistry; Analytical reactions and reagents; Electrolytic dissociation and its analytical importance; Equilibrium in strong electrolyte solutions; Proton exchange equilibrium; Ion or molecules exchange equilibrium; Electron exchange equilibrium.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – oral examination; 30% of the final grade – evaluation of practical skills

COURSE TITLE: ORGANIC CHEMISTRY – SINGLE ORGANIC FUNCTIONS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Provide students with the basic concepts of structure, nomenclature, and reactivity of organic compounds containing simple organic functions.
COURSE CONTENTS: Organic halogen compounds; Hydroxyl compounds (alcohols and phenols); Acyclic ethers; Carbonyl compounds: saturated monocarbonyl and aromatic compounds, dicarbonyl compounds and quinones; Carboxylic

acids: monocarboxylic and dicarboxylic acids, saturated, unsaturated and aromatic acids; Functional derivatives of carboxylic acids: acyl halides, anhydrides, esters, amides and nitriles; Nitro, nitroso compounds; Functional derivatives of carbonic acid: urethanes and urea; Amines, quaternary ammonium salts, diazonium salts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam at the end of the course)

COURSE TITLE: CHEMICAL THERMODYNAMICS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The main objective is the study of the laws of the thermodynamics and their applications to chemical processes, the chemical and physical equilibrium, the deduction of the laws and relationships that govern the phase transformation. In addition the basics of statistical thermodynamics are studied to deduce relationships that connect thermodynamic functions and structural properties of the substances. In direct connection with the theory, the laboratory works and seminars contribute to a better understanding of the thermodynamic phenomena and processes, creating and developing research skills in the field.
COURSE CONTENTS: Basics of thermodynamics; The purpose and the importance of the study of chemical thermodynamics; Thermodynamic system; Parameters of state, equations of state; Thermodynamic state functions; Thermodynamic processes, stationary state; Partial molar properties; Temperature, the zero law of thermodynamics; The first law of thermodynamics; The exchange of energy between the system and environment; The internal energy; The enthalpy; Heat capacity; Applications of the I-st law of thermodynamics; energy exchange in processes taking place without phase transformation; Thermal effects of phase transformations; Thermal effects of chemical processes; The second law of thermodynamics; Carnot cycle, the entropy, the spontaneity criteria of the natural processes; The absolute temperature; Thermodynamic potentials; Free energy; Free enthalpy; Fugacity; Applications of the second law;
The third law of thermodynamics; The heat theorem; Planck postulate; The absolute entropy of the compounds; Physical equilibrium; Criteria for equilibrium; Homogeneous and heterogeneous systems, phase, independent component, degrees of freedom, the fundamental equation of equilibrium; The law of phases; The physical equilibrium in multicomponent systems; Clausius Clapeyron equation; Ideal solutions, real solutions, the vapor pressure of the solutions, Raoult's Law; Activity coefficient, fugacity coefficient; Ebullioscopy, cryoscopy; Solubility of gases in liquids, Henry's law; Solubility of solids in liquids, equilibrium distribution of a substance between two immiscible solvents; Vapor liquid equilibrium, ideal binary systems, and non-ideal systems; Chemical equilibrium; Condition of equilibrium for a chemical reaction; Influence of the reactant system on the free enthalpy of reaction; Equilibrium constant and dependence on temperature and pressure; Chemical equilibrium of the real gases, chemical equilibrium in heterogeneous systems; Reactions in the aqueous phase, liquid phase chemical equilibrium; Calculation of the equilibrium constant; Basics of statistical thermodynamics; Entropy and thermodynamic probability; Calculation of thermodynamic functions for the ideal gas; Calculation of the free enthalpy of reaction using statistical thermodynamics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Examination (written and oral exam on course content; individual projects, laboratory work)

COURSE TITLE: PHYSICAL EDUCATION
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orienteering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and physical education means in actions optimizing physical training and individual motion ability; Use

specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

2ST YEAR, 1ST SEMESTER

COURSE TITLE: QUANTITATIVE-ANALYTICAL CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The discipline aims to deepen the knowledge gained by students in disciplines Theoretical bases of Anorganic Chemistry, Qualitative Analitical Chemistry. As any branch of chemistry, Quantitative Analitical Chemistry develops two important perspectives: to accustom students with the volumetric techniques of analysis and with the gravimetric dosing methods.
Also it aims a systematization of knowledge focusing on classical quantitative methods of dosing compounds involved in the quality and protection of the environment.
COURSE CONTENTS: Titrimetry by proton exchange reactions; Titration curves; The application of acid-based titrimetry; Titrimetry by redox reactions; The applications of redox titrimetry; Titrimetry by complexing reactions; Titrimetry by precipitation reactions; Acid-based titrimetry in non-aqueous agent; Gravimetric analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: CHEMISTRY OF THE NON-METALS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring of the fundaments of synthesis, structure and reactivity of non-metals and their compounds; Presentation of the main applications of non-metals and their most important compounds.
COURSE CONTENTS: Methods of non-metals synthesis; Hydrogen; Group VIII (Mono-atomic gases); Group VII (Halogens); Group VI (Chalcogens); Group IV: carbon and silicon; Group III: boron.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination, continuous assessment and final examination

COURSE TITLE: ORGANIC CHEMISTRY – MIXED FUNCTIONS AND HETEROCYCLIC COMPOUNDS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Discipline aims to deepen knowledge acquired by students disciplines Fundamentals of organic chemistry and Organic Chemistry-simple functions. Like any branch of chemistry develops two important aspects: learning by students to the basics of obtaining and reactivity of organic compounds with multifunctional groups and heterocyclic organic compounds.
COURSE CONTENTS: Classification of organic compounds with multifunctional groups; Amino Alcohols; Hydroxy Acids; Amino Acids; 5-membered heterocycles with one heteroatom; 5-membered heterocycles with two, three or four heteroatoms; 6-membered heterocycles with one heteroatom; 6-membered heterocycles with two and three heteroatoms; 7-membered heterocycles with one heteroatom.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – final written paper; 20% of the final grade – laboratory colloquium; 10% of the final grade – report documentation)

COURSE TITLE: CHEMICAL KINETICS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): This program addresses to the second year students of the Faculty of Sciences, specialization Chemistry. Chemical Kinetics offers information on: (i) the type of chemical reactions; (ii) the mechanisms and chemical reaction rates. The main objective is to deduce the mathematical expressions of reaction rates, taking into account a proposed mechanism. The laws of reaction rates allow the understanding the basic steps which constitute the reaction mechanisms. Subordinated to these objectives, lab work aims to create competences and skills in performing certain works, to determine the constants of reaction rates using different methods such as: analytical methods and physico-chemical methods like: conductivity, polarimetry, thermogravimetry and UV-VIS spectrophotometry.
COURSE CONTENTS: Getting Started: chemical kinetics object; classification of chemical reactions; the chemical reaction rate; constant of reaction rate; Kinetics of simple reactions; Mathematical characterization of complex reactions: successive

reactions; reversible reactions; parallel reactions and simultaneous reactions; Chained processes: the decomposition of acetaldehyde and hydrobromic acid synthesis; Polimerization reactions: radicalic and ionic polymerization; Polycondensation reactions: catalysed and self-catalysed polycondensation; Homogeneous catalysis: kinetics and mechanism; kinetics of enzyme catalysis; Heterogeneous catalysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – laboratory reports)

COURSE TITLE: BIOCHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): To provide students with basic principles of Biochemistry. The course aims for students to: understand elements of basic biochemistry, including molecule names, molecular structures and terms used to describe categories of molecules; understand the relationship between molecular structure and biochemical function; acquire the technical language used to communicate key concepts relevant to biochemistry; perform biochemical analyses and basic calculations with experimental data; apply elementary concepts of biochemistry to specific problems.
COURSE CONTENTS: Amino acids and proteins; Carbohydrates; Lipids; Nucleic acids; Vitamins.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade – final written paper; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation)

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring English language skills.
COURSE CONTENTS: Specific terminology: Types of Inorganic Chemical Reactions; Health and Safety in the Engineering Workplace; Laboratory Equipment; Troubleshooting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral verification

COURSE TITLE: PHYSICAL EDUCATION I

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Athletics – sprinting, middle-distance running, long jump – learning the technical-tactical component parts. Volleyball/ football/ handball/ basketball – learning the game rules for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

COURSE TITLE: FRENCH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Better knowledge of the French language and vocabulary to facilitate student access to specialized texts with a high degree of difficulty, with good knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase in French, in order to acquire the fundamental mechanisms underlying the particular specialized French language; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals, etc.
COURSE CONTENTS: Brief history of the development of the classification of the elements; Structure of the current periodic classification; Periodicity of properties; Electronegativity; Ionic rayon; Study of some chemical families; Amines I; Amines II; Stereo isomerism configuration; Rules sequential C, I, P; The carbon-halogen bond I; The carbon-halogen bond II; The carbon-halogen bond III.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously

purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

2ST YEAR, 2ND SEMESTER

COURSE TITLE: ENGLISH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring English language skills.
COURSE CONTENTS: Specific terminology: Types of Inorganic Chemical Reactions; Health and Safety in the Engineering Workplace; Laboratory Equipment; Troubleshooting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral verification

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Better knowledge of the French language and vocabulary to facilitate student access to specialized texts with a high degree of difficulty, with good knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase in French, in order to acquire the fundamental mechanisms underlying the particular specialized French language; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals, etc.
COURSE CONTENTS: Brief history of the development of the classification of the elements; Structure of the current periodic classification; Periodicity of properties; Electronegativity; Ionic rayon; Study of some chemical families; Amines I; Amines II; Stereo isomerism configuration; Rules sequential C, I, P; The carbon-halogen bond I; The carbon-halogen bond II; The carbon-halogen bond III.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: CHEMISTRY OF THE METALS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The general characterisation of metals both from the point of view of synthesis and of their properties; the explanation of the reactivity of metals based on their electronic configuration; The introduction of some new data, in a modern way, but at the same time accessible to student's understanding; The achievement of a real and broad image of the chemistry of metals on which the student could access more detailed approaches given by various papers in the field.
COURSE CONTENTS: Theories of the Metallic Bond; Synthesis and Purification of the Metals; The Crystalline Structure and the Optical, Mechanical and Physical Properties of the Metals; Magnetic Properties of the Metals and of their Compounds; Chemical Properties of the Metals; Corrosion of the Metals; The Capacity of the Metals to Form Alloys. Representative Types of Alloys. Amalgams; The Metallic Elements from the Blocks "s" and "p".
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: INSTRUMENTAL ANALYSIS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course seeks to convey to students the basic knowledge in learning and in applying modern optical and electrochemical methods in Analytical Chemistry.
COURSE CONTENTS: 1. Atomic Absorption and Emission Spectrometry; Atomic Emission in Viz. and UV; Atomic Absorption in Viz. and UV; 2. Atomic (flame) Emission Spectrometry; Theoretical principles; Equipment; Qualitative and quantitative analysis; Analytical applications; 3. Atomic Absorption Spectrometry; Theoretical principles; Equipment; Quantitative analysis; Analytical applications; 4. Molecular Absorption Spectrometry; Molecular Absorption in UV, VIZ, and IR; Equipment; Analytical applications; 5. Molecular

Absorption Spectrometry in Viz. and UV; Radiation absorption rules; Absorbance additivity property; Qualitative and quantitative analysis; Analytical applications; 6. Molecular Absorption Spectrometry in I.R.; Theoretical principles; Samples preparation; Qualitative and quantitative analysis; Analytical applications; 7. Nephelometric and turbidimetric method of analysis; Principles; Equipment; Analytical applications; 8. Electrodes potential; Experimental determination of electrodes potential; Significance of standard electrodes potential; 9. Electrogravimetry; Principles; Conditions for forming an analitycal deposit; Equipment; Analytical application; 10. Cyclic voltammetry and chronopotentiometry with scanning null current potential; Equipment; Analytical application; 11. Potentiometry; The classification of potentiometric methods; Systems of electrodes used in potentiometry; Potentiometric titration; 12. Amperometric titration; Principles; Titration curves; Equipment; Analytical application; 13. Polarograplic analysis; Principles; Diffusion current; Polarographic methods; Qualitative and quantitative analysis; Analytical application; 14. Conductometry; Specific and equivalent conductivity; Conductometric methods in continuous and alternative current.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: COORDINATION CHEMISTRY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Familiarizing students with the modern way of approaching theoretical coordination chemistry; Investigating the structure of complex compounds by modern methods, by using appropriate computer programs.
COURSE CONTENTS: General theoretical considerations; The structure of complex compounds with one central metallic ion; Characteristics of the central metal ion and the ligands; Primary and secondary valence; Coordination number; Internal coordination sphere and external coordination sphere; Stereochemistry of complex compounds; Geometries and coordination numbers; Symmetry of complex combinations; Symmetry groups of complex combinations; The relationship between symmetry and chirality; Treating chemical bond in complex compounds within the crystal field theory; The general principles of the theory; Splitting of the *d* orbitals of the central metal ion in different crystal fields; Calculation of CFSE; Treating chemical bond in complex combinations within the molecular orbital theory; The general principles of the theory; Molecular orbital energy diagrams of complex compounds; Magnetic and spectral properties of complex combinations; "High-spin" and "low-spin" complex compounds; Electronic transitions; UV-VIS absorption spectra; Reactivity and biological activity of coordination compounds; Types of chemical reactions in which complex compounds may be involved; The *trans* effect; Reaction mechanisms; Biological activity of some coordination compounds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – written paper; 30% of the final grade – continuous assessment and final discussion)

COURSE TITLE: ORGANOMETALLIC COMPOUNDS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The course describes the main classes of organometallic compounds following the groups of chemical elements from the periodic table. To every type of compounds are presented methods of obtaining, chemical and physical properties, representative compounds and their applications.
COURSE CONTENTS: Organometallic chemistry: Nomenclature of organometallic compounds; Carbon-metal bonds; Ionic bonds; σ-Covalent bonds; Electron deficient covalent bonds; Unlocalized bonds in polynuclear systems; Dative covalent bonds with the participation of the d metal orbital; Summary of laboratory techniques for the synthesis of organometallic compounds; Organometallic compounds of alkali metals; Organolithium compounds and compounds of other alkali metals: Organolithium compounds obtaining; Organolithium compounds structure; Chemical properties; Organometallic compounds of sodium and other alkali metals; Organometallic compounds of metals of groups II-a and II-b: Organoberyllium compounds; Organomagnesium compounds; Obtaining of organomagnesium compounds; Grignard reagents in solution; Reactions of organomagnesium compounds; Organometallic compounds of calcium, strontium and barium; Organometallic compounds of zinc, cadmium and mercury; Methods of obtaining; Structure and properties; Organometallic compounds of elements of group III a: Organoboron compounds; Obtaining; Chemical properties; Heteroborones, carboranes; ^{11}B-NMR of organoboron compounds; Organoaluminum compounds; Methods of obtaining organoaluminum compounds; Organoaluminum compounds structure; Properties; Organometallic compounds of gallium-, indium and thallium; Methods for obtaining and properties; Applications of organothallium compounds in organic synthesis;

Organometallic compounds of elements of group IV a: Generality; Organosilicon compounds; Organosilicon compounds with coordination number 4; Obtaining; Properties; Organosilicon compounds with coordination numbers 2 and 3; Organogermanium compounds; Organogermanium compounds with coordination number 4; Organogermanium compounds with coordination numbers 2 and 3; Organometallic compounds of tin; Organotin compounds with coordination numbers 4, 5 and 6; Tetraorganotin compounds R_4Sn; Organotin halides; Organotin hydrides; Hydroxides and alkoxides organotin compounds; Amino derivatives of organotin compounds; Mercapto derivatives of organotin compounds; Organotin polymers; Organotin compounds with coordination numbers 2 and 3; Organometallic compounds of lead; Tetra-substituted organolead compounds; Di- and tricoordinaate organolead compounds; Organolead compounds in vivo; Organometallic compounds of elements of group V a: Compounds oxidation number 5; Derivatives R_5E; Derivatives R_nEX_{5-n}; Compounds oxidation number 3; Derivatives R_3E; Derivatives $RnEX_3$; Hydride derivatives R_nEH_{3-n}; Acyclic and cyclic compounds with simple bond E-E; Compounds with double bonds E = C; Compounds with double bonds E = E; Organometallic compounds of transition metals: Types of ligands; Metal carbonyl compounds, structure and applications in organic synthesis; π-complexes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam at the end of the course)

COURSE TITLE: SYNTHESIS OF BIOLOGICALLY ACTIVE COMPOUNDS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Acquiring information on the structure, synthesis pathways and properties of some biologically active compounds; Description and interpretation of methods and techniques used to determine the structure and properties of synthesized biologically active compounds.
COURSE CONTENTS: Introduction to Chemistry of Biologically Active Compounds; Peptides and Proteins – Chemical Synthesis and Biosynthesis; Biosynthesis of Fatty Acids; Synthesis of Glucose and Other Saccharides and Saccharides Derivatives; Nucleic Acids; Synthesis of Nitrogenous Bases, Nucleosides and Nucleotides; Synthesis of Some Water soluble and Liposoluble Vitamins; Synthesis of Terpenes, Steroids, Flavonoids and Anthocyanins; Synthesis of Some Pharmaceutical Compounds; Synthesis of Anthraquinone, Arylmethane and Indigoid Dyes; Synthesis of Fungicides, Herbicides, Insecticides, Rodenticides and Acaricides.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – exam; 30% of the final grade – lab examination)

COURSE TITLE: SPECIALTY PRACTICE
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Learning basics: organizing a productive, knowledge technologies, physical, chemical, biochemical, mechanical processes, organization of production departments, quality assurance concepts and how to track product quality.
COURSE CONTENTS: Description of technological process flow diagrams technology, measuring and control devices; Description of the main chemical or biochemical processes, according to the process description of the functioning of key equipment, operating parameters, structural characteristics; Raw materials, utilities, finished products, semi-finished products: technical quality.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Verification (written paper regarding the characteristic activity undertaken during practical stage)

COURSE TITLE: PHYSICAL EDUCATION II
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Gymnastics: acrobatic dynamic games, with content from basic and applicative motor skills; Developing motor skills – methods and means of action; Volleyball/ football/ handball/ basketball – learning the game model for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: SEPARATION METHODS
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It aims to make students understand the necessity of separation processes, of theoretical and practical bases of separating different mixtures of compounds; the discipline also aims to accustom students with most of the separation techniques currently used.
COURSE CONTENTS: Necessity of separation processes in analytical chemistry; Classification of separation methods; The mechanisms of separation processes; Parameters used to appreciate the efficiency of the separation methods in analytical chemistry; The separation by precipitation and co-precipitation; The separation by liquid – liquid solvent extraction; The separation by ion exchange. Parameters of the ion exchange process; Planar chromatography: on paper and on thin layer; Separation by gas chromatography; Analytical separation by liquid chromatography; Electrophoresis; Analytical separation by HPLC.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – documentation)

COURSE TITLE: CHEMICAL TECHNOLOGY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Provide students with the fundamental concepts of the structure and content of industrial processes for the production of basic chemicals and specific issues related to catalytic processes, catalysis and catalyst manufacture.
COURSE CONTENTS: Ammonia technology; Nitric acid technology; Sulphuric acid technology; Soda and chlorine technology products; Technology of methanol and formaldehyde; Petrochemical technology; Harnessing water resources; Fundamental aspects of catalytic processes; Homogeneous catalysis; Heterogeneous catalysis; Characterization and manufacturing technology for heterogeneous catalysts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (written examination)

COURSE TITLE: ELECTROCHEMISTRY AND CORROSION
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Electrochemistry and Corrosion, as discipline, provides information about basic concepts of phenomena occurring when current passes through the electrolyte solutions. Practical work materializes the theoretical concepts presented in this course. Moreover, Part II reveals theoretical bases of corrosion processes and their control based on fundamental principles of thermodynamics and electrochemical kinetics. Lab work aims to create competences and skills to determine the corrosion rates of metals in various aggressive media using weight loss and electrochemical measurements.
COURSE CONTENTS: Dissociation electrolytic theory; Equilibrium electrode potential; Electrochemical Cells; Electrochemical kinetics; Diffusion kinetics; Study on electrode processes; The operating parameters of electrochemical systems; Corrosion – the basics; Thermodynamics of corrosion processes. Pourbaix diagrams; The kinetics of corrosion processes; The impact factors on corrosion occurrence; Metals passivation; Methods to prevent corrosion.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (70% of the final grade – exam; 20% of the final grade – assessment during the semester; 10% of the final grade – laboratory reports)

COURSE TITLE: ANALYTICAL BIOCHEMISTRY
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S):Thoroughgoing study and correlation of the main analytical techniques related to the biochemical analysis; training to use correctly certain theoretical knowledge in order to choose the most appropriate method for analysis of biological compounds with understanding the particularities of each class of biochemical compounds.
COURSE CONTENTS: General principles of analytical biochemistry; Separation methods used in biochemical analysis; Radio-isotopes: nature of radioactivity, detection and measurement of radioactivity, biochemical uses of isotopes; Immunological methods; Analysis of important biochemical compounds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

COURSE TITLE: SENSORS AND BIOSENSORS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): It aims to provide students the basic notions about the practical implementation of an E.I.S. or of a biosensor. There are presented the wiring diagrams and the practical applications, for their utilisation to control the

quality of environment for automatic monitoring system of the parameters that check the quality of air, water and soil.
COURSE CONTENTS: 1. Characteristics of electrochemical sensors; Analytical sensors as electrochemical systems; 2. Common electrodic materials: Pt, Au, Hg, varieties of coal, chemical and physical aspects; 3. Electrochemical stability of pure water; Pourbax diagrams; 4. Electrodes with modified surface; 5. Physical methods used in the study of solid sensors surface state; 6. Hydrodynamic electrodes: rotating disk electrode, rotating ring-disk electrode; 7. Amperometric sensors; Work techniques: electrode reactions controlled by mass transfer; 8. E.I.S.(ion-selective electrodes): 8.1. Glass membrane electrodes; 8.2. Homogeneous solid membrane electrodes; 8.3. Heterogeneous solid membrane electrodes; 8.4. Liquid membrane electrodes; 8.5. Gas sensitive electrodes; 8.6. Gasfet electrodes; 9. Biosensors (electrodes with enzymes membrane): 9.1. Sensors for surfactants; 9.2. Sensors of acetylcholine; 9.3. Chiral sensors; 9.4. Coated wire sensor; 9.5. Transistor with ion selective field effect; 10. Calibration of ion – selective sensors.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: MACOMOLECULAR COMPOUNDS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Discipline provides to the students information about the structure of macromolecular compounds, physical and mechanical and electrical properties of macromolecular substances, the mechanisms and kinetics of polymerization reactions. Subordinated to these goals, laboratory work aims to create work availability and skills for the determination of characteristic of polymers: polymerization degree, molecular weight, relative viscosity, specific viscosity, intrinsic viscosity, hydrolysis degree, Huggins, Schultz and Kramer constants, by using equations with thrust coefficients.
COURSE CONTENTS: Fundamentals; Mechanical and physical properties of polymers; Nature of polymer solutions; Additive polymerization of unsaturated compounds; Condensing poly-merization (polycondensation); Chemical reactions of polymers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (80% of the final grade – exam; 20% of the final grade – laboratory reports)

COURSE TITLE: STRUCTURE OF INORGANIC COMPOUNDS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Students will acquire notions regarding quantum theory of covalent bond. A special attention will be paid to the structural characteristics of main classes of inorganic compounds. The students will acquaintance with drawing the energy diagrams of inorganic compounds and stability calculations.
COURSE CONTENTS: Hybridization theory: hybridization between s and p orbitals; Hybridization theory: hybridization between s, p and d orbitals; Molecular orbital theory of covalent bond; Gillespie model; Electronic densities in atoms and molecules; Quantum-mechanical methods for covalent bond formation; Homonuclear biatomic molecules; Heteronuclear biatomic molecules; Threeatomic molecules in LCAO-MO; Tetra- and pentaatomic molecules in LCAO-MO; Chemical bond formation in ML_n – type complexes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – written exam; 20% of the final grade – lab work evaluation; 10% of the final grade – scientific report)

COURSE TITLE: NATURAL COMPOUNDS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The course aims at enriching knowledge acquired by students disciplines Fundamentals of organic chemistry, Organic chemistry-simple functions, Organic compounds with multifunctional groups and heterocycles. It plans to introduce new concepts in a modern manner, in the final year students. The focus is on building a connection between the basics of organic chemistry and biological properties related notions.
COURSE CONTENTS: 1. Classification of natural compounds; 2. Terpenoids; 3. Steroids; 4. Politerpenoide; 5. Nucleic acids; Nucleotides; Nucleosides; 6. Alkaloids; 7. Natural pigments; 8. Tannins; 9. Antioxidants; 10. Natural dyes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – final written paper; 20% of the final grade – laboratory colloquium; 10% of the final grade – report documentation)

COURSE TITLE: QUALITY ASSURANCE AND STANDARDIZATION

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The course aims at making students acquire theoretical and practical bases assurance environmental quality principles, relating in particular to ensure air quality, water and soil. Also, go over basic concepts of standardization their application in practice, and the main methods to combat air pollution, soil and water.
COURSE CONTENTS: Philosophy of standard-dization, life cycle of a standard, access to standards, standard services, standardization and metrology in analytical chemistry; Philosophy of international organizations regarding standard-dization; Standard preparation; The beginnings of standard methods in analytical chemistry; Environmental protection, principles underlying environmental protection. Atmosphere protection, sources of air pollution, the effects of pollutants on vegetation, water, soil; Nitrogen oxides, pollution sources of nitrogen oxides, physiological effects of nitrogen oxides; Oxides of sulphur, pollution sources of sulphur oxides, sulphur oxides physiological effects; Carbon monoxide, pollution sources of carbon monoxide, carbon monoxide physiological effects; General notions about water, water in nature, gases dissolved in water, minerals, biogenic substances dissolved in water; Solutions of gases in liquids, water mineralization, dissolved by moisture; Dissolution by hydrolysis, dissolution of redox process; Characteristics of surface water, chemical pollution of water, leading to the pollution of water; Types of water pollution, biological pollution, physical pollution, chemical pollution, domestic pollution; Water pollution by detergents, soil pollution, soil physical properties, soil functions, fertilizer pollution, pesticide pollution. Methods and chemical indicators used in chemical analysis data processing and interpretation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – exam; 30% of the final grade – report documentation)

FIELD: CHEMISTRY
PROGRAMME TITLE: TECHNOLOGICAL BIOCHEMISTRY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): acquiring fundamental notions of chemistry; the explanation and the understanding of the principles and the phenomena which control the reactivity of elements and of chemical combinations.
COURSE CONTENTS: Fundamental Laws of the Chemistry; Fundamental Notions in Chemistry; The; Periodic Table of Elements; The Structure of the Atom; Interatomic and Intermolecular Chemical Bonds; The Aggregation States of Matter; Solvents and Solutions; Types of Solutions Concentrations; Chemical Thermodynamics; Chemical Kinetics; Electrochemistry and the Electrochemical Conversion of Energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: INFORMATICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The course focuses on initiating students in computer science: the fundamentals of using computers in scientific purposes; the fundamentals of description and design of algorithms; knowledge of Excel spread sheet environment; knowledge of Word document editing environment; using computers to solve problems in chemical engineering related subjects.
Practical applications are to obtain computer skills for using computers to solve various problems (organization and processing of information, data analysis, calculations, graphics processing, communications, documentation, etc.).
COURSE CONTENTS: 1. Elements of information and communication technology (ICT) and knowledge processing: computer systems, operating systems, programming languages, software applications, operating environments/ navigation computer networks, expert systems, intelligent systems, the Internet; 2. Architecture and hardware structure of computing systems: central processing unit, microprocessor, internal memories, external memories, I/O devices, multimedia systems, networking technologies; 3. Architecture and software structure of computing systems: operating systems, utilities, operating environments/ resolution, navigation environments, programming environments, graphical interfaces, processors text/ images, programs, communications, e-mail services, Web services, application programs/ specialized; 4. Windows: functions, kernel, interface, menus, windows, buttons, boxes, icons, files, folders, documents and programs operating, organizing files, operations with files; 5. Word: fonts, editing techniques and operations text/ images, formatting, create and edit tables, sorting information, elements Drawing; 6. Excel: spread sheets, agendas, cells, formulas, spread sheet functions, charts and graphs, data and analysis, applications and problem solving of mathematics, physics, chemistry; 7. The Internet: communications software, e-mail services, Web services, Web pages, e-learning, multimedia technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (written and oral exam)

COURSE TITLE: PHYSICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): It is one of the complementary subjects of the curriculum to familiarize students with basic physical concepts needed in next semester and beyond to understand disciplines. Basically, students learn how to systematize concepts of mechanics, electromagnetism, thermodynamics, optics, atomic physics and nuclear physics encountered in the disciplines of chemistry.
COURSE CONTENTS: Notions complementary to general physics course; Vectors; Operations with vectors; Integral operation; Integral theorems; Notions of vector algebra; Notions of mechanics; Fundamentals of mechanics; Newton's laws; Conservative forces; Types of movements; Mechanical work; Mechanical energy; Mechanical power; Conservation laws; Notions relativistic mechanics; Notions of thermodynamics; Fundamentals of thermodynamics; Zero principle of thermodynamics; The concept of temperature; Temperatures scales; Particular processes of ideal gas; First principle of thermodynamics; The heat capacity; The latent heat; Polytrope processes; The second principle of thermodynamics; Thermal machines; Thermodynamic cycles; Notions of electricity and magnetism; The electric charge; Electromagnetic interactions; Electric field; Electrostatic potential; The flow of electric field; Gauss's theorem under vacuum; Electric current; Circuits; Instruments for measuring electrical quantities; The magnetic field of electricity; Constant magnetic field equations; Electromagnetic induction; Notions of optic; Electromagnetic waves; Nature and propagation of light (light sources,

wave fronts, velocity of light); Interference and diffraction of light; Reflection and refraction of light; Refractive index; Total reflection; Absorption; Dispersion; Rainbow; Lenses and optical instruments; Notions of Atomic and Nuclear Physics; Exclusion principle; The atomic structure; Diatomic molecules; Molecular spectra; Structure of solids; Nucleus of the atom; Natural radioactivity; The radioactive transformations; Nuclear reactions; Nuclear fission and fusion; Physical relationship with other sciences.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: FUNDAMENTALS OF ORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Provide students with a basic understanding of the structure of organic compounds, electronic and quantum theories of chemical bonds, isomerism, electronic effects, speed of reactions, the natural state, the obtaining and the reactivity of hydrocarbons.
COURSE CONTENTS: Structure of organic compounds: Representation formulas of organic molecules; Electronic theory of chemical bonds; Hydrogen bonds; Electronics and quantum theories of chemical bonds in organic compounds: Quantum theory of chemical bonds; Molecular orbital method; Resonance method; sp^3 , sp^2 and sp hybridization; Isomerism of organic compounds: Constitutional isomers: chain, position, function, and valence; Stereoisomerism: geometrical isomers; Stereoisomers: conformation isomers of butane; Stereoisomerism: conformation isomers of cyclohexane; Stereoisomerism: symmetry elements of molecules; Stereoisomers: enantiomers, nomenclature of enantiomers; Stereoisomers: diastereoisomers, meso forms, axial and planar chirality; Electronic and steric effects in organic molecules: Inductive effect; Electromeric effect: static and dynamic; Influence of electromeric effects on the properties of molecules; Groups of atoms with electromeric and inductive effects (-I,-E), (-I, + E), (+ I, + E); Hyperconjugation, steric effects; Spectroscopic methods in organic chemistry: UV-VIS electronic spectroscopy; IR absorption spectroscopy; NMR spectroscopy; Mass spectroscopy; Reactants, intermediates and reaction types in organic chemistry: Types of reagents; Carbocations; Carbanions; Radicals; Carbenes; Rate of reaction: transition state theory and the theory of molecular collisions; Organic reactions of order I; Organic reactions of order II Competing organic reactions; Parallel organic reactions; Catalysts; Isotope effects; Hydrocarbons: Alkanes (paraffins); Cycloalkanes (cycloparaffins); Alkenes; Dienes and polienes; Alkyne (acetylene); Aromatic hydrocarbons;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam paper at the end of the course)

COURSE TITLE: STRUCTURE AND PROPERTIES OF THE MOLECULES

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The students have the opportunity to familiarize and deepen the theoretical basis of molecular structure. These elements, in addition to those related to symmetry, are used to understand the nature of the chemical bonds and molecular properties. A special importance is given to the study of the molecular spectra. Directly connected with the theoretical support, the laboratory works and seminars contribute to a better understanding of the theoretical concepts related to molecular structure, creating and developing research skills in the field.
COURSE CONTENTS: Fundamentals of quantum mechanics; Quantum theory; Particle-wave duality; Wave function; Schrödinger equation; Principles of quantum mechanics; The atomic structure; The structure and spectra of hydrogenous atoms; Atomic orbitals and their energies; Spectroscopic transitions and selection rules; Polyelectronic atoms Structure; Molecular structure; Electrovalence theory, covalence theory; Quantum mechanics theory; Orbital approximation; Valence bond method; Diatomic molecules, polyatomic molecules; Molecular orbital method; Structure of diatomic molecules; Semiempirical methods to calculate energy and molecular orbital coefficients; Molecular orbitals in polyatomic molecules; Hückel approximation; Molecular symmetry; Elements, symmetry operations and groups; Molecules symmetry classification; Consequences of symmetry; Character tables and symmetry symbols; Properties of the molecules; Electrical properties; Magnetic properties; Molecular spectra; Intensity of spectral lines; Selection rules; Energy status of the molecule; Rotational spectra (Microwave); Vibration-rotation spectra; IR spectroscopy; Raman spectra of rotation; Electronic spectra; Electronic magnetism; ESR spectra; Nuclear magnetism; Nuclear magnetic resonance (NMR).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written and oral exam on course content; individual projects, laboratory work)

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry, Biochemistry and Environmental Chemistry

Technology specialisations. The seminar is designed to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests; Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: PHYSICAL EDUCATION

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orienteering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and

physical education means in actions optimizing physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENGLISH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry, Biochemistry and Environmental Chemistry Technology specialisations. The seminar is designed to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests; Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: MATHEMATICS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The acquisition of fundamental concepts of mathematical analysis and differential equations, the development of skills in handling with these concepts and setting connexions between mathematics and chemistry.
COURSE CONTENTS: Linear spaces; Linear dependence and linear independence; Base; Linear

operator; Linear functional; Norm; Distance; The n-dimensional space; Sequences and series; Numerical sequences; Convergence; Numerical series; Convergence; Sequences and series of functions; Power series ;Taylor's series; Taylor's expansions; Functions; Functions of real and vectorial variables; Limits; Continuous functions; Differentiable functions; Partial derivatives; The derivatives of composed functions; Extreme points of vectorial variable functions; Conditioned extreme points; Implicit functions; Integrals; Ordinary integrals; Integrals with parameters; Improper integrals; Curvilinear integrals; Multiple integrals; Integral of surface; Differential equations; Equations of first order; Linear equations of higher order with constant coefficients; Differential equations systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (summative evaluation by two tests during the semester)

COURSE TITLE: BASIC INORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Familiarizing students with the modern way of approaching theoretical inorganic chemistry; Investigating the structure of substances by modern methods, by using appropriate computer programs.
COURSE CONTENTS: The atom; Quantum model of the atom; Quantum numbers; Atomic orbitals; Periodic table of the elements; Electronic configurations of atoms and ions; Periodic variation of some of their properties; Ionic bond; Ionic crystal lattices; Formation of an ionic bond; Ionic crystal lattices; Haber-Born cycle; Metallic bond; Metal crystal lattices; Formation of a metallic bond; Metal crystal lattices; The electronic band structure model; Covalent bond; Formation of molecules; Formation of a covalent bond; Molecular orbital energy diagrams; Stability of molecules; Magnetic properties; Bonding order; Molecular geometry; The VSEPR model; Standard geometry of a molecule; Real geometry of a molecule; Molecular symmetry; Symmetry transformations; Symmetry elements of a molecule; Symmetry point groups; Molecular properties due to the symmetry (polarity and chirality); Molecular vibrations and their symmetry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 30% of the final grade – continuous assessment and final discussion)

COURSE TITLE: QUALITATIVE-ANALYTICAL CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring basic principles of analytical chemistry, appropriate terminology, understanding and operating with concepts about various types of chemical equilibrium.
COURSE CONTENTS: Overview of analytical chemistry; Analytical reactions and reagents; Electrolytic dissociation and its analytical importance; Equilibrium in strong electrolyte solutions; Proton exchange equilibrium; Ion or molecules exchange equilibrium; Electron exchange equilibrium.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – oral examination; 30% of the final grade – evaluation of practical skills

COURSE TITLE: ORGANIC CHEMISTRY – SINGLE ORGANIC FUNCTIONS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Provide students with the basic concepts of structure, nomenclature, and reactivity of organic compounds containing simple organic functions.
COURSE CONTENTS: Organic halogen compounds; Hydroxyl compounds (alcohols and phenols); Acyclic ethers; Carbonyl compounds: saturated monocarbonyl and aromatic compounds, dicarbonyl compounds and quinones; Carboxylic acids: monocarboxylic and dicarboxylic acids, saturated, unsaturated and aromatic acids; Functional derivatives of carboxylic acids: acyl halides, anhydrides, esters, amides and nitriles; Nitro, nitroso compounds; Functional derivatives of carbonic acid: urethanes and urea; Amines, quaternary ammonium salts, diazonium salts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam at the end of the course)

COURSE TITLE: CHEMICAL THERMODYNAMICS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The main objective is the study of the laws of the thermodynamics and their applications to chemical processes, the chemical and physical equilibrium, the deduction of the laws and relationships that govern the phase transformation. In addition the basics of statistical thermodynamics are studied to deduce relationships that connect thermodynamic functions and structural properties of the substances. In direct connection with the theory, the laboratory works and seminars contribute to a better understanding of the thermodynamic phenomena and processes, creating and developing research skills in the field.
COURSE CONTENTS: Basics of thermodynamics; The purpose and the importance of the study of

chemical thermodynamics; Thermodynamic system; Parameters of state, equations of state; Thermodynamic state functions; Thermodynamic processes, stationary state; Partial molar properties; Temperature, the zero law of thermodynamics; The first law of thermodynamics; The exchange of energy between the system and environment; The internal energy; The enthalpy; Heat capacity; Applications of the I-st law of thermodynamics; energy exchange in processes taking place without phase transformation; Thermal effects of phase transformations; Thermal effects of chemical processes; The second law of thermodynamics; Carnot cycle, the entropy, the spontaneity criteria of the natural processes; The absolute temperature; Thermodynamic potentials; Free energy; Free enthalpy; Fugacity; Applications of the second law; The third law of thermodynamics; The heat theorem; Planck postulate; The absolute entropy of the compounds; Physical equilibrium; Criteria for equilibrium; Homogeneous and heterogeneous systems, phase, independent component, degrees of freedom, the fundamental equation of equilibrium; The law of phases; The physical equilibrium in multicomponent systems; Clausius Clapeyron equation; Ideal solutions, real solutions, the vapor pressure of the solutions, Raoult's Law; Activity coefficient, fugacity coefficient; Ebullioscopy, cryoscopy; Solubility of gases in liquids, Henry's law; Solubility of solids in liquids, equilibrium distribution of a substance between two immiscible solvents; Vapor liquid equilibrium, ideal binary systems, and non-ideal systems; Chemical equilibrium; Condition of equilibrium for a chemical reaction; Influence of the reactant system on the free enthalpy of reaction; Equilibrium constant and dependence on temperature and pressure; Chemical equilibrium of the real gases, chemical equilibrium in heterogeneous systems; Reactions in the aqueous phase, liquid phase chemical equilibrium; Calculation of the equilibrium constant; Basics of statistical thermodynamics; Entropy and thermodynamic probability; Calculation of thermodynamic functions for the ideal gas; Calculation of the free enthalpy of reaction using statistical thermodynamics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Examination (written and oral exam on course content; individual projects, laboratory work)

COURSE TITLE: PHYSICAL EDUCATION

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orien teering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and physical education means in actions optimizing physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: QUANTITATIVE-ANALYTICAL CHEMISTRY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The discipline aims to deepen the knowledge gained by students in disciplines Theoretical bases of Anorganic Chemistry, Qualitative Analitical Chemistry. As any branch of chemistry, Quantitative Analitical Chemistry develops two important perspectives: to accustom students with the volumetric techniques of analysis and with the gravimetric dosing methods.

Also it aims a systematization of knowledge focusing on classical quantitative methods of dosing compounds involved in the quality and protection of the environment.
COURSE CONTENTS: Titrimetry by proton exchange reactions; Titration curves; The application of acid-based titrimetry; Titrimetry by redox reactions; The applications of redox titrimetry; Titrimetry by complexing reactions; Titrimetry by precipitation reactions; Acid-based titrimetry in non-aqueous agent; Gravimetric analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: CHEMISTRY OF THE NON-METALS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring of the fundaments of synthesis, structure and reactivity of non-metals and their compounds; Presentation of the main applications of non-metals and their most important compounds.
COURSE CONTENTS: Methods of non-metals synthesis; Hydrogen; Group VIII (Mono-atomic gases); Group VII (Halogens); Group VI (Chalcogens); Group IV: carbon and silicon; Group III: boron.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination, continuous assessment and final examination

COURSE TITLE: ORGANIC CHEMISTRY – MIXED FUNCTIONS AND HETEROCYCLIC COMPOUNDS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Discipline aims to deepen knowledge acquired by students disciplines Fundamentals of organic chemistry and Organic Chemistry-simple functions. Like any branch of chemistry develops two important aspects: learning by students to the basics of obtaining and reactivity of organic compounds with multifunctional groups and heterocyclic organic compounds.
COURSE CONTENTS: Classification of organic compounds with multifunctional groups; Amino Alcohols; Hydroxy Acids; Amino Acids; 5-membered heterocycles with one heteroatom; 5-membered heterocycles with two, three or four heteroatoms; 6-membered heterocycles with one heteroatom; 6-membered heterocycles with two and three heteroatoms; 7-membered heterocycles with one heteroatom.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – final written paper; 20% of the final grade – laboratory colloquium; 10% of the final grade – report documentation)

COURSE TITLE: CHEMICAL KINETICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): This program addresses to the second year students of the Faculty of Sciences, specialization Chemistry. Chemical Kinetics offers information on: (i) the type of chemical reactions; (ii) the mechanisms and chemical reaction rates. The main objective is to deduce the mathematical expressions of reaction rates, taking into account a proposed mechanism. The laws of reaction rates allow the understanding the basic steps which constitute the reaction mechanisms. Subordinated to these objectives, lab work aims to create competences and skills in performing certain works, to determine the constants of reaction rates using different methods such as: analytical methods and physico-chemical methods like: conductivity, polarimetry, thermogravimetry and UV-VIS spectrophotometry.
COURSE CONTENTS: Getting Started: chemical kinetics object; classification of chemical reactions; the chemical reaction rate; constant of reaction rate; Kinetics of simple reactions; Mathematical characterization of complex reactions: successive reactions; reversible reactions; parallel reactions and simultaneous reactions; Chained processes: the decomposition of acetaldehyde and hydrobromic acid synthesis; Polimerization reactions: radicalic and ionic polymerization; Polycondensation reactions: catalysed and self-catalysed polycondensation; Homogeneous catalysis: kinetics and mechanism; kinetics of enzyme catalysis; Heterogeneous catalysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – laboratory reports)

COURSE TITLE: QUANTUM CHEMISTRY
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquisition of fundamental concepts, formalism and computational aspects of molecular modelling through molecular mechanics calculations and quantum-chemical calculations.
COURSE CONTENTS: Introduction to quantum mechanics; The dynamics of microscopic systems; Mathematical formulation of quantum mechanics; Molecular mechanics modeling; Hückel molecular orbital theory; Hartree-Fock method formalism; Semiempirical quantum chemistry methods and

their implementation; Ab initio quantum chemistry methods and their implementation; Fundamental and computational aspects of functional density theory; Computation of charge distribution, molecular electrostatic potential and spectroscopic properties.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – exam; 30% of the final grade – continuous assessment and colloquium)

COURSE TITLE: PHYSICAL EDUCATION I
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Athletics – sprinting, middle-distance running, long jump – learning the technical-tactical component parts. Volleyball/ football/ handball/ basketball – learning the game rules for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

COURSE TITLE: BIOCHEMISTRY
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): To provide students with basic principles of Biochemistry. The course aims for students to: understand elements of basic biochemistry, including molecule names, molecular structures and terms used to describe categories of molecules; understand the relationship between molecular structure and biochemical function; acquire the technical language used to communicate key concepts relevant to biochemistry; perform biochemical analyses and basic calculations with experimental data; apply elementary concepts of biochemistry to specific problems.
COURSE CONTENTS: Amino acids and proteins; Carbohydrates; Lipids; Nucleic acids; Vitamins.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade – final written paper; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: ENGLISH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring English language skills.
COURSE CONTENTS: Specific terminology: Types of Inorganic Chemical Reactions; Health and Safety in the Engineering Workplace; Laboratory Equipment; Troubleshooting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral verification

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Better knowledge of the French language and vocabulary to facilitate student access to specialized texts with a high degree of difficulty, with good knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase in French, in order to acquire the fundamental mechanisms underlying the particular specialized French language; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals, etc.
COURSE CONTENTS: Brief history of the development of the classification of the elements; Structure of the current periodic classification; Periodicity of properties; Electronegativity; Ionic rayon; Study of some chemical families; Amines I; Amines II; Stereo isomerism configuration; Rules sequential C, I, P; The carbon-halogen bond I; The carbon-halogen bond II; The carbon-halogen bond III.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of

professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: CHEMISTRY OF THE METALS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The general characterisation of metals both from the point of view of synthesis and of their properties; the explanation of the reactivity of metals based on their electronic configuration; The introduction of some new data, in a modern way, but at the same time accessible to student's understanding; The achievement of a real and broad image of the chemistry of metals on which the student could access more detailed approaches given by various papers in the field.
COURSE CONTENTS: Theories of the Metallic Bond; Synthesis and Purification of the Metals; The Crystalline Structure and the Optical, Mechanical and Physical Properties of the Metals; Magnetic Properties of the Metals and of their Compounds; Chemical Properties of the Metals; Corrosion of the Metals; The Capacity of the Metals to Form Alloys. Representative Types of Alloys. Amalgams; The Metallic Elements from the Blocks "s" and "p".
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: INSTRUMENTAL ANALYSIS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course seeks to convey to students the basic knowledge in learning and in applying modern optical and electrochemical methods in Analytical Chemistry.
COURSE CONTENTS: 1. Atomic Absorption and Emission Spectrometry; Atomic Emission in Viz. and UV; Atomic Absorption in Viz. and UV; 2. Atomic (flame) Emission Spectrometry; Theoretical principles; Equipment; Qualitative and quantitative analysis; Analytical applications; 3. Atomic Absorption Spectrometry; Theoretical principles; Equipment; Quantitative analysis; Analytical applications; 4. Molecular Absorption Spectrometry; Molecular Absorption in UV, VIZ, and IR; Equipment; Analytical applications; 5. Molecular Absorption Spectrometry in Viz. and UV; Radiation absorption rules; Absorbance additivity property; Qualitative and quantitative analysis; Analytical applications; 6. Molecular Absorption Spectrometry in I.R.; Theoretical principles; Samples preparation; Qualitative and quantitative analysis; Analytical applications; 7. Nephelometric and turbidimetric method of analysis; Principles; Equipment; Analytical applications; 8. Electrodes potential; Experimental determination of electrodes potential; Significance of standard electrodes potential; 9. Electrogravimetry; Principles; Conditions for forming an analitycal deposit; Equipment; Analytical application; 10. Cyclic voltammetry and chronopotentiometry with scanning null current potential; Equipment; Analytical application; 11. Potentiometry; The classification of potentiometric methods; Systems of electrodes used in potentiometry; Potentiometric titration; 12. Amperometric titration; Principles; Titration curves; Equipment; Analytical application; 13. Polarograplic analysis; Principles; Diffusion current; Polarographic methods; Qualitative and quantitative analysis; Analytical application; 14. Conductometry; Specific and equivalent conductivity; Conductometric methods in continuous and alternative current.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: METABOLIC BIOCHEMISTRY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Knowledge and understanding of the role of active substances in the regulation of metabolic processes in living organisms; Acquiring knowledge about the stages of development of key metabolic processes, their regulation and various metabolic interconnections.
COURSE CONTENTS: 1. Vitamins; Generalities; Fat-soluble and water-soluble vitamins; 2. Enzymes; Generalities, structure, classification, nomenclature; Main classes of enzymes; 3. Metabolism; Introductory concepts, bioenergetics, macroergic compounds, examples of intermediary metabolism; 4. Glucidic metabolism; *Catabolic processes*: glycolysis, stages, energy balance, intermediates for other pathways; Cori cycle; glyoxylic acid cycle; cellular respiration; oxidative decarboxylation of pyruvate, Krebs cycle, respiratory chain, aerobic and anaerobic fermentation; *Anabolic processes*: photosynthesis; light dependent reactions, light independent reactions, metabolic role; gluconeogenesis, stages, metabolic role; 5. Lipid metabolism; Fatty acid biosynthesis and biodegradation; Biosynthesis of triglycerides and glycerol; 6. Aminoacid and protein metabolism; Biosynthesis and biodegradation of aminoacids and proteins.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 20% of the final grade – laboratory colloquium; 10% of the final grade – documentation [report])

COURSE TITLE: SYNTHESIS OF BIOLOGICALLY ACTIVE COMPOUNDS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Acquiring information on the structure, synthesis pathways and properties of some biologically active compounds; Description and interpretation of methods and techniques used to determine the structure and properties of synthesized biologically active compounds.
COURSE CONTENTS: Introduction to Chemistry of Biologically Active Compounds; Peptides and Proteins – Chemical Synthesis and Biosynthesis; Biosynthesis of Fatty Acids; Synthesis of Glucose and Other Saccharides and Saccharides Derivatives; Nucleic Acids; Synthesis of Nitrogenous Bases, Nucleosides and Nucleotides; Synthesis of Some Water soluble and Liposoluble Vitamins; Synthesis of Terpenes, Steroids, Flavonoids and Anthocyanins; Synthesis of Some Pharmaceutical Compounds; Synthesis of Anthraquinone, Arylmethane and Indigoid Dyes; Synthesis of Fungicides, Herbicides, Insecticides, Rodenticides and Acaricides.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – exam; 30% of the final grade – lab examination)

COURSE TITLE: BIOINORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The aim of this course is to deepen the knowledge acquired by students in the field of "Inorganic chemistry". Two main aspects will be developed: synthesis and characterization of inorganic and coordination compounds of biocations involved in life processes. A special attention will be paid to coordination compounds involved in environmental quality and protection.
COURSE CONTENTS: Coordination chemistry and its importance for biological structures; Metalloenzymes used for oxygen transport and storage; Nitrogen fixation in biological systems; Metalloenzymes as catalysts of redox processes; Metalloenzymes as catalysts of hydrolytic processes; Chlorophylls – magnesium coordination compounds; Complex combinations and carcinogen diseases; Applications in environment protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – assessment of laboratory reports)

COURSE TITLE: SPECIALTY PRACTICE

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): To integrate the knowledge, practical skills and attitudes that are required of graduates to work competently in a biochemistry laboratory; To equip students with a range of attributes that will give them strong potential and ability to work equally well in the industrial or research biochemical fields; To understand the technology and scope of measuring techniques in biochemistry and acquire proficiency in the use of laboratory equipment; To develop skills to use bioinformatics resources and accessing specialized databases; To understand the need and means for environmental protection (waste disposal, pollution, energy saving).
COURSE CONTENTS: Techniques concerning the structural-functional characterization of proteins and complex biological systems; Strategies for the preparation and purification of proteins at industrial level; Use of enzymes and proteins in the food, pharmaceutical and chemical industries; biosensors; bioremediation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (50% of the final grade – the quality and complexity of the portfolio; 50% of the final grade – the skills and knowledge acquired during practical placement)

COURSE TITLE: PHYSICAL EDUCATION II

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Gymnastics: acrobatic dynamic games, with content from basic and applicative motor skills; Developing motor skills – methods and means of action; Volleyball/ football/ handball/ basketball – learning the game model for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: SEPARATION METHODS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It aims to make students understand the necessity of separation processes, of theoretical and practical bases of separating different mixtures of compounds; the discipline also aims to accustom students with most of the separation techniques currently used.
COURSE CONTENTS: Necessity of separation processes in analytical chemistry; Classification of separation methods; The mechanisms of separation processes; Parameters used to appreciate the efficiency of the separation methods in analytical chemistry; The separation by precipitation and co-precipitation; The separation by liquid – liquid solvent extraction; The separation by ion exchange. Parameters of the ion exchange process; Planar chromatography: on paper and on thin layer; Separation by gas chromatography; Analytical separation by liquid chromatography; Electrophoresis; Analytical separation by HPLC.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – documentation)

COURSE TITLE: CELLULAR AND MOLECULAR BIOLOGY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The knowledge of the basic cell structure and function, DNA, RNA, genes and chromosomes.
COURSE CONTENTS: Microscopes: components, the procedures for using; Light microscope; Cellular anatomy; The molecular organization and the function of the membrane; Cytoplasmic matrix; The description and the roles of the cytoplasmic organelles such as mitochondria, ribosome, endoplasmic reticulum, Golgi Apparatus, lysosomes, centrosome; Patterns of protein synthesis; Cytoskeletal elements: microtubules, microfilaments; Nucleus; Secretion and excretion of cellular products; Osmosis and cell membrane integrity; Cellular differentiation: cilia and flagella, microvilli; Nucleic acids – DNA, RNA; Cellular cycles; Cell division: mitosis, meiosis; Genes and chromosomes; Morphological aspects of various types of cells: epithelial, connective, nervous; Blood cells – preparation of slides, morphology, counts; Cytological nature and significance of spermatogenesis and oogenesis; Sexual cells: oocytes and mature ovum, spermatogonia, spermatocyte and spermatozoa; Spermograms – normal and pathological parameters; Immunity – humoral and cell-mediated, active and adoptive, artificial; Programmed cell death – apoptosis; Oncogenes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the final grade – final theoretical exam; 20% of the final grade – final practical exam; 20% of the final grade – continuous evaluation during the semester)

COURSE TITLE: BIOCATALYSIS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): To acquire and explain the complex notions and phenomena characteristic to biocatalysis.
COURSE CONTENTS: Catalysis; Definition; Classification; Objectives; Homogeneous and heterogeneous catalysis; Enzymes; Definition; Classification; Structure; Kinetics of enzymatic reactions; Preparation of biocatalysts; Immobilized biocatalysts; Biocatalysts performance; Biocatalysis in unconventional media; Chiral synthesis of pharma intermediates; Applications of ketoreductases and alcohol-oxidases; Application of metabolic engineering for the development and synthesis of pharm products; Commercial and financial issues in biocatalysis research.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (30% of the final grade – lab examination; 70% of the final grade – written exam)

COURSE TITLE: ANALYTICAL BIOCHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S):Thoroughgoing study and correlation of the main analytical techniques related to the biochemical analysis; training to use correctly certain theoretical knowledge in order to choose the most appropriate method for analysis of biological compounds with understanding the particularities of each class of biochemical compounds.
COURSE CONTENTS: General principles of analytical biochemistry; Separation methods used in biochemical analysis; Radio-isotopes: nature of radioactivity, detection and measurement of radioactivity, biochemical uses of isotopes; Immunological methods; Analysis of important biochemical compounds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – written exam; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

COURSE TITLE: SENSORS AND BIOSENSORS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): It aims to provide students the basic notions about the practical implementation of an E.I.S. or of a biosensor. There are presented the wiring diagrams and the practical applications, for their utilisation to control the quality of environment for automatic monitoring system of the parameters that check the quality of air, water and soil.
COURSE CONTENTS: 1. Characteristics of electrochemical sensors; Analytical sensors as electrochemical systems; 2. Common electrodic materials: Pt, Au, Hg, varieties of coal, chemical and physical aspects; 3. Electrochemical stability of pure water; Pourbax diagrams; 4. Electrodes with modified surface; 5. Physical methods used in the study of solid sensors surface state; 6. Hydrodynamic electrodes: rotating disk electrode, rotating ring-disk electrode; 7. Amperometric sensors; Work techniques: electrode reactions controlled by mass transfer; 8. E.I.S.(ion-selective electrodes): 8.1. Glass membrane electrodes; 8.2. Homogeneous solid membrane electrodes; 8.3. Heterogeneous solid membrane electrodes; 8.4. Liquid membrane electrodes; 8.5. Gas sensitive electrodes; 8.6. Gasfet electrodes; 9. Biosensors (electrodes with enzymes membrane): 9.1. Sensors for surfactants; 9.2. Sensors of acetylcholine; 9.3. Chiral sensors; 9.4. Coated wire sensor; 9.5. Transistor with ion selective field effect; 10. Calibration of ion – selective sensors.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: BIOMOLECULES

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): To provide students with theoretical and practical knowledge on biological macromolecules. The intention of the course is for students to: analyse the relationships between the structure of biological macromolecules and their properties; understand the molecular mechanisms underlying complex biological processes; correlate the functions of biomolecules with their biotechnological applications; develop capacity for analysis and synthesis of scientific information; develop skills for specific experimental investigation.
COURSE CONTENTS: 1. Methods and techniques for protein extraction, separation, purification and analysis; 2. Enzymes: key concepts and kinetics; regulatory strategies and biotechnological applications; 3. Nucleic acids and the flow of genetic information in cells: replication, transcription, translation; protein folding, post-translational modifications and cellular trafficking of proteins; 4. Recombinant DNA technology: principles, methods and applications; ethical and safety implications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the final grade – final written exam; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation)

COURSE TITLE: PHYSICAL CHEMISTRY OF BIOLOGICAL PROCESSES

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Understanding chemical reactivity under certain environmental conditions, quantitative characterization of the speed of their transformation from reactant state to the product, establish the reaction mechanism and the correlation between the structure of substances and the ability to react. The proposed practical work covers the most important sections of the course and pursues deeper theoretical knowledge.
COURSE CONTENTS: The molecular structure of biological systems; Energy and dynamics of biological systems; Physical external factors; Electron transfer reactions; Molecular and biomolecular electrochemistry; Homogenous kinetics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (80% of the final grade – exam; 20% of the final grade – assessment of laboratory reports)

FIELD: CHEMISTRY
PROGRAMME TITLE: PHARMACEUTICAL CHEMISTRY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): acquiring fundamental notions of chemistry; the explanation and the understanding of the principles and the phenomena which control the reactivity of elements and of chemical combinations.
COURSE CONTENTS: Fundamental Laws of the Chemistry; Fundamental Notions in Chemistry; The; Periodic Table of Elements; The Structure of the Atom; Interatomic and Intermolecular Chemical Bonds; The Aggregation States of Matter; Solvents and Solutions; Types of Solutions Concentrations; Chemical Thermodynamics; Chemical Kinetics; Electrochemistry and the Electrochemical Conversion of Energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: INFORMATICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The course focuses on initiating students in computer science: the fundamentals of using computers in scientific purposes; the fundamentals of description and design of algorithms; knowledge of Excel spread sheet environment; knowledge of Word document editing environment; using computers to solve problems in chemical engineering related subjects.
Practical applications are to obtain computer skills for using computers to solve various problems (organization and processing of information, data analysis, calculations, graphics processing, communications, documentation, etc.).
COURSE CONTENTS: 1. Elements of information and communication technology (ICT) and knowledge processing: computer systems, operating systems, programming languages, software applications, operating environments/ navigation computer networks, expert systems, intelligent systems, the Internet; 2. Architecture and hardware structure of computing systems: central processing unit, microprocessor, internal memories, external memories, I/O devices, multimedia systems, networking technologies; 3. Architecture and software structure of computing systems: operating systems, utilities, operating environments/ resolution, navigation environments, programming environments, graphical interfaces, processors text/ images, programs, communications, e-mail services, Web services, application programs/ specialized; 4. Windows: functions, kernel, interface, menus, windows, buttons, boxes, icons, files, folders, documents and programs operating, organizing files, operations with files; 5. Word: fonts, editing techniques and operations text/ images, formatting, create and edit tables, sorting information, elements Drawing; 6. Excel: spread sheets, agendas, cells, formulas, spread sheet functions, charts and graphs, data and analysis, applications and problem solving of mathematics, physics, chemistry; 7. The Internet: communications software, e-mail services, Web services, Web pages, e-learning, multimedia technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (written and oral exam)

COURSE TITLE: PHYSICS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): It is one of the complementary subjects of the curriculum to familiarize students with basic physical concepts needed in next semester and beyond to understand disciplines. Basically, students learn how to systematize concepts of mechanics, electromagnetism, thermodynamics, optics, atomic physics and nuclear physics encountered in the disciplines of chemistry.
COURSE CONTENTS: Notions complementary to general physics course; Vectors; Operations with vectors; Integral operation; Integral theorems; Notions of vector algebra; Notions of mechanics; Fundamentals of mechanics; Newton's laws; Conservative forces; Types of movements; Mechanical work; Mechanical energy; Mechanical power; Conservation laws; Notions relativistic mechanics; Notions of thermodynamics; Fundamentals of thermodynamics; Zero principle of thermodynamics; The concept of temperature; Temperatures scales; Particular processes of ideal gas; First principle of thermodynamics; The heat capacity; The latent heat; Polytrope processes; The second principle of thermodynamics; Thermal machines; Thermodynamic cycles; Notions of electricity and magnetism; The electric charge; Electromagnetic interactions; Electric field; Electrostatic potential; The flow of electric field; Gauss's theorem under vacuum; Electric current; Circuits; Instruments for measuring electrical quantities; The magnetic field of electricity; Constant magnetic field equations; Electromagnetic induction; Notions of optic; Electromagnetic waves; Nature and propagation of light (light sources,

wave fronts, velocity of light); Interference and diffraction of light; Reflection and refraction of light; Refractive index; Total reflection; Absorption; Dispersion; Rainbow; Lenses and optical instruments; Notions of Atomic and Nuclear Physics; Exclusion principle; The atomic structure; Diatomic molecules; Molecular spectra; Structure of solids; Nucleus of the atom; Natural radioactivity; The radioactive transformations; Nuclear reactions; Nuclear fission and fusion; Physical relationship with other sciences.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: FUNDAMENTALS OF ORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Provide students with a basic understanding of the structure of organic compounds, electronic and quantum theories of chemical bonds, isomerism, electronic effects, speed of reactions, the natural state, the obtaining and the reactivity of hydrocarbons.
COURSE CONTENTS: Structure of organic compounds: Representation formulas of organic molecules; Electronic theory of chemical bonds; Hydrogen bonds; Electronics and quantum theories of chemical bonds in organic compounds: Quantum theory of chemical bonds; Molecular orbital method; Resonance method; sp^3 , sp^2 and sp hybridization; Isomerism of organic compounds: Constitutional isomers: chain, position, function, and valence; Stereoisomerism: geometrical isomers; Stereoisomers: conformation isomers of butane; Stereoisomerism: conformation isomers of cyclohexane; Stereoisomerism: symmetry elements of molecules; Stereoisomers: enantiomers, nomenclature of enantiomers; Stereoisomers: diastereoisomers, meso forms, axial and planar chirality; Electronic and steric effects in organic molecules: Inductive effect; Electromeric effect: static and dynamic; Influence of electromeric effects on the properties of molecules; Groups of atoms with electromeric and inductive effects (-I,-E), (-I, + E), (+ I, + E); Hyperconjugation, steric effects; Spectroscopic methods in organic chemistry: UV-VIS electronic spectroscopy; IR absorption spectroscopy; NMR spectroscopy; Mass spectroscopy; Reactants, intermediates and reaction types in organic chemistry: Types of reagents; Carbocations; Carbanions; Radicals; Carbenes; Rate of reaction: transition state theory and the theory of molecular collisions; Organic reactions of order I; Organic reactions of order II Competing organic reactions; Parallel organic reactions; Catalysts; Isotope effects; Hydrocarbons: Alkanes (paraffins); Cycloalkanes (cycloparaffins); Alkenes; Dienes and polienes; Alkyne (acetylene); Aromatic hydrocarbons;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam paper at the end of the course)

COURSE TITLE: STRUCTURE AND PROPERTIES OF THE MOLECULES

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The students have the opportunity to familiarize and deepen the theoretical basis of molecular structure. These elements, in addition to those related to symmetry, are used to understand the nature of the chemical bonds and molecular properties. A special importance is given to the study of the molecular spectra. Directly connected with the theoretical support, the laboratory works and seminars contribute to a better understanding of the theoretical concepts related to molecular structure, creating and developing research skills in the field.
COURSE CONTENTS: Fundamentals of quantum mechanics; Quantum theory; Particle-wave duality; Wave function; Schrödinger equation; Principles of quantum mechanics; The atomic structure; The structure and spectra of hydrogenous atoms; Atomic orbitals and their energies; Spectroscopic transitions and selection rules; Polyelectronic atoms Structure; Molecular structure; Electrovalence theory, covalence theory; Quantum mechanics theory; Orbital approximation; Valence bond method; Diatomic molecules, polyatomic molecules; Molecular orbital method; Structure of diatomic molecules; Semiempirical methods to calculate energy and molecular orbital coefficients; Molecular orbitals in polyatomic molecules; Hückel approximation; Molecular symmetry; Elements, symmetry operations and groups; Molecules symmetry classification; Consequences of symmetry; Character tables and symmetry symbols; Properties of the molecules; Electrical properties; Magnetic properties; Molecular spectra; Intensity of spectral lines; Selection rules; Energy status of the molecule; Rotational spectra (Microwave); Vibration-rotation spectra; IR spectroscopy; Raman spectra of rotation; Electronic spectra; Electronic magnetism; ESR spectra; Nuclear magnetism; Nuclear magnetic resonance (NMR).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written and oral exam on course content; individual projects, laboratory work)

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry,

Biochemistry and Environmental Chemistry Technology specialisations. The seminar is designed to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests; Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: PHYSICAL EDUCATION

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orien teering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a

game of your choice; Use specific knowledge and physical education means in actions optimizing physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry, Biochemistry and Environmental Chemistry Technology specialisations. The seminar is designed to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests; Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: HUMAN ANATOMY AND PHYSIOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Acquiring fundamental notions of human anatomy and physiology; The knowledge of the anatomical structure and

physiology of the main systems of the human body, methods of contraception.
COURSE CONTENTS: Anatomical terminology; Organ systems; The skeletal system: parts of the skeleton; Bone tissues: compact and spongy bone; Articulations; Muscle structure and body movements; The major skeletal muscles; The nervous system; The sense organs; The respiratory system; The digestive system; Heart and the circulatory system; The excretory system; The male and female reproductive systems; The endocrine glands; Methods of contraception; Sexual transmissible disease; Rules of hygiene and the prevention of different diseases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade –exam; 20% of the final grade – lab examination; 20% of the final grade – continuous evaluation)

COURSE TITLE: BASIC INORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Familiarizing students with the modern way of approaching theoretical inorganic chemistry; Investigating the structure of substances by modern methods, by using appropriate computer programs.
COURSE CONTENTS: The atom; Quantum model of the atom; Quantum numbers; Atomic orbitals; Periodic table of the elements; Electronic configurations of atoms and ions; Periodic variation of some of their properties; Ionic bond; Ionic crystal lattices; Formation of an ionic bond; Ionic crystal lattices; Haber-Born cycle; Metallic bond; Metal crystal lattices; Formation of a metallic bond; Metal crystal lattices; The electronic band structure model; Covalent bond; Formation of molecules; Formation of a covalent bond; Molecular orbital energy diagrams; Stability of molecules; Magnetic properties; Bonding order; Molecular geometry; The VSEPR model; Standard geometry of a molecule; Real geometry of a molecule; Molecular symmetry; Symmetry transformations; Symmetry elements of a molecule; Symmetry point groups; Molecular properties due to the symmetry (polarity and chirality); Molecular vibrations and their symmetry.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 30% of the final grade – continuous assessment and final discussion)

COURSE TITLE: QUALITATIVE-ANALYTICAL CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring basic principles of analytical chemistry, appropriate terminology, understanding and operating with concepts about various types of chemical equilibrium.
COURSE CONTENTS: Overview of analytical chemistry; Analytical reactions and reagents; Electrolytic dissociation and its analytical importance; Equilibrium in strong electrolyte solutions; Proton exchange equilibrium; Ion or molecules exchange equilibrium; Electron exchange equilibrium.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – oral examination; 30% of the final grade – evaluation of practical skills

COURSE TITLE: ORGANIC CHEMISTRY – SINGLE ORGANIC FUNCTIONS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Provide students with the basic concepts of structure, nomenclature, and reactivity of organic compounds containing simple organic functions.
COURSE CONTENTS: Organic halogen compounds; Hydroxyl compounds (alcohols and phenols); Acyclic ethers; Carbonyl compounds: saturated monocarbonyl and aromatic compounds, dicarbonyl compounds and quinones; Carboxylic acids: monocarboxylic and dicarboxylic acids, saturated, unsaturated and aromatic acids; Functional derivatives of carboxylic acids: acyl halides, anhydrides, esters, amides and nitriles; Nitro, nitroso compounds; Functional derivatives of carbonic acid: urethanes and urea; Amines, quaternary ammonium salts, diazonium salts.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam at the end of the course)

COURSE TITLE: CHEMICAL THERMODYNAMICS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The main objective is the study of the laws of the thermodynamics and their applications to chemical processes, the chemical and physical equilibrium, the deduction of the laws and relationships that govern the phase transformation. In addition the basics of statistical thermodynamics are studied to deduce relationships that connect thermodynamic functions and structural properties of the substances. In direct connection with the theory, the laboratory works and seminars contribute to a better understanding of the thermodynamic phenomena and processes, creating and developing research skills in the field.
COURSE CONTENTS: Basics of thermodynamics; The purpose and the importance of the study of

chemical thermodynamics; Thermodynamic system; Parameters of state, equations of state; Thermodynamic state functions; Thermodynamic processes, stationary state; Partial molar properties; Temperature, the zero law of thermodynamics; The first law of thermodynamics; The exchange of energy between the system and environment; The internal energy; The enthalpy; Heat capacity; Applications of the I-st law of thermodynamics; energy exchange in processes taking place without phase transformation; Thermal effects of phase transformations; Thermal effects of chemical processes; The second law of thermodynamics; Carnot cycle, the entropy, the spontaneity criteria of the natural processes; The absolute temperature; Thermodynamic potentials; Free energy; Free enthalpy; Fugacity; Applications of the second law; The third law of thermodynamics; The heat theorem; Planck postulate; The absolute entropy of the compounds; Physical equilibrium; Criteria for equilibrium; Homogeneous and heterogeneous systems, phase, independent component, degrees of freedom, the fundamental equation of equilibrium; The law of phases; The physical equilibrium in multicomponent systems; Clausius Clapeyron equation; Ideal solutions, real solutions, the vapor pressure of the solutions, Raoult's Law; Activity coefficient, fugacity coefficient; Ebullioscopy, cryoscopy; Solubility of gases in liquids, Henry's law; Solubility of solids in liquids, equilibrium distribution of a substance between two immiscible solvents; Vapor liquid equilibrium, ideal binary systems, and non-ideal systems; Chemical equilibrium; Condition of equilibrium for a chemical reaction; Influence of the reactant system on the free enthalpy of reaction; Equilibrium constant and dependence on temperature and pressure; Chemical equilibrium of the real gases, chemical equilibrium in heterogeneous systems; Reactions in the aqueous phase, liquid phase chemical equilibrium; Calculation of the equilibrium constant; Basics of statistical thermodynamics; Entropy and thermodynamic probability; Calculation of thermodynamic functions for the ideal gas; Calculation of the free enthalpy of reaction using statistical thermodynamics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Examination (written and oral exam on course content; individual projects, laboratory work)

COURSE TITLE: PHYSICAL EDUCATION

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orienteering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and physical education means in actions optimizing physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: QUANTITATIVE-ANALYTICAL CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The discipline aims to deepen the knowledge gained by students in disciplines Theoretical bases of Anorganic Chemistry, Qualitative Analitical Chemistry. As any branch of chemistry, Quantitative Analitical Chemistry develops two important perspectives: to accustom students with the volumetric techniques of analysis and with the gravimetric dosing methods.

Also it aims a systematization of knowledge focusing on classical quantitative methods of dosing compounds involved in the quality and protection of the environment.
COURSE CONTENTS: Titrimetry by proton exchange reactions; Titration curves; The application of acid-based titrimetry; Titrimetry by redox reactions; The applications of redox titrimetry; Titrimetry by complexing reactions; Titrimetry by precipitation reactions; Acid-based titrimetry in non-aqueous agent; Gravimetric analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: CHEMICAL KINETICS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): This program addresses to the second year students of the Faculty of Sciences, specialization Chemistry. Chemical Kinetics offers information on: (i) the type of chemical reactions; (ii) the mechanisms and chemical reaction rates. The main objective is to deduce the mathematical expressions of reaction rates, taking into account a proposed mechanism. The laws of reaction rates allow the understanding the basic steps which constitute the reaction mechanisms. Subordinated to these objectives, lab work aims to create competences and skills in performing certain works, to determine the constants of reaction rates using different methods such as: analytical methods and physico-chemical methods like: conductivity, polarimetry, thermogravimetry and UV-VIS spectrophotometry.
COURSE CONTENTS: Getting Started: chemical kinetics object; classification of chemical reactions; the chemical reaction rate; constant of reaction rate; Kinetics of simple reactions; Mathematical characterization of complex reactions: successive reactions; reversible reactions; parallel reactions and simultaneous reactions; Chained processes: the decomposition of acetaldehyde and hydrobromic acid synthesis; Polimerization reactions: radicalic and ionic polymerization; Polycondensation reactions: catalysed and self-catalysed polycondensation; Homogeneous catalysis: kinetics and mechanism; kinetics of enzyme catalysis; Heterogeneous catalysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – laboratory reports)

COURSE TITLE: BIOCHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): To provide students with basic principles of Biochemistry. The course aims for students to: understand elements of basic biochemistry, including molecule names, molecular structures and terms used to describe categories of molecules; understand the relationship between molecular structure and biochemical function; acquire the technical language used to communicate key concepts relevant to biochemistry; perform biochemical analyses and basic calculations with experimental data; apply elementary concepts of biochemistry to specific problems.
COURSE CONTENTS: Amino acids and proteins; Carbohydrates; Lipids; Nucleic acids; Vitamins.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade – final written paper; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation)

COURSE TITLE: ORGANIC CHEMISTRY – MIXED FUNCTIONS AND HETEROCYCLIC COMPOUNDS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Discipline aims to deepen knowledge acquired by students disciplines Fundamentals of organic chemistry and Organic Chemistry-simple functions. Like any branch of chemistry develops two important aspects: learning by students to the basics of obtaining and reactivity of organic compounds with multifunctional groups and heterocyclic organic compounds.
COURSE CONTENTS: Classification of organic compounds with multifunctional groups; Amino Alcohols; Hydroxy Acids; Amino Acids; 5-membered heterocycles with one heteroatom; 5-membered heterocycles with two, three or four heteroatoms; 6-membered heterocycles with one heteroatom; 6-membered heterocycles with two and three heteroatoms; 7-membered heterocycles with one heteroatom.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – final written paper; 20% of the final grade – laboratory colloquium; 10% of the final grade – report documentation)

COURSE TITLE: QUANTUM CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquisition of fundamental concepts, formalism and computational aspects of

molecular modeling through molecular mechanics calculations and quantum-chemical calculations.
COURSE CONTENTS: Introduction to quantum mechanics; The dynamics of microscopic systems; Mathematical formulation of quantum mechanics; Molecular mechanics modeling; Hückel molecular orbital theory; Hartree-Fock method formalism; Semiempirical quantum chemistry methods and their implementation; Ab initio quantum chemistry methods and their implementation; Fundamental and computational aspects of functional density theory; Computation of charge distribution, molecular electrostatic potential and spectroscopic properties.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – exam; 30% of the final grade – continuous assessment and colloquium)

COURSE TITLE: PHYSICAL EDUCATION I

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Athletics – sprinting, middle-distance running, long jump – learning the technical-tactical component parts. Volleyball/ football/ handball/ basketball – learning the game rules for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring English language skills.
COURSE CONTENTS: Specific terminology: Types of Inorganic Chemical Reactions; Health and Safety in the Engineering Workplace; Laboratory Equipment; Troubleshooting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral verification

COURSE TITLE: FRENCH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Better knowledge of the French language and vocabulary to facilitate student access to specialized texts with a high degree of difficulty, with good knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase in French, in order to acquire the fundamental mechanisms underlying the particular specialized French language; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals, etc.
COURSE CONTENTS: Brief history of the development of the classification of the elements; Structure of the current periodic classification; Periodicity of properties; Electronegativity; Ionic rayon; Study of some chemical families; Amines I; Amines II; Stereo isomerism configuration; Rules sequential C, I, P; The carbon-halogen bond I; The carbon-halogen bond II; The carbon-halogen bond III.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: INORGANIC COMPOUNDS IN CHEMOTHERAPY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): Acquiring fundamental notions related to complex combinations of metals with antimicrobial, antiviral, antitumor activity or used in the treatment of other diseases; The ability to determine the structure and the biologically

active properties of metal chelates which can be used as medicaments.
COURSE CONTENTS: Implications of Metal Complexes in Medicine; Complex Chelated Combinations; Stability of Complex Combinations; Chelating Agents in Heavy Metal Poisoning Therapy; Complexes Formulated into Pharmaceutical Forms with Antimicrobial Activity or Used in the Treatment of Various Disorders; Anticancer and Antiviral Activity of some Coordination Compounds; Physical and Chemical Methods Used in the Study of the Structure of Biologically Active Metal Complexes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – laboratory exam)

COURSE TITLE: INSTRUMENTAL ANALYSIS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course seeks to convey to students the basic knowledge in learning and in applying modern optical and electrochemical methods in Analytical Chemistry.
COURSE CONTENTS: 1. Atomic Absorption and Emission Spectrometry; Atomic Emission in Viz. and UV; Atomic Absorption in Viz. and UV; 2. Atomic (flame) Emission Spectrometry; Theoretical principles; Equipment; Qualitative and quantitative analysis; Analytical applications; 3. Atomic Absorption Spectrometry; Theoretical principles; Equipment; Quantitative analysis; Analytical applications; 4. Molecular Absorption Spectrometry; Molecular Absorption in UV, VIZ, and IR; Equipment; Analytical applications; 5. Molecular Absorption Spectrometry in Viz. and UV; Radiation absorption rules; Absorbance additivity property; Qualitative and quantitative analysis; Analytical applications; 6. Molecular Absorption Spectrometry in I.R.; Theoretical principles; Samples preparation; Qualitative and quantitative analysis; Analytical applications; 7. Nephelometric and turbidimetric method of analysis; Principles; Equipment; Analytical applications; 8. Electrodes potential; Experimental determination of electrodes potential; Significance of standard electrodes potential; 9. Electrogravimetry; Principles; Conditions for forming an analitycal deposit; Equipment; Analytical application; 10. Cyclic voltammetry and chronopotentiometry with scanning null current potential; Equipment; Analytical application; 11. Potentiometry; The classification of potentiometric methods; Systems of electrodes used in potentiometry; Potentiometric titration; 12. Amperometric titration; Principles; Titration curves; Equipment; Analytical application; 13. Polarograplic analysis; Principles; Diffusion current; Polarographic methods; Qualitative and quantitative analysis; Analytical application; 14. Conductometry; Specific and equivalent conductivity; Conductometric methods in continuous and alternative current.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: SYNTHESIS OF PHARMACEUTICAL COMPOUNDS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): Acquiring information on the structure, synthesis pathways and properties of some pharmaceutical compounds; Description and interpretation of methods and techniques used to determine the structure and properties of synthesized pharmaceutical compounds; Optimizing the methods of analyzing and controlling the purity of raw materials, water, solvents, intermediates, pharmaceutical products, as well as the stability of the latter
COURSE CONTENTS: Introduction to Pharmaceutical Chemistry; Neuroleptic Drugs: Phenothiazine, Thioxanthene and Butyrophenone Derivatives; Anticonvulsants: Pyrimidine Derivatives, Acyclic Ureide, Imides and Dibenzazepine, Hydantoin, Oxazolidinedione and Imidazo-lidinedione Derivatives; Antidepressants: Thymoleptic Drugs; Sympathomimetics: β-Phenylethylamine and Imidazoline Derivatives; Sympatholytics: α-Adrenolytic and β- Adrenolytic Compounds; Drugs Used in Heart Diseases; Anti-coagulants: 4-Hydroxycoumarin and Indan-1,3-dione Derivatives; Antiseptics and Antipyretics: Phenols, Benzoic Acid and Pyrazolone and Salicylic Acid Derivatives; Antineoplastic Drugs: β-Chloroethylamine and Ethyleneimine Derivatives; Drugs Used to Treat Digestive Disorders: Hepatoprotectors and Purgatives.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – laboratory exam)

COURSE TITLE: SPECIALTY PRACTICE
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Knowing how to organize your pharmacy, the specifics of your activity pharmaceutical storage and preservation of medicines; Assimilation of practical aspects of general operations used in pharmaceutical practice.
COURSE CONTENTS: Community Pharmacy (Hospital); Utensils and Packaging; Basic Operations of Pharmaceutical Practice; Criteria for

Classification of Medicines; Sterile and Non-Sterile Homogeneous and Heterogeneous Pharmaceutical Forms; Homeopathic Preparations; Dermo-cosmetic products; Technical and Medical Products; Ethics and Pharmaceutical Deontology in Pharmaceutical Practice.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Verification (50% of the final grade – lab verification; 50% of the final grade – paper documentation)

COURSE TITLE: PHYSICAL EDUCATION II
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Gymnastics: acrobatic dynamic games, with content from basic and applicative motor skills; Developing motor skills – methods and means of action; Volleyball/ football/ handball/ basketball – learning the game model for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

3RD YEAR, 1ST SEMESTER

COURSE TITLE: SEPARATION METHODS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It aims to make students understand the necessity of separation processes, of theoretical and practical bases of separating different mixtures of compounds; the discipline also aims to accustom students with most of the separation techniques currently used.
COURSE CONTENTS: Necessity of separation processes in analytical chemistry; Classification of separation methods; The mechanisms of separation processes; Parameters used to appreciate the efficiency of the separation methods in analytical chemistry; The separation by precipitation and co-precipitation; The separation by liquid – liquid solvent extraction; The separation by ion exchange. Parameters of the ion exchange process; Planar chromatography: on paper and on thin layer; Separation by gas chromatography; Analytical separation by liquid chromatography; Electrophoresis; Analytical separation by HPLC.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – documentation)

COURSE TITLE: BIOELECTROCHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Understanding the reactivity of biologically active compounds under certain environmental conditions; Quantitative characterization of their rate of transformation from the state of the reactant to the product.
COURSE CONTENTS: Molecular structure of biological systems; Molecular forces in biological structures; Molecular associations; Allosteric interactions; Ionic permeability; Membrane potential; Molecular electrochemistry; Biomolecular electrochemistry; Electroenzimatic synthesis; Biosensors; Bioelectrochemistry of drugs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (30% of the final grade – lab examination; 70% of the final grade – exam)

COURSE TITLE: BIOCATALYSIS
CODE:
ECTS CREDITS: 5
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): To acquire and explain the complex notions and phenomena characteristic to biocatalysis.
COURSE CONTENTS: Catalysis; Definition; Classification; Objectives; Homogeneous and heterogeneous catalysis; Enzymes; Definition; Classification; Structure; Kinetics of enzymatic reactions; Preparation of biocatalysts; Immobilized biocatalysts; Biocatalysts performance; Biocatalysis in unconventional media; Chiral synthesis of pharma intermediates; Applications of ketoreductases and alcohol-oxidases; Application of metabolic engineering for the development and synthesis of pharm products; Commercial and financial issues in biocatalysis research.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (30% of the final grade – lab examination; 70% of the final grade – written exam)

COURSE TITLE: CHEMOMETRIC APPLICATIONS IN PHARMACEUTICAL CHEMISTRY
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Acquiring the principles and methods of statistical analysis of experimental

data; Develop capacity to evaluate and select data with significant chemical information; Understanding the methodology for validating modern methods of analysis of pharmaceutical compounds.
COURSE CONTENTS: Introduction to chemometrics; Statistical concepts; Analysis of variance; Chemometrics and experimental design; Multiple regression methods; Exploratory data analysis; Unsupervised pattern recognition; Supervised pattern recognition; Multiway pattern recognition.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (30% of the final grade – continuous assessment and colloquium; 70% of the final grade – exam)

COURSE TITLE: SAMPLING AND SAMPLE PREPARATION

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The acquisition of drug analysis methods, theoretical principles, the apparatus, the main operational parameters, the advantages and limitations of the methods and in particular their applications in drug analysis and control; Developing modern methods of analyzing drugs in presentation forms; The use of the latest techniques for the isolation and extraction of drugs in both presentation forms and biological fluids.
COURSE CONTENTS: Introduction; Generalities about chemical analysis; Scheme block of an analytical flow; Exactity; Accuracy; Selectivity; Detection limit; The sample; Luying the sample for analysis; Preparation of the laboratory samples; Disaggregation of the sample for analysis; Sample removal for instrumental monitoring; Chemical analysis methods; Interference with instrumental analyses; Grammimeters; Physical-chemical constants, density, viscosity, melting point, boiling point, distillation range drop point, solidification point, acid index, ester index, hydroxyl index, iodine index, peroxide index, saponification index; Biological methods in drug analysis and control; Sterilization, control of sterility, microbial contamination pyrogenic impurities, impurities hours hypotensive; The arbitrage of the medicants; The normative analytical considerations that regulate quality of medicines, general and particular pharmacopoeial monographs as well as temporary pharmacopoeial monographs; Pharmaceutical substances; The identity of medicines; Quality control of pharmaceutical and industrial pharmaceutical forms; Specific quality parameters for different types of pharmaceutical forms; Influence of composition, active substance content hours of auxiliary substances.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (20% of the final grade – lab examination; 70% of the final grade – verification; 10% of the final grade – paper [documentation])

COURSE TITLE: RULES OF GOOD PRACTICE IN THE PHARMACEUTICAL INDUSTRY

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The objective of the discipline is to provide students with information support in order to: acquire the necessary skills in pharmaceutical management practice; to know pharmaceutical marketing policies; will apply protocols for the release of medicinal products; to apply ethical principles related to medical-pharmaceutical practice.
COURSE CONTENTS: Subject of the course, relationship with other pharmaceutical sciences, current directions of development; The concept of marketing mix; The 4Ps in the pharmaceutical market; Product policy; Advertising policy; Pricing Policy; Placement Policy; Market strategy; Factors that influence market strategies; Methods used to establish strategies; Neuromarketing; Strategic planning in pharmaceutical practice; Quality management; Rules of good pharmaceutical practice; Legislation; The 13 basic procedures.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – exam; 30% of the final grade – paper [documentation])

3RD YEAR, 2ND SEMESTER

COURSE TITLE: PHARMACOLOGY AND TOXICOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The main objective of the course is proving the students with basic information regarding the general concepts of pharmacology and toxicology. At the end of the course, students should be able to understand the main scientific terms and indicators used in pharmacology toxicology, acquire the language and information necessary for explaining the processing of drugs and toxic substances *in vivo* and exemplifying the toxicity of various classes of toxicants. Subordinated to these objectives, laboratory work aims to teach the students the main aspects related to drug administration and to create abilities and skills needed in performing analysis specific for drug and toxins identification and dosage.
COURSE CONTENTS: General concepts of pharmacology and toxicology; General pharma-cology; Notions of general biopharmaceutics;

Drugs bioavailability; General pharmacokinetics; Phase of exposure, toxicokinetic and toxicodynamic phase; Cross of cellular membranes; Types of pharmaceutical formulations and routes of administration of drugs; Absorption, distribution and elimination (metabolism and excretion) of drugs and toxins; Phase I and phase II reactions of metabolism; General pharmacodynamics; Ligands and receptors; Agonists and antagonists; General toxicology; toxicology domains and braches; classification of toxic substances after origin, structure, organ targeted toxicity, acute toxicity indicators; main indicators of toxicity; Dose/ Response curves, NOEL; Types of toxic effects: local and systemic; short and long-term intoxications; mutagenic, carcinogenic, teratogenic effects; General pharmacotoxicology; Selected classes of toxicants: Natural toxicity caused by plants and natural food; Microbiological contamination of food; Chemical toxicity and contamination of food: the chemical contamination due to pesticides used in agriculture; the chemical contamination due to food additives; potentially toxic metals and plastics toxicity; toxicity due to antibiotics added to animal nutrition; synthetic estrogens; radionuclides.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – laboratory activity and reports)

COURSE TITLE: METAOLISM AND METABOLITES

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Knowledge and understanding of the role of active substances in the regulation of metabolic processes in living organisms; Acquiring knowledge about the stages of development of key metabolic processes, their regulation and various metabolic interconnections; To optimise and to streamline the methods for analysing and controlling the purity of raw materials, solvent, water, intermediary products and also for the stability of pharmaceutical products.
COURSE CONTENTS: 1. Metabolism; Introductory concepts, bioenergetics, macroergic compounds, examples of intermediary metabolism; 2. Glucidic metabolism; *Catabolic processes*: Glycolysis stages, energy balance, intermediates for other pathways; Cori cycle; glyoxylic acid cycle; Cellular respiration; Oxidative decarboxylation of pyruvate, Krebs cycle, respiratory chain, aerobic and anaerobic fermentation; *Anabolic processes*: Photosynthesis; Light dependent reactions, light independent reactions, metabolic role; Gluconeogenesis, stages, metabolic role; 3. Lipid metabolism: Digestion and absorption of lipids; Fatty acid biosynthesis and biodegradation; Biosynthesis of triglycerides and glycerol; 4. Aminoacid and protein metabolism; Digestion and absorption of proteins; Biosynthesis and biodegradation of aminoacids and proteins; 5. Nucleic acids metabolism; Biosynthesis of nucleic acids; Biodegradation of purine and pyrimidine bases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – laboratory examination; 10% of the final grade – paper [documentation])

COURSE TITLE: COORDINATION AND BIO-COORDINATION CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Understanding the structure, main properties and most frequently occurring reactions of the coordination compounds; Presenting important bio-coordination compounds, such as heme and chlorophyll; Studying some coordination compounds with well-known bio-medical applications; Investigating the biological activity exhibited by other different kinds of coordination compounds and, therefore, the possibility to use them as drugs.
COURSE CONTENTS: Introduction to coordination chemistry: chemical structure and the properties induced by it; Coordination compounds – treated within different theories (crystal field theory, AOM, LCAO-MO); Most frequently occurring reactions of the coordination compounds; Bio-coordination compounds – the essential role in life played by heme and chlorophyll; Coordination compounds with already known applications in medicine; Tests performed on biological activity of different kinds of coordination compounds and, in order to identify their possible bio-medical applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – activity during the entire semester)

COURSE TITLE: MACROMOLECULAR AND SYNTHESIS COMPOUNDS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Acquiring fundamental notions of macromolecular chemistry; The explanation and the understanding of the principles and the phenomena which control the synthesis, reactivity and biological activity of macromolecular compounds.
COURSE CONTENTS: 1. Polymerization of vinyl and diene monomers; Polymerization processes; 2. Polymers by radical mechanism; Copolymerization; Polymerization by cationic mechanism Anionic mechanism polymerization; 3. Polymerization by

organometallic complexes; 4. Polymerization of non-vinyl monomers; Copolymerization of non-vinyl monomers: polyesters, polyurethanes, polyamides; 5. Obtaining macromolecular compounds by polycondensation reactions; 6. Properties of polymers; Polymer stereochemistry; 7. Chemical properties of polymers; 8. The boron polyanions; Silicon polyanions; Phosphorus polyanions.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – lab examination)

FIELD: ENVIRONMENTAL SCIENCE
PROGRAMME TITLE: ENVIRONMENTAL CHEMISTRY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: GENERAL CHEMISTRY
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): acquiring fundamental notions of chemistry; the explanation and the understanding of the principles and the phenomena which control the reactivity of elements and of chemical combinations.
COURSE CONTENTS: Fundamental Laws of the Chemistry; Fundamental Notions in Chemistry; The; Periodic Table of Elements; The Structure of the Atom; Interatomic and Intermolecular Chemical Bonds; The Aggregation States of Matter; Solvents and Solutions; Types of Solutions Concentrations; Chemical Thermodynamics; Chemical Kinetics; Electrochemistry and the Electrochemical Conversion of Energy.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: INFORMATICS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): The course focuses on initiating students in computer science: the fundamentals of using computers in scientific purposes; the fundamentals of description and design of algorithms; knowledge of Excel spread sheet environment; knowledge of Word document editing environment; using computers to solve problems in chemical engineering related subjects.
Practical applications are to obtain computer skills for using computers to solve various problems (organization and processing of information, data analysis, calculations, graphics processing, communications, documentation, etc.).
COURSE CONTENTS: 1. Elements of information and communication technology (ICT) and knowledge processing: computer systems, operating systems, programming languages, software applications, operating environments/ navigation computer networks, expert systems, intelligent systems, the Internet; 2. Architecture and hardware structure of computing systems: central processing unit, microprocessor, internal memories, external memories, I/O devices, multimedia systems, networking technologies; 3. Architecture and software structure of computing systems: operating systems, utilities, operating environments/ resolution, navigation environments, programming environments, graphical interfaces, processors text/ images, programs, communications, e-mail services, Web services, application programs/ specialized; 4. Windows: functions, kernel, interface, menus, windows, buttons, boxes, icons, files, folders, documents and programs operating, organizing files, operations with files; 5. Word: fonts, editing techniques and operations text/ images, formatting, create and edit tables, sorting information, elements Drawing; 6. Excel: spread sheets, agendas, cells, formulas, spread sheet functions, charts and graphs, data and analysis, applications and problem solving of mathematics, physics, chemistry; 7. The Internet: communications software, e-mail services, Web services, Web pages, e-learning, multimedia technologies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (written and oral exam)

COURSE TITLE: PHYSICS
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): It is one of the complementary subjects of the curriculum to familiarize students with basic physical concepts needed in next semester and beyond to understand disciplines. Basically, students learn how to systematize concepts of mechanics, electromagnetism, thermodynamics, optics, atomic physics and nuclear physics encountered in the disciplines of chemistry.
COURSE CONTENTS: Notions complementary to general physics course; Vectors; Operations with vectors; Integral operation; Integral theorems; Notions of vector algebra; Notions of mechanics; Fundamentals of mechanics; Newton's laws; Conservative forces; Types of movements; Mechanical work; Mechanical energy; Mechanical power; Conservation laws; Notions relativistic mechanics; Notions of thermodynamics; Fundamentals of thermodynamics; Zero principle of thermodynamics; The concept of temperature; Temperatures scales; Particular processes of ideal gas; First principle of thermodynamics; The heat capacity; The latent heat; Polytrope processes; The second principle of thermodynamics; Thermal machines; Thermodynamic cycles; Notions of electricity and magnetism; The electric charge; Electromagnetic interactions; Electric field; Electrostatic potential; The flow of electric field; Gauss's theorem under vacuum; Electric current; Circuits; Instruments for measuring electrical quantities; The magnetic field of electricity; Constant magnetic field equations; Electromagnetic induction; Notions of optic; Electromagnetic waves; Nature and propagation of light (light sources,

wave fronts, velocity of light); Interference and diffraction of light; Reflection and refraction of light; Refractive index; Total reflection; Absorption; Dispersion; Rainbow; Lenses and optical instruments; Notions of Atomic and Nuclear Physics; Exclusion principle; The atomic structure; Diatomic molecules; Molecular spectra; Structure of solids; Nucleus of the atom; Natural radioactivity; The radioactive transformations; Nuclear reactions; Nuclear fission and fusion; Physical relationship with other sciences.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral exam

COURSE TITLE: QUANTUM CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Acquisition of fundamental concepts, formalism and computational aspects of molecular modeling through molecular mechanics calculations and quantum-chemical calculations.
COURSE CONTENTS: Introduction to quantum mechanics; The dynamics of microscopic systems; Mathematical formulation of quantum mechanics; Molecular mechanics modelling; Hückel molecular orbital theory; Hartree-Fock method formalism; Semiempirical quantum chemistry methods and their implementation; Ab initio quantum chemistry methods and their implementation; Fundamental and computational aspects of functional density theory; Computation of charge distribution, molecular electrostatic potential and spectroscopic properties.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – exam; 30% of the final grade – continuous assessment and colloquium)

COURSE TITLE: FUNDAMENTALS OF ORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory
COURSE OBJECTIVE(S): Provide students with a basic understanding of the structure of organic compounds, electronic and quantum theories of chemical bonds, isomerism, electronic effects, speed of reactions, the natural state, the obtaining and the reactivity of hydrocarbons.
COURSE CONTENTS: Structure of organic compounds: Representation formulas of organic molecules; Electronic theory of chemical bonds; Hydrogen bonds; Electronics and quantum theories of chemical bonds in organic compounds: Quantum theory of chemical bonds; Molecular orbital method; Resonance method; sp^3 , sp^2 and sp hybridization; Isomerism of organic compounds: Constitutional isomers: chain, position, function, and valence; Stereoisomerism: geometrical isomers; Stereoisomers: conformation isomers of butane; Stereoisomerism: conformation isomers of cyclohexane; Stereoisomerism: symmetry elements of molecules; Stereoisomers: enantiomers, nomenclature of enantiomers; Stereoisomers: diastereoisomers, meso forms, axial and planar chirality; Electronic and steric effects in organic molecules: Inductive effect; Electromeric effect: static and dynamic; Influence of electromeric effects on the properties of molecules; Groups of atoms with electromeric and inductive effects (-I,-E), (-I, + E), (+ I, + E); Hyperconjugation, steric effects; Spectroscopic methods in organic chemistry: UV-VIS electronic spectroscopy; IR absorption spectroscopy; NMR spectroscopy; Mass spectroscopy; Reactants, intermediates and reaction types in organic chemistry: Types of reagents; Carbocations; Carbanions; Radicals; Carbenes; Rate of reaction: transition state theory and the theory of molecular collisions; Organic reactions of order I; Organic reactions of order II Competing organic reactions; Parallel organic reactions; Catalysts; Isotope effects; Hydrocarbons: Alkanes (paraffins); Cycloalkanes (cycloparaffins); Alkenes; Dienes and polienes; Alkyne (acetylene); Aromatic hydrocarbons;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written exam paper at the end of the course)

COURSE TITLE: ENGLISH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry, Biochemistry and Environmental Chemistry Technology specialisations. The seminar is designed to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests;

Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: PHYSICAL EDUCATION
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.
b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orien teering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and physical education means in actions optimizing physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENGLISH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory

COURSE OBJECTIVE(S): English language is one of the compulsory curriculums for the Chemistry, Biochemistry and Environmental Chemistry Technology specialisations. The seminar is designed to fix fundamental vocabulary and structural paradigms specific conversational sciences. The seminar also aims at developing those skills necessary to achieve the necessary documentation for employment purposes: cover letter, CV in English, letters of recommendation and complete an application form correctly.
COURSE CONTENTS: 1. What is Science? Word Formation; 2. Branches of Science; Plural in English; Greek and Latin Plurals; 3. Fundamental Concepts of Chemistry; Gender and Determinants; 4. Laboratory Equipment; Countable and Uncountable Nouns; 5. Alchemy; Idioms; American English vs. British English; 6. Periodic Table; Consist, Contain, Include; Chemical Elements; 7. States of Matter; Revision of Tenses; The Passive Voice; 8. Types of Inorganic Chemical Reactions; Phrasal Verbs; 9. Inorganic Nomenclature; Comparison Degrees of Adjective; 10. Carbon Facts; Word Order; 11. Organic Nomenclature; Hazard Symbols; Relative Pronouns; 12. Environmental Chemistry; Titration; Mathematical Operations; 13. Analytical Chemistry; Flame Tests; Articles; 14. Everyday Chemistry; Modal Verbs; Abstract.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (75% of the final grade – final exam; 25% of the final grade – portfolio)

COURSE TITLE: FRENCH

CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Checking knowledge of French and the vocabulary to facilitate easier and faster access to specialized texts, through better knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase from French to facilitate access to learning fundamental mechanisms underlying the simplest phrasing in French; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals etc.
COURSE CONTENTS: Chemistry has revolutionized the lives of men; Isomerism; Laboratory techniques in inorganic chemistry; Laboratory techniques in organic chemistry; Vitamins; First concepts of dietetics fermentations; Food preservation; Bread and milk; What happens to food; Composite foods; Aspartame; The blood haemostasis; Role of blood cells; Antiseptic and disinfectant; Drugs – aspirin formulations; Perfumes; Esterification and hydrolysis; Soaps; Soaps – mode of action; I. Water, wine or cola; II. Fire floating; III. The coloured flames; IV. Auto-ignition; V. Mini fireworks; VI. Artificial fog.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: MATHEMATICS

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The acquisition of fundamental concepts of mathematical analysis and differential equations, the development of skills in handling with these concepts and setting connexions between mathematics and chemistry.
COURSE CONTENTS: Linear spaces; Linear dependence and linear independence; Base; Linear operator; Linear functional; Norm; Distance; The n-dimensional space; Sequences and series; Numerical sequences; Convergence; Numerical series; Convergence; Sequences and series of functions; Power series ;Taylor's series; Taylor's expansions; Functions; Functions of real and vectorial variables; Limits; Continuous functions; Differentiable functions; Partial derivatives; The derivatives of composed functions; Extreme points of vectorial variable functions; Conditioned extreme points; Implicit functions; Integrals; Ordinary integrals; Integrals with parameters; Improper integrals; Curvilinear integrals; Multiple integrals; Integral of surface; Differential equations; Equations of first order; Linear equations of higher order with constant coefficients; Differential equations systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (summative evaluation by two tests during the semester)

COURSE TITLE: PHYSICAL GEOGRAPHY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Deepen the knowledge about planet Earth and about the Sun influence on Earth phenomena; Formation of a synthetic image on Terra geosphere (lithosphere, atmosphere, hydrosphere, biosphere, anthroposphere), as well as on relations between them; Explanation of main phenomena and geotectonic processes occurring in geographical planetary environment.
COURSE CONTENTS: 1. Geography as science; The history of geography development; 2. The universe; Universe definition; General data and characteristics of Universe; Universe structure; Universe origin and evolution; Our galaxy – Milky Way; Solar system; Sun; General characteristics; Solar System planets; 3. Earth – living planet, component of solar system; Earth shape and sizes; Earth movements; Internal structure of Earth; Earth geophysical properties; Terra geospheres and relief; Atmosphere; Hydrosphere; Biosphere; Pedosphere.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 20% of the final grade – paper [documentation])

COURSE TITLE: GENERAL ECOLOGY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The knowledge of the relationship between organism and the environment, understanding ecological principles and concepts, understanding how certain abiotic factors affect organisms and community structure.
COURSE CONTENTS: Introduction, definition of ecology; Ecosystem structure, biotic and abiotic factors, limiting factors; Physical environment (temperature, water, light, chemical composition, salinity, etc.); Community structure; Trophic structure of the community; Food webs; Interspecific relationships (competition, predation, mutualisms, etc.); Species abundance; Indices of diversity; Primary production, nutrient cycling; Energy transfer and flow; Biogeochemical cycles; Succession.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the final grade – final theoretical exam; 20% of the final grade – final practical exam; 20% of the final grade – continous evaluation during the semester)

COURSE TITLE: ANIMAL AND PLANT BIOLOGY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Animal and plant comparative biology study the functions across levels of organization, from subcellular through organismal, in order to reveal physiological homologies.
COURSE CONTENTS: Nervous system; Muscle; Cardiovascular system; Respiratory system; Digestive system; Renal system; Endocrine system; Male and female reproduction; Photosynthesis: light and dark reactions; Growth and development of plants; Plants movements; Mineral nutrition.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – lab examination)

COURSE TITLE: CHEMISTRY OF METALS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): The general characterisation of metals both from the point of view of synthesis and of their properties; the explanation of the reactivity of metals based on their electronic configuration; The introduction of some new data, in a modern way, but at the same time accessible to student's understanding; The achievement of a real and broad image of the chemistry of metals on which the student could access more detailed approaches given by various papers in the field.
COURSE CONTENTS: 1. Theories of the Metallic Bond; 2. Synthesis and Purification of the Metals; 3. The Crystalline Structure and the Optical, Mechanical and Physical Properties of the Metals; 4. Magnetic Properties of the Metals and of their Compounds; 5. Chemical Properties of the Metals; 6. Corrosion of the Metals; 7. The Capacity of the Metals to Form Alloys; Representative Types of Alloys; Amalgams; 8. The Metallic Elements from the Blocks "s" and "p".
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

COURSE TITLE: PHYSICAL EDUCATION

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): a. Cognitive objectives: knowing the benefits on the organism, of activities practiced during physical education classes; the formation of beliefs and habits of systematic practice of various physical activities, according to individual interests and needs, during and after graduation; the development of moral-volitional traits, of the aesthetic sense, discipline, honesty, as well as the ability of communication and teamwork.

b. Practical application objectives: keeping and maintaining health using exercise in order to increase the potential of physical and intellectual work; acquiring the ability of movement at a compatible level with future professional requirements; helping growth processes and physical harmonious development of the body; physical and mental recovery after various actions; harmonious combination of intellectual and physical activity.
COURSE CONTENTS: Acquiring basic knowledge specific to the field of physical education and sport; Development of basic motion qualities, functional, practiced, volitional and aesthetic through physical exercise; Practice of exercise by option expressed by the students for the following branches of sports: aerobics,athletics,basketball,football,handball,orienteering,volleyball,badminton,training in which effort is made in order to prepare the body to learn technical and tactical sports, and practicing them fully and exercise them to improve exercise capacity; Strengthening technical and tactical elements and processes previously learned in a game of your choice; Use specific knowledge and physical education means in actions optimizing physical training and individual motion ability; Use specific knowledge and skills in the organization and practice of competition or non-competition, of sports branches corresponding physical availability and individual interests. Application of basic techniques in adapted forms of competition – contest; Using aerobics programs adapted to the physical training level of students.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 50% of the final grade – periodic and final evaluations reflecting the quality of the performance of the student during the activities practiced in physical education classes; 50% of the final grade – demeanour and frequency. The grading system is Pass/ Fail.

2ND YEAR, 1ST SEMESTER

COURSE TITLE: BIOCHEMISTRY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): To provide students with basic principles of Biochemistry. The course aims for students to: understand elements of basic biochemistry, including molecule names, molecular structures and terms used to describe categories of molecules; understand the relationship between molecular structure and biochemical function; acquire the technical language used to communicate key concepts relevant to biochemistry; perform biochemical analyses and basic calculations with experimental data; apply elementary concepts of biochemistry to specific problems.
COURSE CONTENTS: Amino acids and proteins; Carbohydrates; Lipids; Nucleic acids; Vitamins.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade – final written paper; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation)

COURSE TITLE: QUANTITATIVE-ANALYTICAL CHEMISTRY

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): The discipline aims to deepen the knowledge gained by students in disciplines Theoretical bases of Anorganic Chemistry, Qualitative Analitical Chemistry. As any branch of chemistry, Quantitative Analitical Chemistry develops two important perspectives: to accustom students with the volumetric techniques of analysis and with the gravimetric dosing methods.
Also it aims a systematization of knowledge focusing on classical quantitative methods of dosing compounds involved in the quality and protection of the environment.
COURSE CONTENTS: Titrimetry by proton exchange reactions; Titration curves; The application of acid-based titrimetry; Titrimetry by redox reactions; The applications of redox titrimetry; Titrimetry by complexing reactions; Titrimetry by precipitation reactions; Acid-based titrimetry in non-aqueous agent; Gravimetric analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: CHEMICAL KINETICS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): This program addresses to the second year students of the Faculty of Sciences, specialization Chemistry. Chemical Kinetics offers information on: (i) the type of chemical reactions; (ii) the mechanisms and chemical reaction rates. The main objective is to deduce the mathematical expressions of reaction rates, taking into account a proposed mechanism. The laws of reaction rates allow the understanding the basic steps which constitute the reaction mechanisms. Subordinated to these objectives, lab work aims to create competences and skills in performing certain works, to determine the constants of reaction rates using different methods such as: analytical methods and physico-chemical methods like: conductivity, polarimetry, thermogravimetry and UV-VIS spectrophotometry.

COURSE CONTENTS: Getting Started: chemical kinetics object; classification of chemical reactions; the chemical reaction rate; constant of reaction rate; Kinetics of simple reactions; Mathematical characterization of complex reactions: successive reactions; reversible reactions; parallel reactions and simultaneous reactions; Chained processes: the decomposition of acetaldehyde and hydrobromic acid synthesis; Polimerization reactions: radicalic and ionic polymerization; Polycondensation reactions: catalysed and self-catalysed polycondensation; Homogeneous catalysis: kinetics and mechanism; kinetics of enzyme catalysis; Heterogeneous catalysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – laboratory reports)

COURSE TITLE: BIOLOGICALLY ACTIVE NATURAL COMPOUNDS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, optional
COURSE OBJECTIVE(S): The main objective of the course is proving the students with basic information regarding the structure and properties of biologically active natural compounds. At the end of the course, students should be able to: (a) understand and recognize the basic elements related to the main classes of natural compounds, including basic structural features and nomenclature, as well as identifying the main functional groups found in natural compounds; (b) understand the main properties and biological activities of natural compounds. Subordinated to these objectives, laboratory work aims to create abilities and skills in isolating, identifying and quantifying natural compounds in various extracts and assessing biological activities of natural extracts.
COURSE CONTENTS: 1. Introduction: natural compounds, biological activity, hydrocarbons and functional groups found in natural compounds; 2. Primary and secondary metabolites; 3. Notions of chemical ecology; Communication chemicals (semiochemicals): pheromones and allelochemic substances: kairomones, allomones, and synomones (etymology, definitions, examples and roles); 4. Sources of biologically active natural compounds; 5. Usage of natural compounds; Natural compounds with therapeutic properties; Strategies and practical approaches used in obtaining biologically active natural compounds; 6. Main classes of secondary metabolites (classes, examples, spread and roles in nature, biological activity): terpenes, terpenoids and their derivatives; phenolic compounds and their derivatives; alkaloids and other nitrogen-containing compounds, alkaloid-derived drugs of abuse and their effect on brain function.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – examination; 30% of the final grade – laboratory activity and reports)

COURSE TITLE: INORGANIC POLLUANTS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: specialty, compulsory
COURSE OBJECTIVE(S): General notions (source, nature, characteristics) regarding the pollution of the environment (water, air, soil); The characterization of the main inorganic pollutants which are present in the environment factors; Methods of prevention and abatement of inorganic pollutants.
COURSE CONTENTS: Air Pollution: Pollution Sources, the Nature of the Characteristics of Pollutants; the Self-purification Phenomenon of the Atmospheric Air; Effects of Atmospheric Pollution; Methods of Prevention and Abatement of Atmospheric Pollution; Inorganic Pollutants: Carbon Monoxide, Nitrogen Oxides, Sulphur Oxides, Metallic Powders; Water Pollution: Pollution Sources; Water Self-purification; Methods of Prevention and Abatement of Water Pollution; Soil Pollution: Properties and Functions of the Soil; Types of Soil Pollution; Prevention and Abatement of Soil Pollution; Special Forms of Pollution (Radioactive Pollution, Phonic Pollution, Vibration Pollution).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; paper [documentation])

COURSE TITLE: SOIL SCIENCE

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course deals with studying the fundamental notions regarding the forming, composition, properties and characteristics of soils. The chemistry and mode of action of amendments and fertilizers in the system soil- plant is presented, as well as general notions regarding pesticides, or regarding soil pollution due to hazardous management of chemical products in agriculture.
COURSE CONTENTS: 1. The evolution of notions regarding soil; Soil fertility; Soil formation, as a particular living organism, which ensures the existential support and the source of nutritive elements for living organisms (pedogenetic factor/ pedogenetic processes); 2. Soil composition (solid phase, liquid phase, gas phase), the importance and their interactions in forming soil; 3. Soil physical properties, soil texture, soil structure,

specific weight and apparent density, porosity, hydro physical properties, mechanical properties, thermal properties; 4. Chemical properties of soil (capacity of absorption and exchange, soil acidity, buffering capacity, nutritive elements composition of soils); 5. Nitrogen, phosphorous and potassium agrochemistry; 6. Romanian soil natural resources; 7. Prognosis and agrochemical evolution of soils, optimizing soil reaction through treatments of acid and alkaline soils; 8. The agrochemical optimization of the system soil-plant through fertilizing treatments; Methods of calculations, estimation of the necessary amount of nutrients for agrochemical optimization of the soil- plant system; The evolution of soils in the context of applying fertilizers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written examination; 20% of the final grade – continuous evaluation; 10% of the final grade – report)

COURSE TITLE: PHYSICAL EDUCATION I
CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Athletics – sprinting, middle-distance running, long jump – learning the technical-tactical component parts. Volleyball/ football/ handball/ basketball – learning the game rules for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

COURSE TITLE: ENGLISH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring English language skills.
COURSE CONTENTS: Specific terminology: Types of Inorganic Chemical Reactions; Health and Safety in the Engineering Workplace; Laboratory Equipment; Troubleshooting.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral verification

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Better knowledge of the French language and vocabulary to facilitate student access to specialized texts with a high degree of difficulty, with good knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase in French, in order to acquire the fundamental mechanisms underlying the particular specialized French language; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals, etc.
COURSE CONTENTS: Brief history of the development of the classification of the elements; Structure of the current periodic classification; Periodicity of properties; Electronegativity; Ionic rayon; Study of some chemical families; Amines I; Amines II; Stereo isomerism configuration; Rules sequential C, I, P; The carbon-halogen bond I; The carbon-halogen bond II; The carbon-halogen bond III.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

2ND YEAR, 2ND SEMESTER

COURSE TITLE: ENGLISH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring English language skills.
COURSE CONTENTS: Specific terminology: Types of Inorganic Chemical Reactions; Health and Safety in the Engineering Workplace; Laboratory Equipment; Troubleshooting.

LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written and oral verification

COURSE TITLE: FRENCH
CODE:
ECTS CREDITS: 2
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Better knowledge of the French language and vocabulary to facilitate student access to specialized texts with a high degree of difficulty, with good knowledge of vocabulary, morphology and syntax elements common to French and Romanian language; Understanding the morph-syntactic elements of sentence and phrase in French, in order to acquire the fundamental mechanisms underlying the particular specialized French language; Acquisition of systematic rules for understanding scientific texts in the different specializations of students necessary to become familiar with specific tools for intellectual work: learning logic technique, critical approach to scientific reading, using information sources – dictionaries, encyclopaedias, handbooks, books and journals, etc.
COURSE CONTENTS: Brief history of the development of the classification of the elements; Structure of the current periodic classification; Periodicity of properties; Electronegativity; Ionic rayon; Study of some chemical families; Amines I; Amines II; Stereo isomerism configuration; Rules sequential C, I, P; The carbon-halogen bond I; The carbon-halogen bond II; The carbon-halogen bond III.
LANGUAGE OF INSTRUCTION: French
ASSESSMENT METHOD(S): Written verification (70% of the final grade – final written examination; 20% of the final grade – work of the seminar/practical course; 10% of the final grade – attendance). The assessment of first year students will evaluate specific skills, such as: their ability to discover, by reference to context and using a French-Romanian dictionary, the meaning of lexical units in the area of chemistry; their ability to recognize specialised texts (quoted in the theme of course) to previously purchased items morphology; their ability to demonstrate skills based on selected texts translation, to verify purchases language skills of professional translation of a text from French into Romanian (maximum 3 sentences) and from Romanian into French (maximum 3 sentences).

COURSE TITLE: THE METHODOLOGY OF THE IMPACT STUDIES ELABORATION
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialty, optional
COURSE OBJECTIVE(S): Getting acquainted with the provisions of the Romanian and Community legislation for the endorsement and authorization of social-economic activities having significant impact on the environment; The introduction of some new data, in a modern way, but at the same time accessible to student's understanding.
COURSE CONTENTS: 1. Legal Regulations and Normative Acts Regarding the Environment Protection; Defining Some Terms Specific to the Environment Protection; 2. The Content of the Studies on the Environment Impact Assessment, the Achievement Steps and the Procedures for their Promotion; 3. The Content of the Environment Balance, Achievement Steps and the Procedures for their Promotion; 4. The Content and the Significance of the Compliance Programme, Elaboration and Implementation Methods; 5. The Impact on the Environment Analysis; The provisions of the Romanian and Community Legislation for the Endorsement and Authorization of Social-economic Activities Having Significant Impact on the Environment; 6. Impact Assessment: the Approach System, Steps and Strategies of Impact Assessment, the Impact Dimensions; 7. Impact Quantification: Significant Impacts, Methods of Impact Assessment; 8. The Aim and the Requests of the Impact Study; The Integration of Impact Study in the Process of Technical Projection; General Principles for the Achievement of the Impact Study.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (80% of the final grade – assessment test; 20% of the final grade – paper)

COURSE TITLE: ENVIRONMENTAL ECONOMICS
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course aims to develop the existent knowledge which refers to the relationship between environment and economics. The environmental economics takes into account two important aspects: the environmental policy and the economic and ecologic costs of pollution. It also aims at achieving a systematization of the knowledge in the environmental field in the context of economic growth.
COURSE CONTENTS: Global issues related to environmental economics; Relationship between environment and economics; Lasting development; Environmental policy tools; Distortions of the social evaluation of resources and pollution; Biodiversity preservation; Ecologic impact evaluation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 10% of the final grade – applied activities, projects; 10% of the final grade – tests within the semester; 10% of the final grade – oral presentation)

COURSE TITLE: ORGANIC POLLUANTS

CODE:

ECTS CREDITS: 5

TYPE OF COURSE: specialty, optional

COURSE OBJECTIVE(S): The course aims at enriching knowledge acquired by students in the subject Fundamentals of organic chemistry. Organic Pollutants course develops two important aspects: organic compounds pollutants and their impact on the three environmental factors: air water and soil. Notions regarding pollution sources, properties, and methods of identifying pollutants are also addressed.

COURSE CONTENTS: 1. General concepts about pollution; 2. Pollutant organic compounds: a) Hydrocarbons; b) Halogenatedcompounds; c) Alcohols and phenols; d) Aldehydes and ketones; e) Carboxylic acids; f) Organic compounds with nitrogen; g) Organic compounds with sulphur; h) Organometallic compounds; i) Food additives; j) Detergents; 3. Air pollution; 4. Water pollution; 5. Soil pollution.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (70% of the final grade – final written test; 20% of the final grade – laboratory colloquium; 10% of the final grade – report documentation)

COURSE TITLE: ENVIRONMENTAL CHEMISTRY

CODE:

ECTS CREDITS: 6

TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): The course will provide a rigorous introduction regarding the principles which governs the reactions, transport and effects of chemical species in water, soil and air. A special attention will be paid to the knowledge and understanding of the effects of industrial and human activity on the chemical composition and properties of the environment, as well as the solutions for the environmental remediation.

COURSE CONTENTS: Introduction to environmental chemistry; Chemistry of processes in atmosphere and lithosphere; Chemistry of processes in hydrosphere; Natural biochemical processes in biosphere. Biochemical cycles; Effects of pollutants on the atmosphere, hydrosphere and lithosphere chemistry; Effects of pollutants on biosphere: biodegradability, toxicity and risks; Physical and chemical treatment of pollutants and wastes; Biological treatment of pollutants and wastes; Pollution minimization and prevention.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (70% of the final grade – written test; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

COURSE TITLE: ATMOSPHERE AND AIR QUALITY

CODE:

ECTS CREDITS: 5

TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): The understanding of the physics and chemistry of Earth atmosphere; The understanding of the impact of natural and anthropogenic factors on the atmosphere; The knowledge of the laws and policies regarding the air pollution.

COURSE CONTENTS: Atmosphere; Atmosphere pollution; Air pollution and human health; Chemical processes in atmosphere; The physics of atmosphere; Models of pollutant dispersion in atmosphere; Prevention of air pollution; Macro air pollution; The monitoring of air pollutants.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (oral examination and continuous assessment and final examination)

COURSE TITLE: SPECIALTY PRACTICE

CODE:

ECTS CREDITS: 4

TYPE OF COURSE: speciality, compulsory

COURSE OBJECTIVE(S): Acquiring basic notions regarding environment pollution; Methods of preventing and combating pollution; Learning lab methods for the determination of different pollutants; Shaping the abilities to work in a team; Interpreting the obtained data and proposing measures for diminishing the values, if necessary.

COURSE CONTENTS: The content of the subject matter is structured on the following directions: Atmospheric pollutants: sources, sampling methods, laboratory determination methods; Water pollutants: sources, sampling methods, laboratory determination methods; Measurement and control equipment; Description of the equipment function used for laboratory determination of chemical pollutants. Students' activity consists of: labour safety rules will be recorded; students will study and watch along with qualified persons the interpretation of data received from automatic stations which monitor different atmospheric pollutants; students will take part along with qualified persons in analysing the samples brought to the laboratory and they will interpret the obtained data proposing repair measures in case of exceeding the provided norms; probationer students have to draw up the lab notebook practice which contains: the presentation of the society, the organization of the society, the description of the means of monitoring the atmospheric pollutants, analysis and control methods for water samples.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Verification (50% of the final grade – assessment test; 50% of the final grade – lab notebook practice)

COURSE TITLE: PHYSICAL EDUCATION II

CODE:
ECTS CREDITS: 1
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Acquiring knowledge on how to use specific content of the physical education in order to outline appropriate individual strategies for maintaining health, fostering harmonious physical development of the body, improving motor skills and social integration.
COURSE CONTENTS: Gymnastics: acrobatic dynamic games, with content from basic and applicative motor skills; Developing motor skills – methods and means of action; Volleyball/ football/ handball/ basketball – learning the game model for beginners; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the attack phase; Volleyball/ football/ handball/ basketball – learning technical-tactical structures specific to the defense phase.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 30% of the final grade – continuous evaluation; 70% of the final grade – final practice evaluation. The grading system is Pass/ Fail.

COURSE TITLE: ANIMAL AND PLANT PHYSIOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): Animal and plant comparative physiology study the functions across levels of organization, from subcellular through organismal, in order to reveal physiological homologies. The course presents broad concepts in a concise manner and to minimize the compilation of isolated facts.
COURSE CONTENTS: Cell physiology; Nervous system; Muscle; Cardiovascular system; Respiratory system; Digestive system; Renal system; Endocrine system; Male and female reproduction; Photosynthesis: light and dark reactions; C3 photosynthesis; C4 photosynthesis; CAM photosynthesis; Growth and development of plants; Plants movements; Mineral nutrition.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (60% of the final grade – final theoretical exam; 20% of the final grade – final practical exam; 20% of the final grade – continuous evaluation during the semester)

3RD YEAR, 1ST SEMESTER

COURSE TITLE: PHYSICS OF THE ENVIRONMENT

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Apprehension, by the Chemistry of the Environment specialisation students, of basic notions regarding the physics of the atmosphere; Understanding of the main sources for the environment pollution, as well as their consequences on the environment.
COURSE CONTENTS: 1. The atmosphere: composition, physical structure; 2. Solar, terrestrial and atmospheric radiation; 3. Air humidity; 4. Atmospheric pressure; 5. Environmental pollution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (80% of the final grade – written exam; 20% of the final grade – laboratory test)

COURSE TITLE: ENVIRONMENTAL LAW, LEGISLATIONS, POLICIES AND STRATEGIES

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The objective of this discipline is the acquiring of concepts regarding environmental legislation by students. The matter will be discussed following two important aspects: learning the fundaments of the law and then attaining fundamental knowledge about environmental law, environmental policies and development strategies.
COURSE CONTENTS: Introduction to Law; Law, Definition and Etymology; Law norms and their sources; The action in time, space and over people of the legal norms ; Legal relation; Administrative legal relation; The main institutions and governing bodies of the state; Civil legal relation; Elements of civil legal relation; Object of civil legal relation; Subjects of civil legal relation; Content of civil legal relation; Introduction to environmental law; Object, definition and concepts specific to the environment; Functions; Fundamental principles and sources of environmental law; The place and role of environmental law in the legal system; Environmental legal relation; Environment - institutional framework; Environment - goal and scope; Protection of natural resources and biodiversity; Regulation of environmentally hazardous activities; The main institutions responsible for environmental protection; Environmental policies; Romania's environmental policy integration in Europe and worldwide; Sustainable development concept and content; Sustainable Development Strategy of Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (20% of the final grade – continuous evaluation; 80% of the final grade – final evaluation)

COURSE TITLE: WATER RESOURCES MANAGEMENT

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: speciality, compulsory

COURSE OBJECTIVE(S): Knowledge and understanding: knowledge and appropriate use of specific concepts of water resources management; Explanation and Interpretation: Analysis of water resources in terms of their potential and protection in the context of sustainable development; systematization of knowledge on water resource management; Attitude: awareness about water resource management in the world and in Romania.

COURSE CONTENTS: 1. Water resources – Definition of water resources; The influence of human activity on water resources; Importance of water resources; 2. Objective and field of water resources management; The complex planning and the use of water resources; 3. Infrastructure and management of water resources; 4. Management and use of water resources in Romania – The complex improvement of the river basins and the systematization of the hydrographic network; 5. Management of water resources and their use in Europe – regional differentiation water resources; 6. European strategy in the water management; European Directives terms used in the water field; 7. Water Framework Directive (WFD) 2000/60/EC; 8. River Basin Management Plan; 9. Drinking Water Directive 1998/83/EC; 10. Directive 91/676/EC concerning the protection of waters against pollution caused by nitrates from agricultural sources; 11. Monitoring of water resources; Pollution sources and water quality categories; 12. Wastewater; Schemes operating wastewater treatment plants.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (continuous and final evaluation; reports and final exam)

COURSE TITLE: CELLULAR AND MOLECULAR BIOLOGY

CODE:

ECTS CREDITS: 6

TYPE OF COURSE: speciality, compulsory

COURSE OBJECTIVE(S): The knowledge of the basic cell structure and function; Acquiring the principles and the methods of the microscopy.

COURSE CONTENTS: Cellular anatomy; The molecular organization and the function of the membrane; Secretion and excretion of cellular products; Osmosis and cell membrane integrity; Cellular differentiation: cilia and flagella, microvilli; Cytoplasmic matrix; The description and the roles of the cytoplasmic organelles such as mitochondria, ribosome, endoplasmic reticulum, Golgi Apparatus, lysosomes, centrosome; Cytoskeletal elements: microtubules, microfilaments; Nucleus; Nucleic acids: DNA, RNA; Cellular cycles; Cell division: mitosis, meiosis; Blood cell; Immunity – humoral and cell-mediated, active and adoptive, artificial; Immunization; Chromosomes – structure and morphological forms; Patterns of protein synthesis; Translation; Transcription; The human genome; Microscopes: components, the procedures for using; The microscopic studies of various types of cells; Proto-oncogenes and carcinogenesis; Programmed cell death; Apoptosis.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam (60% of the final grade – final theoretical exam; 20% of the final grade – final practical exam; 20% of the final grade – continuous evaluation during the semester)

COURSE TITLE: ELECTROCHEMISTRY AND CORROSION

CODE:

ECTS CREDITS: 6

TYPE OF COURSE: speciality, optional

COURSE OBJECTIVE(S): Electrochemistry and Corrosion, as discipline, provides information about basic concepts of phenomena occurring when current passes through the electrolyte solutions. Practical work materializes the theoretical concepts presented in this course. Moreover, Part II reveals theoretical bases of corrosion processes and their control based on fundamental principles of thermodynamics and electrochemical kinetics. Lab work aims to create competences and skills to determine the corrosion rates of metals in various aggressive media using weight loss and electrochemical measurements.

COURSE CONTENTS: Dissociation electrolytic theory; Equilibrium electrode potential; Electrochemical cells; Electrochemical kinetics; Diffusion kinetics; Study on electrode processes; The operating parameters of electrochemical systems; Corrosion – the basics; Thermodynamics of corrosion processes; Pourbaix diagrams; The kinetics of corrosion processes; The impact factors on corrosion occurrence; Metals passivation; Methods to prevent corrosion.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Exam, oral examination (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – assessment of laboratory reports)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: BIOINORGANIC CHEMISTRY

CODE:

ECTS CREDITS: 8

TYPE OF COURSE: speciality, optional

COURSE OBJECTIVE(S): The aim of this course is to deepen the knowledge acquired by students in the field of “Inorganic chemistry”. Two main aspects will be developed: synthesis and characterization of inorganic and coordination compounds of biocations involved in life processes. A special attention will be paid to coordination compounds involved in environmental quality and protection.

COURSE CONTENTS: Coordination chemistry and its importance for biological structures; Metalloenzymes used for oxygen transport and storage; Nitrogen fixation in biological systems; Metalloenzymes as catalysts of redox processes; Metalloenzymes as catalysts of hydrolytic processes; Chlorophylls – magnesium coordination compounds; Complex combinations and carcinogen diseases; Applications in environment protection.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – examination; 20% of the final grade – assessment during the semester; 10% of the final grade – assessment of laboratory reports)

COURSE TITLE: TOXICOLOGY

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): The main objective of the course is proving the students with basic information regarding the general concepts of toxicology. At the end of the course, students should be able to understand the main scientific terms and indicators used in toxicology, acquire the language and information necessary for explaining the processing of toxic substances *in vivo* and exemplifying the toxicity of various classes of toxicants. Subordinated to these objectives, laboratory work aims to create abilities and skills in performing certain analyses that reveal and allow the dosage of toxic substances that contaminate food, water, alcoholic and soft drinks.
COURSE CONTENTS: 1. Brief history of toxicology; 2. General concepts of toxicology: toxicology domains and braches; classification of toxic substances after origin, structure, organ targeted toxicity, acute toxicity indicators; main indicators of toxicity; Dose/Response curves, NOEL; Types of toxic effects: local and systemic; short and long-term intoxications; mutagenic, carcinogenic, teratogenic effects; 3. Processing of toxic compounds *in vivo*: xenobiotics and endogenous substances; Phase of exposure, toxicokinetic and toxicodynamic phase; Cross of cellular membranes; Absorption, distribution and elimination (metabolism and excretion) of toxins; Phase I and phase II reactions of metabolism; 4. Selected classes of toxicants: Natural toxicity caused by plants and natural food; Microbiological contamination of food; Biological pollution substances (mycotoxins); Food spoilage; Chemical toxicity and contamination of food: the chemical contamination due to pesticides used in agriculture; the chemical contamination due to food additives; potentially toxic metals and plastics toxicity; toxicity due to antibiotics added to animal nutrition; synthetic estrogens; radionuclides.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – examination; 30% of the final grade – laboratory activity and reports)

COURSE TITLE: INORGANIC POLYMERS AND CLUSTERS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: speciality, optional
COURSE OBJECTIVE(S): Acquiring of the fundaments of synthesis, structure and reactivity of inorganic polymers and clusters; The application of theoretical modes describing the reactivity of inorganic clusters to the understanding of natural occurring processes.
COURSE CONTENTS: The formation of inorganic chains and rings; General methods for the synthesis of homo and hetero element-element bounds; Water-ions interaction; Olation; Oxolation; Application of inorganic clusters models to the understanding of minerals reactivity; The analysis of minerals solubility on basis of polymers model.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (oral examination and continuous assessment and final examination)

FIELD: GEOGRAPHY
PROGRAMME TITLE: GEOGRAPHY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: CARTOGRAPHY, TOPOGRAPHY, PHOTOGRAMMETRY

CODE: D11GEOL101
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): To develop the ability to read and use maps or plans. To acquire knowledge of methods and means by which cartographic products can be made. To use of topographical instruments. To interpret satellite imagery, aerophotographs, orthophotomaps.
COURSE CONTENTS: Getting started, Geodesy notions, Topographic methods and concepts, Units of measurement, Planimetry, Altimetry, Topographic instruments, Plans and maps, Cartographic projections, Drawing of general maps, Cartograms, Cartographic methods, Photographic sensors, Photointerpretation. Practical activities include the following topics: Cartography - General notions, Conventional signs used on topographic maps; Plans, Maps and Atlases; Orientation of plans and maps; Practical application of the various ways of mapping the field map; Cartometry: Measurement of distances on topographic maps, Determination of surfaces on topographic maps, Determination of geographic coordinates on topographic maps, Construction of topographic profile, Study of deformations by projections, Projection systems and their classification, Instruments used in surveying, Interpretation of Satellite Imageries
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral evaluation (70 % of the final garde – exam results; 30% of the final grade – evaluation of practical activity)

COURSE TITLE: METEOROLOGY

CODE: D11GEOL102
ECTS CREDITS: 4
TYPE OF COURSE: compulsory, fundamental
COURSE OBJECTIVE(S): to define the atmospheric processes and phenomena, the laws governing them; to present the regime and geographical distribution of atmospheric processes and phenomena; to highlight the complexity of phenomena that determine the evolution of the weather; knowledge of methods and means of obtaining meteorological data; detailed knowledge of instruments and equipments used at meteorological stations.
COURSE CONTENTS: Introductory notions; The atmosphere; The structure of the atmosphere; The Sun and solar activity; Radiation fluxes; Consumption of heat from the radiation balance; Water in the atmosphere; Atmospheric precipitation; Atmospheric pressure; Horizontal air movements; Air masses; Atmospheric fronts; Cyclones; Anticyclones.
Practical activities include the following topics: The meteorological station; Practical application at Craiova Meteorological Station; The determination of the sunshine duration; The determination of air temperature – Thermogram; The determination of atmospheric pressure – Barogram; The clouds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – answers during the examination; 30% of the final grade – evaluation of practical activity)

COURSE TITLE: HYDROLOGY

CODE: D11GEOL103
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to define the subject matter of hydrology; to acquire knowledge about the aquifers and the classification of springs; to present the morphometric elements of the basin and of the hydrographic network; to highlight the factors that influence river flow; to compare the phases of the river drainage regime; to underline the complex phenomena that determine the river dynamics and hydrological regime; to identify and to compare the main phenomena and processes in the field of limnology.
COURSE CONTENTS: The concept and the research field of hydrology as a science; Water on Earth; The hydrological properties of the rocks; Confined and unconfined aquifer strata; The springs; The river hydrology (Potamology); The drainage area; The river dynamics; The river hydrological regime; The liquid and alluvial flow; The thermal and freezing regime of rivers; Limnology; The dynamics, balance and thermal regime of lake water. Practical activities include the following topics: The main river basins in Romania; The variation of groundwater levels; The classification of springs on the basis of their mineralogical composition; Practical elements of potamology – delimitation of river basins and achievement of distribution chart for basin and inter-basin areas; compiling the hydrographic network density map; The measurement and processing of river water level; The measurement and processing of river water speed; The measurement and processing of liquid flow; The measurement and processing of alluvial flow; The distribution of lakes on Earth; Fieldtrip: The Preajba – Făcăi Lacustrine Complex.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – final answers to practical activities)

COURSE TITLE: GEOGRAPHY OF RESOURCES

CODE: D11GEOL104
ECTS CREDITS: 4
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): to gain fundamental knowledge about the resources of the geospheres, their economic capitalization and their role in the development of human society; to achieve a logical system of correlations with respect to the geosystemic unity and the nature – human society interactions; to use the fundamental information of the domain in order to explain and analyse the main processes and phenomena; to elaborate professional projects, the research topic being represented by various geographic elements, processes and phenomena that refer to particular territories and periods; to analyse qualitative and quantitative geographical information and statistical data in the social-economic and territorial framework; to apply the principles and methods specific to the domain in the framework of specialised IT applications in order to achieve and analyse required graphic or cartographic products.
COURSE CONTENTS: Categories and types of resources; classification criteria; the human resources of the Earth; The cosmos as generator of resources: availability and economic capitalization of resources with cosmic origin; The atmosphere in the geosystemic relationships and in the genesis of resources: atmospheric raw materials and energy resources; the climates and their role in the distribution of biomass resources; The hydrosphere resources; The lithosphere – main supplier of mineral resources; metalliferous and non-metalliferous resources; energetic resources; The biosphere and the regeneration of biotic resources; the forest fund and other vegetal resources; the fauna and its economic importance. Practical activities include the following topics: Graphic and cartographic products used in the geography of resources; The capture, conversion and economic capitalization of solar resources; dynamic and territorial characteristics; The atmospheric resources – spatial and temporal characteristics of the economic valorization of wind energy; The hydrosphere resources – regional disparities connected to the fresh water resources availability and use; The lithospheric resources – the geographic distribution and dynamics of coal, oil, gas, iron and gold capitalization; The biotic resources; wood resources: importance and capitalization; quantitative and qualitative dynamics of the forest fund resources and disparities connected to the woodland extension; Energetic capitalization of biomass and biogas; World Energy Trilemma Index;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60 % of the final garde – exam answers; 40% of the final grade – final answers to practical activities)

COURSE TITLE: GENERAL GEOLOGY AND GEOLOGY OF ROMANIA

CODE: D11GEOL105
ECTS CREDITS: 4
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The general geology part presents and explain topics like orogeny, volcanism, earthquakes, faults and folds, forming of igneous, sedimentary and metamorphic rocks, as well the connection existing in nature between these topics. The second part of the course deals with the geological structure of Romania's major relief units and also presents data about major mineralogical deposits and their formation.
COURSE CONTENTS: Introductory elements; Inner structure of the Earth and its influence on the lithospheric plates motion; Minerals and crystalline structure; Igneous, metamorphic, sedimentary rocks-types, formation; Introductory elements of structural geology; Geological platforms identified on Romanian territory; Orogene structures of Romania. Practical activities include the following topics: Minerals – Classification, description, properties, identification; Igneous, metamorphic, sedimentary rocks – Classification, description, properties, identification; Geological compass; Elements of a geological map; Use of geological map, scale 1:1000 000, for identifying geological features of Carpathians on Romanian territory, Transylvania basin and in the regions found outside the Carpathians.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – final examination; 30% of the final grade – practical activities)

COURSE TITLE: METHODS AND TECHNIQUES OF ANALYSIS OF GEOGRAPHICAL DATA

CODE: D11GEOL106
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Analysis and interpretation of qualitative and quantitative geographical data and information in a socio-economic and territorial context; Develop graphic and cartographic materials using ITC methods and programs; Making a diagnosis of certain geographic aspects; Analyzing, writing and presenting the obtained data.
COURSE CONTENTS: General concepts of the geographic research; Fundamental concepts of data analysis; Sources and models for analyzing secondary geographical data; The main research methods used in geography; Stages of research to conduct a physical geography study; Research methods and techniques used in human geography studies; Stages in preparing a research report. Practical activities include the following topics: The geographic matrix; Statistical series analysis – physical geographic data and their graphical

representation; Statistical series analysis – human geography data and their graphical representation; Observation as a research method in geography – conducting a structured observation in the field; Cartographic method-cartogram; Cartographic method-carto-diagram; Qualitative analysis – elaboration of a questionnaire.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – final answers to practical training activities)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: GENERAL PHYSICAL AND HUMAN GEOGRAPHY
CODE: D11GEOL209
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Interpretation of relations between the geosystem and neighboring systems (cosmic space and inner terrestrial system); Formation of a synthesis image of Terra's layers (lithosphere, reliefosphere, atmosphere, hydrosphere, biosphere, anthroposphere) and the relationships between them; Defining, analyzing and interpreting anthropogenic phenomena in the context of complex interrelation with the natural framework; the use of terms, concepts, methods and techniques of investigation specific to human geography; highlighting territorial disparities at global level and regional peculiarities; presenting the factors that influenced the patterns of development and the consequences on the demographic, ethnic, cultural, economic, geopolitical profile.
COURSE CONTENTS: Geography: object, principles, methods, laws; Geosystem; Characteristics of the Universe; Structures of the Universe; Solar System; The shape and dimensions of the Earth; Earth's rotation and revolution; The internal structure of the Earth; Geophysical properties of the Earth; Lithosphere; Earth relief; Atmosphere; The general circulation of the atmosphere; Hydrosphere; Ocean – atmosphere relationship; Biosphere; Pedosphere; Geographic environment laws; Global laws; Specific laws; Human Geography – branch of geographic science; Operational Components in Human Geography; Models and methods of analysis in human geography; The main features that define the population and human settlements; Typology and resource classification; Agriculture; Industry; Transport and communications; International economic exchanges; Tourism; Geopolitics; Elements of social and cultural geography. Seminar activities include the following topics: Characteristics of the geosystem; Relationships of continuity, discontinuity and threshold; Examples of methods and principles used in geography; Exercises: the shape and dimensions of the Earth; Geographic coordinates; Applications on the Earth's movements and their influences on the Earth's surface; Analysis of plaque tectonics and associated phenomena: volcanism and earthquakes; Interpretation of the map on the spread of volcanoes and earthquakes on the Globe; Importance and role of a research project in human geography, stages accomplishment; Presentation of data sources and information in achieving a good research project in human geography; Methods of analysis, deontological norms, techniques for obtaining tables, diagrams, cartograms and other graphic representations; Presentation of research projects;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70 % of the final garde – exam; 30% of the final grade – practical assignment)

COURSE TITLE: CLIMATOLOGY
CODE: D11GEOL210
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): To use fundamental knowledge in the field in order to explain and interpret the main processes and phenomena; To elaborate professional projects focusing on the geographic elements, processes and phenomena related to certain territories and time intervals; To acquire methods and techniques for collecting, processing and analyzing data; To specify the basic concepts and methods in the achievement of graphic materials; To apply fundamental knowledge in interpreting geographic reality; To analyze, write and transmit the resulting data; To explain and interpret certain geographic phenomena in accordance with the needs of each public or private actor.
COURSE CONTENTS: Climatic genetic factors: radiation factors; Climatic genetic factors: physical-geographic factors; Climate genetic factors: dynamic factors and anthropogenic factors; Air temperature – geographical distribution; Geographical distribution of air humidity; Geographic distribution of cloud cover; Geographical distribution of liquid and solid atmospheric precipitations; Climate classification; Classification criteria; The hot climate zone; The temperate and cold climate zones; Climatic risk phenomena; Global climate change; Practical activities include the following topics: Presentation of methods for the processing of climatological data; Processing of temperature climatic data – Monthly multiannual average temperature, Variability of annual average temperature, Evolution trend of annual average temperatures rendered by gliding averages method; The histogram; Processing data on relative humidity;

Processing data on atmospheric precipitation – Monthly, seasonal and half-year averages, Variability of annual rainfall amounts (Hellman Criterion), Evolution trend of annual amounts by gliding averages method; Péguy Climogramme; Walter – Lieth Climogramme; Processing data on atmospheric pressure; Wind data processing.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – answers during the examination; 30% of the final grade – evaluation of the practical activity)

COURSE TITLE: OCEANOGRAPHY

CODE: D11GEOL211
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to define the concepts and processes of the ocean environment; to gain knowledge about the relief of ocean basins; to present the ocean basins structure and water masses dynamics; to correlate the physical and chemical properties of ocean and marine waters; to achieve cause-effect correlations in the context of World Ocean level increase; to achieve detailed knowledge of the Black Sea – marine relief, sea and coastal area.
COURSE CONTENTS: The World Ocean – introductory elements; The relief of marine and ocean basins; The regional geography of the World Ocean; The seas of the World Ocean; The marine and ocean waters dynamics; The chemical properties of ocean and marine waters; The physical properties of ocean and marine waters; The global sea level rise; The Black Sea; Romania's Black Sea coastal area. Practical activities include the following topics: The map of sea classification and distribution on ocean basins by surface and depth; The cartographic chart of ocean currents; The continental-oceanic joints and shoreline types; The cartographic map of islands in the Atlantic Ocean – classification by origin and surface; The cartographic islands in the Pacific Ocean – classification by origin and surface; The analysis of water temperature and salinity distribution on the surface of the World Ocean; The global sea level rise between 1990 and 2100, according to different SRES scenarios (IPCC) – overlapping liner chart; The Influence of Global Ocean oscillations on Earth deltas – case studies; The state of the Romanian coastal environment – SWOT analysis; The variation of the Romanian shoreline – distribution of multi-annual erosion rates.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – final answers to practical laboratory work)

COURSE TITLE: WORLD ECONOMIC GEOGRAPHY

CODE: D11GEOL212
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to gain knowledge about the relations among the structure, repartition and output of the economic activities in connection with the geographical space; to use the fundamental information of the domain in order to explain and analyse the main processes and phenomena; to elaborate professional projects, the research topic being represented by various geographic elements, processes and phenomena that refer to particular territories and periods; to apply the principles and methods specific to the domain in the framework of specialised IT applications in order to achieve and analyse required graphic or cartographic products.
COURSE CONTENTS: The concept of economic geography; The state and its components; the world political map; The fundamental principles in the repartition of production factors at global level; Geo-economic typology of states; Economical-geographical data on the primary sector of economy; the role and functions of agriculture; The natural, technical-economic and social-demographic factors that influence agriculture; the characteristics of land use/land cover categories; The cultivation of cereals; cereal stocks and cereal world trade; The industrial crops; The perennial cultivated plants; The animal husbandry; The structural types of agriculture and the agrarian landscapes; The most important agricultural regions of the world; The sectors complementary to agriculture: hunting and fishing activities; ecologic perspectives;Economical-geographical characteristics of the secondary sector of economy; The evolution of the industrialization process and its consequences; Economical-geographical characteristics of the consumer goods industry; The main industrial regions of the world; The transportation and the communication routes; The world trade; The tourism and the tourist activities. Practical activities include the following topics: World land use and land cover; structural disparities at regional level; Regional differences concerning the role of the demographic and technical-economic factors in agriculture; The comparative evolution of wheat, maize and rice production and trade at global level and in the main countries; The viticulture economy; The plants used for stimulating beverages/food products; The world livestock and its characteristics in relation with the natural and economic conditions; SWOT matrix use for the characterization of the agricultural capitalization at regional level; The air transportation and its characteristics; The maritime transportation and port characteristics; The main international organisations in the promotion of economic relations; Globalization: dynamic

perspective and contrasting aspects; the KOF Index of Globalization; Types of states depending on development level; the Human Development Index (HDI).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60 % of the final garde – exam answers; 40% of the final grade – final answers at practical training)

COURSE TITLE: GIS
CODE: D11GEOL213
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Use of specific software to achieve cartographic products; To use of spatial modeling and spatial data bases using ArcGis 9.3 software and QGis software; Using attribute-type databases for spatial modeling; Generating specific layers used in human geography and physical geography.
COURSE CONTENTS: Introduction to geographic information systems; Mapping projection systems and Georeference; Creating databases for territorial analysis; Managing geographic data; The main geoprocessing tools; Using spatial analysis for geographic data processing; Digital maps. Practical activities include the following topics: Creating relationships between tabular data; Using rasters in a geodatabase; Inclusion of geographic data sets; Compilation and recording of data; Data collection and import; Assigning coordinates using street addresses or routes Compiling and recording data: Creating and modifying objects, Creating layers using a scanned map, Editing attribute data; Compilation and recording of data: Editing of routes and geometric networks, Verification of data for error correction, Coordinate system and projection; Digital mapping and visualization: Labeling of elements on the map, Creating graphics in a map; Geographic analysis: Table data, column addition, data calculation; Joining tables, Extracting certain portions of the layer; Geographic analysis: Derivatization of data from an elevation, TIN/ DEMs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written evaluation (70 % of the final garde – exam answers; 30% of the final grade – evaluation of practical activity)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: POPULATION GEOGRAPHY
CODE: D11GEOL316
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Fundamenting the theoretical knowledge system of the Population Geography; analysing the diversity of natural, territorial and structural diversity of the world population from the spatial and time perspective; good use of the methods for gathering, processing and analysing the statistical date; interpretation of qualitative and quantitative geographical information considering the social and economic context.
COURSE CONTENTS: Introductory notions; Spatial distribution of the population; Population natural dynamics; Natural demographic balance; Population number; Spatial mobility; Population structures: on areas of residence, gendre, age groups, social- economic, racial, ethnic, linguistic, religion; Population and social-economic development. Practical activities include the following topics: World countries – definition, geographical characteristics, territorial and demographic typology; Evolution of population number on continents in the 20th century; Population fertility; Natural increase of the European population; Population density; Age pyramid; Social and professional structure of the population; Distribution of human races; Country topology depending on the ethnical structure of the population; Distribution of main religions; Index of human development; Geographical distribution of refugees and asylum-seekers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70 % of the final garde – exam answers; 30% of the final grade – projects during practical activities)

COURSE TITLE: BIOGEOGRAPHY
CODE: D11GEOL317
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Interpretation of distribution patterns of living organisms in correlation with historical and ecological factors, the way of formation and evolution of biogeographical areas and criteria of biogeographic regionalization.
COURSE CONTENTS: Diversity of organisms over time; Spatial variation of biodiversity; Number of species; Biodiversity concentration centers; Elements of chorology; Means of dissemination of living organisms; The biogenetic center; The distribution limit of the species; Barriers to species spreading; The ecological adaptive skills; Types of biogeographical areas; Endemism; The influence of ecological factors on the distribution of living organisms; Biomes; Biogeographic regionalization in the world and in Romania. Practical activities include the following topics: Classification of living organisms and nomenclature of taxonomic units: Taxonomic classification of plants and animals, scientific names of taxonomic units; Interpretation of determination keys; Elements regarding vascular plant morphology, indicator of plant adaptation to environmental conditions; Determination in the fields of representative species specifying the area, the ecological conditions and their importance;

Practical application – The Botanical Garden; Appreciation of species ecology and indicating plant value: humidity scale; heat scale, light scale, degree of acidity and soil trophicity; nitrogen scale; Indicator species (calcareous plants, oxifils, halophiles, psamophiles); Sequence of vegetation levels/areas; Analysis of the biothermic index on vegetation levels/areas; Biogeographical profile – synthesis representation of the distribution of organisms under the influence of environmental factors; Vegetation map; Methods of vegetation mapping; Using aerophotograms in vegetation mapping; Mapping of biogeographical areas; Interpretation of distribution patterns of species at various scales; Phytogeographical spectrum and zoogeographic spectrum.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70 % of the final garde – exam answers; 30% of the final grade – practical activities)

COURSE TITLE: SOIL GEOGRAPHY
CODE: D11GEOL318
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Identifying, defining and describing the main notions, concepts, laws, processes and geographic phenomena, as well as the basic methods used of the field; Assimilation of methods and techniques of data collection, processing and analysis.
COURSE CONTENTS: General notions; Soil components: mineral matter; Soil components: organic matter in the soil and humus formation; Components of soil – water and air in the soil; Physical, chemical and morphological properties; Pedogenesis; Soil classification; Soil Resources of Romania; Classes: protisols, cernisols, umbrisols, cambisols, luvisols, spodisols. Practical activities include the following topics: Soil profile; Achievement of soil profile in the field; Differentiation and interpretation of soil horizons and forming conditions; Sampling methods; Laboratory determination of the colour of soil samples using Munsell determination guide; Methods for determining the texture of soil samples in the laboratory; Assessment of soil structure on soil samples; Pedological map; Analysis and interpretation of soil maps; Use of pedological maps to assess the degree of soil erosion and the way it is distributed on the affected relief forms; The geographical distribution of soil salinization and the determination of causes;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – practical activities)

COURSE TITLE: GEOMORPHOLOGY
CODE: D11GEOL319
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compolsory
COURSE OBJECTIVE(S): To use the fundamental knowledge in the field to explain and interpret the main processes and phenomena; To assimilate methods and techniques of data collection, processing and analysis; To analyse and interpretat qualitatively and quantitatively the geographic data and information in a socio-economic and territorial context; To apply fundamental knowledge in interpreting geographic reality.
COURSE CONTENTS: General notions; Theories and methods of research in geomorphology; Planetary geomorphology; Tectonic geomorphology; Exogenous agents and processes; Processes preceding erosion; Displacement of materials on slopes; The relief created by temporary water courses; The relief created by permanent water courses. Practical activities include the following topics: Documentary sources used to represent the relief; Topographic maps, photogrammetric materials, geological maps, etc; Types of geomorphological maps and their classification; General geographic basis of geomorphological maps; Analysis of topographic maps in relief research; Drawing of simple geomorphological profiles; Achieving complex geomorphological profiles; Delimiting a hydrographic basin, extracting the hydrographic network; Its hierarchy in the Horton – Strahler system; Morphometric model of drainage in a hydrographic basin; Drawing and interpreting hypsometric maps by different methods; Drawing the map of the drainage density by the cartogram method; Drawing the map of the fragmentation depth by the river basin method; Drawing the map of the fragmentation depth by means of the isolines method; Mapping slopes (geodesites); Demo block diagram.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – practical activities)

COURSE TITLE: TOURISM GEOGRAPHY
CODE: D11GEOL320
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): understand the conceptual structure for organizing tourism activities; formation of environment-friendly behaviour for tourists and tourism working staff; use for fundamental knowledge to explain and interpret the main process and phenomena; proper use of methods and techniques for data collection, processing and interpretation.
COURSE CONTENTS: Theoretical elements: tourism, tourist, tourism patrimony, tourism

demand and offer; Main stages for the development of tourism; Role and functions of tourism; Tourism offer; Tourism infrastructure and characteristics of tourism services; Tourism demand/ tourism flows; Types and forms of tourism; Main tourism destinations; Elements and notions of tourism regionalization. Practical activities include the following topics: Principles of geographical regionalization, with focus on tourism regionalization; Methodology of tourism analysis; Tourism infrastructure – accommodation facilities; Case studies France, Greece; Occupation rate within European states; Main tourism regions based on dominant characteristics; Main international destinations; Tourism flows; The market of mountain tourism – case studies: Switzerland, Austria; The market of seaside tourism – case studies: Spain, Greece; Market of cultural tourism – case studies Egypt, France; Elaboration of a brochure for the promotion of a region/ town; Elaboration of a thematic tourism circuit;.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60 % of the final garde – test; 20% of the final grade – practical activities; 20% of the final grade – project)

COURSE TITLE: REGIONAL GEOGRAPHY

CODE: D11GEOL321
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): to identify, define and describe the main concepts, processes and geographical phenomena, as well as the basic methods used in the domain of regional geography; acquire the skills to use the techniques, principles, methods and instruments of geographical research to find solutions for territorial dysfunctions; to use and apply the basic methods and principles of GIS for generating cartographic material; to identify the geographical methods and to use the specific terms to conceptualize, realize and interpret the geographical studies they elaborate.
COURSE CONTENTS: Introduction to principles and research methods; Delimitation of regions: types and delimitation criteria; Region – entity and functions; The typology of geographical regions according to structural criterion: homogenous, polarization and anisotropic; Theories of regional development; Elements of regional planning: typology and regional flows: categories of regions; The main parts and the structure of territorial planning. Practical activities include the following topics: Types and examples of regions delimitated according to the structural criterion: homogenous, polarization and anisotropic regions; Models to establish and calculate the influence areas of growth poles; Principles and methods used in regional geography: chorems; Analysis of territorial disparities: labour force, infrastructure and their impact on the development of socio-economic component; SWOT analysis of SW Oltenia region for the issuance of development strategies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60 % of the final garde – test; 30% of the final grade – practical activities; 20% of the final grade – activity and responses during lectures)

COURSE TITLE: SOCIAL AND CULTURAL GEOGRAPHY

CODE: D11GEOL322
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): fundament the theoretical knowledge system in the domain of social and cultural geography; logical and coherent perception of the influences that the environment has upon society and humans; use the fundament knowledge of the domain to explain and interpret the main processes and phenomena; acquire the methods and techniques to select, process and analyze geographical data; describe spatial behaviors of human groups.
COURSE CONTENTS: Introductory notions; Geography of behavior; Specific forms of deviations: the geopolitics of taste; Medical geography: morphological differences of human body – expression of climatic conditions; Diseases specific to climatic zones; Cultural geography; Cultural landscapes; The geography of ethnic groups; Linguistics geography; Geography of religions; International dimension of confessional conflicts; The geography of genre; The geography of living. The seminar includes the following topics: Questionnaire as research method in social geography; Questionnaires: gathering field information, quantification and interpretation; Case study: the perception of the population about the sanitary system in Romania; Food insecurity around the world; The incidence of diseases in Romanian as a result of life styles after 1989; The analysis of social networks; Ethnic disparities around the world; Ethnic and linguistic areas in Europe; Confessional conflict areas.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – activity during practical activities)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: GEOMORPHOLOGY

CODE: D11GEOL425
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): To use the fundamental knowledge in the field to explain and interpret the main processes and phenomena; To assimilate methods and techniques of data collection,

processing and analysis; To analyse and interpret qualitatively and quantitatively the geographic data and information in a socio-economic and territorial context; To apply fundamental knowledge in interpreting geographic reality.

COURSE CONTENTS: Petrographic relief; Structural relief; Volcanic and pseudo-volcanic relief; Climatic relief; Littoral relief; Submarine relief and islands. Practical activities include the following topics: Drawing the legend of the geomorphological map; Mapping valleys, slopes and interfluves; The relationship between horizontal and inclined surfaces, orientation, types; Drawing maps of petrographic reliefs; Drawing maps of structural tectonic relief forms; Field observations on the outflow of monoclinic structures; Case study – Bucovăţ, Podari, Gura Văii; Mapping a current geomorphologic process; Practical application – the landslides from Bucovăţ-Hârligei; Carrying out the landslide map from Bucovăţ-Carligei; Mapping the bed processes; Field application – the Jiu Meadow in Bucovăţ-Podari (I); Mapping of general geomorphological processes; Drawing and interpreting the morphographic map; Presentation of granulometric analysis methodology.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination (70 % of the final garde – exam answers; 30% of the final grade – practical activities)

COURSE TITLE: URBAN AND RURAL GEOGRAPHY

CODE: D11GEOL426

CREDITS: 4

DISCIPLINE TYPE: specialization, compulsory

COURSE OBJECTIVE(S): to define the rural and the urban spaces; to gain knowledge about the elements regarding the spatial-residential and productive organisation of the above-mentioned media; to determine the rural and urban typology; to specify the stability and instability elements appeared between the rural and the urban environments; to identify stable strategies, effective in the promotion and development of the rural communities; to gain knowledge about the geo-ecological and economic requirements connected to the rural and urban sustainable development.

COURSE CONTENTS: Introductory notions; Research directions in the Romanian urban and rural geography; specialised international institutions and organisations; Urbanisation and the urbanisation level; Urban dynamics; Individualization criteria, urban concentration origin, components and forms; The role of the natural and social-economic factors in the internal structuring of the city; functional zones: location and dynamics; Urban economy; Urban functions; The importance of the natural components in the functioning of the rural space; The social-economic components of the rural space; The adjustment of the agrarian structures to the modern rural economy; Rural landscapes and agricultural regions; The sustainable development of rural spaces. Practical activities include the following topics: The Romanian urban settlements; Ranked functional hierarchy; Demographic dimensions of the Romanian cities/towns; Urbanization rate; Dynamics and distribution of world urban agglomerations; Hierarchy and centrality – the hierarchy of European cities; Changes of the urban network within the middle and lower Danube sectors, during the post-communist period; Functional typology of the urban settlements within Dolj County; the nomogram of the urban functions; Dispersion of the rural settlements; The dispersion index; The morpho-structural typology of the rural settlements; Dysfunctions and sustainable development within the Romanian rural space; Case-study: technical infrastructure and utility elements within Dolj County.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – final answers to practical activities)

COURSE TITLE: LAND USE

CODE: D11GEOL427

ECTS CREDITS: 4

TYPE OF COURSE: specialization, compulsory

COURSE OBJECTIVE(S): to identify, define and describe the main concepts, processes and geographical phenomena, as well as the basic methods used in this domain; skills to use the techniques and methods to acquire, process and analyze geographical and statistical data; elaborate cartographic materials using dedicated software; select the best methodological strategies to elaborate land use studies.

COURSE CONTENTS: Introductory theoretical notions; Types of land use and land cover; Evaluation of land use categories; Evolution of forest covers; Urban sprawl and soil sealing; Land degradation processes. Practical activities include the following topics: Dynamics of land use in Romania; Evolution of forest covers in Europe and Romania; Urban sprawl and agricultural loss; Evaluate the quality of the environment due to land use by environmental transformation indices; Soil sealing phenomenon; Land degradation by hydric erosion; Urban land use categories.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written verification (60 % of the final garde – written examination; 30% of the final grade – practical activity; 10% of the final grade – activity and responses during courses)

COURSE TITLE: GEOGRAPHY OF NATURAL AND ANTHROPOGENIC HAZARDS AND RISKS

CODE: D11GEOL428

ECTS CREDITS: 4

TYPE OF COURSE: specialization, compulsory

COURSE OBJECTIVE(S): to gain knowledge and to correctly use the terminology and fundamental concepts within the geography of hazards; to identify the particularities of local/ regional/ global natural and human-induced hazards; to gain knowledge about the most important means of hazard mitigation; to identify, define and use the basic concepts, laws, geographic processes and phenomena, as well as the fundamental methods of the domain; to analyse qualitative and quantitative geographical information and statistical data in the social-economic and territorial framework; to critically assess the achievement of graphic/cartographic documents; to become familiar with the specific methodology and terminology used for the conceptualization, achievement and analysis of elaborated geographical studies; to critically and constructively analyse and evaluate the solutions offered to the social stakeholders.
COURSE CONTENTS: The definition, the classification, the main dynamic and spatial characteristics of natural and human-induced hazards; Hazards and sustainable development; The volcanic hazards and risks; The seismic hazards and risks; The geomorphic hazards and risks; those connected to soil degradation; The avalanches; The meteo-climatic hazards and risks; The hydro-meteorological and oceanographic hazards and risks; The human-induced hazards and risks; The biological and biophysical hazards and risks. The seminar includes the following topics: The *hazard* concept and the associated terminology; the UNISDR perspective; The seismic hazard and associated vulnerability in Romania – examples and models; Assessment of the perception of seismic risk in Craiova city – social survey; The mass movements – examples and modelling; zonation of the Romanian territory with respect to the landslide risk; The avalanches in Europe: hot occurrence spots and warning systems (EAWS); the situation in Romania; The impact of tropical cyclones and tornadoes on population and other environmental elements; The main regional characteristics of the climatic risk phenomena in Romania; Tsunami: origin, spatial occurrence, examples, consequences; Directive 2007/60/EC and its transposition in the Romanian legislation; the exposure of the Romanian territory to floods; An integrated environmental assessment in the flood framework; the Romanian Danube Floodplain after the 2006 flood; the *Danube Floodrisk* Project; The technogenic hazards and risks; the IPPC Directive and the SEVESO Directives; An integrated analysis of hazards and risks; case-study 1: hazard assessment and mitigation in the Danube Floodplain (Calafat–Turnu Măgurele sector); case-study 2: assessment of natural and technogenic hazards in Oltenia.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – final answers at seminars)

COURSE TITLE: GEOGRAPHY OF EUROPE
CODE: D11GEOL429
ECTS CREDITS: 4
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): acknowledgements of the overall physical features; understanding the physical, human and economic regional differences.
COURSE CONTENTS: Europe Geography course aims at familiarizing the students with the overall physical features of the continent and especially with the regional differences in terms of social, cultural and economic values. Practical activities include the following topics: Elaboration of physico-geographic records of European regions; Table correlation of tectonic units and subunits with Europe's current situation; The altimetric qualification of the European territory and the realization of the mountain morphological ideogram; Hydrographic map of Europe with delineation of primary and secondary water catchments; Comparative study between the Danube and the Rhine with the realization of the longitudinal profile on the hydrographic sectors; Achieving the bio-pedo-climatic profile for the European regions; Regional differentials of demographic density and regional differentiation of the urbanization index in Europe.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – evaluation of practical activity)

COURSE TITLE: QUATERNARY GEOGRAPHY
CODE: D11GEOL430
ECTS CREDITS: 5
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): presentation of the divisions and limit of Quaternary, presentation of the climate changes and the evolution of geographic environments in Quaternary, the appearance and evolution of man; to understand and use the analysis methods characteristic to the study of the Quaternary; to identify on maps the limits of the surfaces formerly covered by ice caps, the vegetation zones and animals characteristic to different climate types.
COURSE CONTENTS: Introduction to Quaternary Geography; Quaternary climate; Glaciar and periglaciar relief; Consequences of glaciation on the landscape; Evolution of flora and fauna in the Quaternary; Anthropogenesis and evolution of human areas; Paleolithic and Neolithic civilizations and their distribution; The Geological Evolution of Romania's Territory in the Quaternary. Practical activities include the following topics:

Dendrochronology – method of investigation for Quaternary; Analysis of contours of continents during glacial and interglacial periods and mapping of ice caps expansion; Drawing vegetation areas in Europe during glaciations and interglacial phases; Construction of maps rendering the distribution of Archantropins, Paleantropins, paleo-Indians paleo-Australians; Drawing maps for the altimetric position of the marshes and rendering Riss and Würm glaciation in the Romanian Carpathians; Paleolithic inhabitants in Romania;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – evaluation of practical activity)

COURSE TITLE: TERRITORIAL PLANNING
CODE: D11GEOL430
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): Scientific knowledge of the human intervention upon the geographical space for the establishment of a territorial order that contributes to the increase of the quality and efficiency of the economic act and also to the welfare of the population.
COURSE CONTENTS: Territorial planning – Contemporary Concepts; Rural areas; Urban Management; Urban space; Industrial space; Technical and municipal structures; The metropolitan areas. Practical activities include the following topics: Basic models of geographic space organization and representation; Regional and general spatial patterns; Determination of the zones of influence of the localities with central role; Planning of rural space; Planning of urban space; Organization of peri-urban space; Organizing and managing forest bodies; Principles of sustainable tourism development; Planning of sports complexes.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70 % of the final garde – exam answers; 30% of the final grade – evaluation of practical activity)

3RD YEAR, 1ST SEMESTER

COURSE TITLE: PHYSICAL GEOGRAPHY OF ROMANIA I
CODE: D11GEOL535
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): Physical geography of Romania synthesizes multiple geomorphologic, climatological, hydrological, biogeographical, pedological knowledge, etc. in order to develop the physico-geographic analysis skills of the Romanian territory and initiation in deciphering the physical geography problems of Romania.
COURSE CONTENTS: Quaternary specific morphogenetic conditions; Structural, petrographic, volcanic, sculptural, glaciar, periglaciar and river relief in Romania; The current modeling of Romania's relief. The seminar includes the following topics: Physical-geographic knowledge of Romania's territory; Romania's geographic position and its geographical implications; Palaeogeographical evolution of Romania's territory.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – evaluation of the seminar activity)

COURSE TITLE: ENVIRONMENTAL GEOGRAPHY
CODE: D11GEOL536
ECTS CREDITS: 4
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): structural acknowledgement of the geographic environment; understanding of the functional processes within earth system; acknowledgement of systemic modification and the evolutional pattern of geographic environment; understanding the functional units of the ecosphere.
COURSE CONTENTS: Systematic organization of geographic environment; Abiotic structure of the environment; Systematic hierarchical organization of biotic components; Biotope-biocoenosis integrated level in the environment; Energy, matter and information as interchangeable elements in the environment; Laws of environmental functionality, processes and phenomena of state and environmental dynamics; Energy circuits in the environment; The geological circuit of the matter; Gaseous media of macronutrients in the environment; Sedimentary circuits of macronutrients; Eco-efficient ecological systems; The ecological functions of the forest ecosystem; Terrestrial functional units of the environment; Functional aquatic environment units. Practical activities include the following topics: The Earth radiative balance (Qt); Qs short wave radiation and Qt long wave radiation; Biogeochemical Circuit of oxygen, carbon, nitrogen, calcium, phosphorus, sulfur.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – written examination; 30% of the final grade – practical evaluation)

COURSE TITLE: REGIONAL GEOGRAPHY OF ROMANIA (THE CARPATHIANS AND SUBCARPATHIANS)
CODE: D11GEOL537
ECTS CREDITS: 4
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): Analysis of the geographic components of the Carpathians and Sub-

Carpathians as coordinating elements of Romania's landscape. Studying the biopedoclimatic, hydrological, human and economic features of the Romanian mountainous and submontainous areas.
COURSE CONTENTS: General features and characteristics of the Carpathians; Criteria for regionalization; The Eastern Carpathians: physical and socio-economic characteristics; North Carpathian Group (Carpathians of Maramureş and Bucovina), Central Group of Oriental Carpathians (Moldavian-Transylvanian Carpathians), Southern Group of Oriental Carpathians (Carpathians of the Curvature); The Southern Carpathians: particularities of physical and economic-social geography; Bucegi Group, Făgăraş Group, Parâng Group; Retezat-Godeanu Group; The Western Carpathians (Banat Mountains, Poiana Ruscă Mountains, Apuseni Mountains) – complex geographic features; The Romanian Subcarpathians (The Moldavian, Curvature and Getic Subcarpathians): particularities of physical and economic-social geography. Seminar activities include the following topics: Main geographic research on the Carpathians and Sub-Carpathians; Discussions on the general geographical features of the Romanian Carpathians and Sub-Carpathians; Comparative presentations of the Carpathian and Sub-Carpathian branches;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – written evaluation; 30% of the final grade – discussions and debate participation)

COURSE TITLE: GLOBAL MODIFICATIONS OF THE ENVIRONMENT

CODE: D11GEOL538
ECTS CREDITS: 4
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): This course aims at a detailed analysis of the continuous transformations within the Earth system, reflected in the regional features of the environment and in the dynamics of planetary circuits such as biochemical, atmospheric, thermo-coal circuits, etc. It also aims at familiarizing students with the usual methods of interdisciplinary research and analysis of changes in the terrestrial system. A series of strategies for sustainable development are also addressed in a global context.
COURSE CONTENTS: Systemic environmental changes (global climate change, greenhouse effect and current climate warming trends, ozone depletion, changes in biogeochemical cycles, the water cycle, the water resource cycle, elevation of the Planetary Ocean level, current trends in the phenomenon El Nino; Cumulative environmental changes (changes in land use, deforestation and their role in environmental degradation, desertification, intensification of dust storms, soil erosion, environmental pollution, global change syndrome concept). Seminar activities include the following topics: Interdisciplinary research of changes in the terrestrial system; Global research programs of global environmental changes; Terrestrial system features; Local, regional and global hazards and risks; Sustainable development in a global context.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written verification (70% of the final garde – written evaluation; 30% of the final grade – discussions and debate participation)

COURSE TITLE: POLITICAL AND HISTORICAL GEOGRAPHY

CODE: D11GEOL539
ECTS CREDITS: 4
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): use of fundamental knowledge of the domain to analyze and explain the geographical phenomenon and relations; use of specific terminology.
COURSE CONTENTS: Major geopolitical concepts; Determinant factors in geopolitics; Risks and threats to the security of human society; Forms of terrorism; Geopolitics of the Black Sea; The geopolitics of failed states and global climate change; The great change;
Seminar activities include the following topics: Capital cities with a geopolitical role; Geopolitical advantages of the states; Geopolitical concepts of center and periphery; Case study: the Triade (Japan, Russia, USA); Peripheral states (China, India, Brazil); States with emergent economies; The geopolitical evolution of Romania during the Cold War under the influence of communism; The role of UE and NATO for Romania and its ascension on the world geopolitical stage; The evolution of terrorist attacks; Case studies; Causes of contemporary acts of terrorism; Forms of terrorism; Methods to fight terrorism; The main conflict areas in the world; Asymmetric conflicts; The geopolitical effects of global warming; Relation between geopolitics and religion; The geopolitics of seas; The geopolitical role of natural resources; Geopolitical position of Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (60% of the final garde – examination; 30% of the final grade – seminars; 10% of the final grade – activity and responses during lectures)

COURSE TITLE: GEOGRAPHY OF SERVICES AND CIRCULATION

CODE: D11GEOL540
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): use of fundamental knowledge of the domain to analyze and explain the geographical phenomenon and relations; use

of specific terminology; to understand the role of services in the dynamics of geographical space, to interpret the territorial dynamics of services and identify some territorial development services.
COURSE CONTENTS: Definition and characteristics of the tertiary sector; Evolution of services and their impact on the territorial development; Main stages in the evolution of road and rail transport; Individualisation and dynamics of railway and road nodes; Stages in the evolution of shipping; The role of maritime transport in enhancing economic links; Maritime transport and functional urbanization; River transport and organization of local settlements; The evolution of air transport; Airports and their influence on metropolises; Prospective dynamics of transport systems; The role of human settlements in the dynamics of transport systems; Changes in the structure of economic activities interconnected with transports; Dynamics of transport infrastructure and regional development. Practical activities include the following topics: Road transport; Rail transport in Europe; Transports and port infrastructure – case studies; River transport and their role in dynamizing regions; Airports and their role in urban development; Metro networks and their dynamics; Critical points and dangers in urban transport – case studies (different Romanian cities).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final garde – examination; 30% of the final grade – seminars; 10% of the final grade – activity and responses during lectures)

COURSE TITLE: GEOGRAPHY OF AGRICULTURE

CODE: D11GEOL541
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): use of fundamental knowledge of the domain to analyze and explain the geographical phenomenon and relations; use of specific terminology.
COURSE CONTENTS: Definition and characteristics of agriculture; Organization of production factors; The influence of natural factors on agriculture; Influence of socio-economic, technical-material factors on specialization and mutual exchange of production; Land resources and land use; Vegetal agri-food resources (plant culture) and their exploitation; Zootechny and animal product valorization; The evolution in time and space of agricultural practices, agricultural types and structures, agricultural regions and landscapes; Geo-economic typology of states; Typology indicators; Geoeconomic types of countries. Practical activities include the following topics: Basic principles and factors of distribution of production – Facts worldwide; Rational distribution of production forces; Basic Laws; GDP by sectors of the economy at country level; Human Development Index: HDI calculation at world level, HDI map at world level; Types of landscapes on the globe; Case Studies: Agriculture and Hunger; Agriculture in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final garde – examination; 30% of the final grade – practical activities; 10% of the final grade – activity and responses during lectures)

COURSE TITLE: MANAGEMENT OF BIODIVERSITY AND ECODIVERSITY

CODE: D11GEOL542
ECTS CREDITS: 4
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): Insight into the methods for the evaluation, monitoring and conservation of biodiversity, knowledge of the ecosystemic diversity, identification of priorities for biodiversity and ecodiversity protection, integration of preservation issues into the management plans of protected areas, development of skills for drawing the management plans for natural protected areas.
COURSE CONTENTS: Biodiversity and ecodiversity – concepts, evolution of knowledge; Species diversity, genetic diversity, ecosystems diversity; Interactions within a biological community; Effect of fragmentation, degradation and destroy of habitats; Ecological reconstruction; Categories of protected areas; Ecological networks of protected areas; Management of natural protected areas (aim, themes, objectives, actions). Practical activities include the following topics: Services of ecosystems – case study; Identification of areas that require protection measures and establishment of priorities for preservation; Case study; Configuration and modelling an ecological network; Case study; Human activities and their impact on biodiversity; Minimizing edge effects and fragmentation, optimal size, corridor habitats – case study; Elaboration of management plan for protected areas.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – verification; 30% of the final grade – practical assignment)

COURSE TITLE: TOPOCLIMATOLOGY

CODE: D11GEOL543
ECTS CREDITS: 4
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): To correctly and coherently perceive and acquire the main topoclimatic elements, processes and phenomena; To explain and describe the main elements that define geographic regions; To identify and acquire the topoclimatic specificity; To analyse, interpret and acquire the main correlations of interdependence between the natural environment and the evolution of the human societies, with direct reference to the economy and the exploitation of the resources from the geographic space concerned; To understand

the system of factors that highlight topoclimatic knowledge and its role, with direct involvement in the integration of knowledge assimilated into its own system of scientific values and geographic knowledge.
COURSE CONTENTS: Introduction to topo-climatology; Radiant energy flows of the active surface; Calorific balance of the active surface; Vertical distribution of meteorological elements (> 2 m); Forest topoclimate; Crops microclimate; Microclimate of grass vegetation; Microclimate of small water basins and coasts; Microclimate of the snow layer; Microclimate of relief microforms; Microclimate of the interiors; Topoclimate of cities;
Practical activities include the following topics: Urban topoclimate – Determination of the influence of the city on the wind regime: the determination of the main roads with a role in wind channeling; Wind diagram at the meteorological station of Craiova and comparing with the situation in the city; Identification of the main topoclimates at the level of Craiova municipality; Forest topoclimate – Practical application in Bucovăţ forest: Determination of the air temperature in the forest at different points, at different heights above the ground, for different tree species; Determination of open air temperature at different points at different heights above ground level; Achieve the vertical air temperature curve in the forest and in the open field; Topoclimate of lake basins – Practical application in Preajba area: Determination of air temperature; Determination of air humidity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final garde – answers during the examination; 40% of the final grade – evaluation of the practical activity)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: PHYSICAL GEOGRAPHY OF ROMANIA II

CODE: D11GEOL646
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Physical geography of Romania synthesizes multiple knowledge of geomorphology, climatology, hydrology, bio-geography, soil science, etc. in order to develop the physico-geographic analysis skills of the Romanian territory.
COURSE CONTENTS: Climate of Romania; Water resources of Romania; Vegetation, fauna and soils of Romania; Biopedogeographic zonation of Romania; The biopedogeographic mapping of the territory of Romania; Physical-geographic units of Romania. Seminar activities include the following topics: The regime of the main climatic elements; Climate types in Romania; Groundwater reserve and degree of use; The origin of flora species in Romania; The historical evolution of Romania vegetation; Anthropogenic changes of flora and vegetation of Romania; Anthropogenic influences on fauna; Soil Classification in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final garde – written evaluation; 30% of the final grade – discussions and debate participation)

COURSE TITLE: HUMAN AND ECONOMIC GEOGRAPHY OF ROMANIA

CODE: D11GEOL647
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to gain knowledge of the aspects regarding the continuity and permanence of living conditions, dynamics, mobility and demographical structures; to identify the differences between the components of the human habitat, determinant factors regarding the contrasts imposed by the genesis and dynamics of human settlements in Romania; to gain knowledge about the relations between the population and economy; to identify the territorial disparities in the economic development of Romania; to use the fundamental information of the domain in order to explain and present the significance of the main processes and phenomena; to gain knowledge and practice regarding the methods and technics of data gathering, processing and analysing; to analyse and interpret qualitative and quantitative data and geographical information within the social-economic and territorial framework.
COURSE CONTENTS: Romania's geographic and geostrategic position; Romania – an area of ancient and permanent habitation; Territorial-administrative organization; Natural growth of the population; Geographical distribution of the population; Territorial mobility of the population; Demo- graphical structures regarding: habitation environment, sexes, age groups, economic, ethnical, confessional; Rural settlements; Urban settlements; The economic potential of Romania; Historical and geographical aspects regarding the national economic development; The natural and social-economic premises of the agricultural development; changes within the land use categories; The cultivation and industrial valorization of cereals, pulse, technical plants, and vegetables; The viticulture, the fruit growing and their industrialization; The animal breeding and the animal products industry; The zonation of the agricultural production; The extractive industry; The processing industry; The communication axes and the transportation; The internal, the external trade and the international commercial relations; The tourism. Practical activities include the following topics: Geographical information about Romania's territory and the Romanian School of Geography; The characteristics of the territorial-administrative

units; Natural growth of the population during 1966-2011; Migratory flows between 1992 and 2011; Numerical evolution of the population in Dolj County between 1992 and 2011; Dynamics of the ratio between urban settlements number and urban population growth in Romania; Urbanization ratio in 2011; General density of the population between 1912 and 2011; territorial differences; Economic structure of the population; Ethnical structure of the population; Confessional structure of the population; Morphological-structural and functional types of rural settlements; Rural settlements dispersion in Dolj County; The use of the Romanian agricultural potential; The viticultural economy; The communication axes and transportation system – integration within the European transportation corridors; Concepts connected to the Romanian tourist potential and tourist regions; the index of the functioning tourist accommodation capacity in use; Human and economic characteristics of the Romanian development regions; territorial analyses.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – final answers at practical activities)

COURSE TITLE: REGIONAL GEOGRAPHY OF ROMANIA (HILLS AND PLAINS)

\CODE: D11GEOL648
ECTS CREDITS: 4
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): Defining and describing the main notions, laws, processes and geographic phenomena, explaining their genesis and evolution, assessing the consequences they have on the natural and anthropogenic geographic systems.
COURSE CONTENTS: Transylvanian Depression, Moldavian Plateau and Siret Corridor, Dobrogea Plateau, Western Plain and Hills, Getic Piedmont, Mehedinti Plateau, the Danube and the Danube Delta: general characteristics and boundaries, evolution and features of the relief, climate, hydrography, vegetation, fauna, soils, reserves and natural resources, population and human settlements, industry, agriculture, communication routes and tourism potential. Seminar activities include the following topics: Transylvanian Depression, Moldavian Plateau and Siret Corridor, Dobrogea Plateau, Western Plain and Hills, Getic Piedmont, Mehedinti Plateau, the Danube and the Danube Delta; Debates on: general characteristics and boundaries, evolution and features of the relief, climate, hydrography, vegetation, fauna, soils, reserves and natural resources, population and human settlements, specificity of natural resources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – final answers at seminar activities)

COURSE TITLE: GEOGRAPHY OF CONTINENTS

CODE: D11GEOL649
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to identify, define and describe the main concepts, processes and geographical phenomena, as well as the basic methods used in geography; skills to analyze quantitative and qualitative geographical data in socio-economic and territorial context; use databases and dedicated software to generate cartographic material.
COURSE CONTENTS: Regional differences and similitudes in the relief of Asia and Africa, North and South America – natural regions; Disparities in the distribution and characteristics of hydrological resources of the world continents: economy of water; Australia and Oceania: cultural features- the lost generation of a developed continent; Regional demographic and socio-economic disparities between the northern and southern continents. Economic regions: developed world vs. underdeveloped countries; Urbanized landscapes; The north American development model; Cultural differences of Asia, Africa and the Americas. The emigration phenomenon; Geopolitical interests in Latin America of great economic powers from North America. Practical activities include the following topics: Morpho structural map of Asia – regional differences; Economic differentiations among the states of Asia – models of economic development; Physical geographical features of Oceania and Australia: climate, vegetation and hydrography; Particularities of the population distribution in urban-rural areas. Urbanization in Africa; North and South America – comparative analysis regarding the general features of natural landscape. The analysis of the regions characterized by natural hazards and their effects upon human society. The impact of climate changes on world agriculture: solutions and mitigations. Demographic and economic territorial structures of world and regional rank in America (Tokyo, Boswash, California, Ciudad de Mexico, SE Brazilian).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final garde – oral examination; 30% of the final grade – practical activity; 10% of the final grade – activity and responses during lectures)

COURSE TITLE: WATER MANAGEMENT AND QUALITY

CODE: D11GEOL650
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional

COURSE OBJECTIVE(S): to gain knowledge and properly use the water management concepts; to quantitatively and qualitatively evaluate the water resources according to the European legislation; to analyse the water uses in terms of their potential and protection; to gain awareness of water resource management issues in Romania.
COURSE CONTENTS: The management of water resources- introductory notions; The hydrotechnical works: definition and classifications; importance in water resource management; flood risk management; The water supply: water supply systems, water uses and water demand; costs in water supply; The European Water Strategy – the Water Framework Directive 60/2000/EEC; The Directive 83/98/EEC on drinking water quality; The Directive 676/91/EC on the protection of waters against pollution caused by nitrates from agricultural sources; The Directive 271/91/EEC on waste water treatment; The national water resources strategy: water law and the drinking water quality law; Water pollution: diffuse pressures and punctual pressures; Methods of assessing the quality of surfaces: ecological status and chemical status. Practical activities include the following topics: The WISE European Program – The Water Information System for Europe; Flood risk management within the Jiu river basin: hazard and risk maps; Craiova Municipality water supply – interpretation of quality records related to drinking water from public sources for Craiova municipality; Human pressures on surface water bodies: the Motru river basin as case study; The Hydrographic Basin Management Plan – the Jiu river basin as case study: establishing ecological and chemical status of water bodies; SIG and its use in water management; Fieldtrip: visit to the water capture and treatment station (Işalnita) and to the water distribution station (Şimnic), essential points in the drinking water supply of Craiova (SC Oltenia Water Company SA).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final garde – exam answers; 30% of the final grade – final answers to practical laboratory work)

COURSE TITLE: ENVIRONMENTAL PLANNING

CODE: D11GEOL651
ECTS CREDITS: 5
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): To apply research principles, methods and techniques appropriate to the purpose of research in order to identify concrete solutions to real situations; To assimilate methods and techniques of data collection, processing and analysis; To specify basic concepts and methods in the development of graphic materials.
COURSE CONTENTS: Introduction environmental planning for communities; Getting the right people involved; Developing community vision; Defining your community's needs; Finding feasible solutions for your community; Putting the plan together; Implementation: Putting the plan into action and keeping it on track. Practical activities include the following topics: Formation of planning team and finding of local experts; Defining the boundaries of environmental planning area; Identification of environmental regulations that affect your community; Identification of threatens of public health, ecosystems and quality of life in your community; Targeting of problems; Setting priorities for action; Creating the Big Picture; Developing the schedule for putting the plan into action; Financing the Plan; Roles of government and other organisations; Roles of community members; Evaluation and revising the plan; Technical support centres and hotlines; Electronic Bulletin bords and databases.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final garde – exam answers; 30% of the final grade – final answers to practical laboratory work)

FIELD: GEOGRAPGY
PROGRAMME TITLE: TOURISM GEOGRAPHY
BACHELOR'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: METEOROLOGY

CODE: D11GTL101
ECTS CREDITS: 5
TYPE OF COURSE: compulsory, fundamental
COURSE OBJECTIVE(S): to define the atmospheric processes and phenomena, the laws governing them; to present the regime and geographical distribution of atmospheric processes and phenomena; to highlight the complexity of phenomena that determine the evolution of the weather; knowledge of methods and means of obtaining meteorological data; detailed knowledge of instruments and equipments used at meteorological stations.
COURSE CONTENTS: Introductory notions; The atmosphere; The structure of the atmosphere; The Sun and solar activity; Radiation fluxes; Consumption of heat from the radiation balance; Water in the atmosphere; Atmospheric precipitation; Atmospheric pressure; Horizontal air movements; Air masses; Atmospheric fronts; Cyclones; Anticyclones. Practical activities include the following topics: The meteorological station; Practical application at Craiova Meteorological Station; The determination of the sunshine duration; The determination of air temperature – Thermogram; The determination of atmospheric pressure – Barogram; The clouds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – answers during the examination, 30% of the final grade – evaluation of the practical activity)

COURSE TITLE: HYDROLOGY

CODE: D11GTL102
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to define the subject matter of hydrology; to acquire knowledge about the aquifers and the classification of springs; to present the morphometric elements of the basin and of the hydrographic network; to highlight the factors that influence river flow; to compare the phases of the river drainage regime; to underline the complex phenomena that determine the river dynamics and hydrological regime; to identify and to compare the main phenomena and processes in the field of limnology.
COURSE CONTENTS: The concept and the research field of hydrology as a science; Water on Earth; The hydrological properties of the rocks; Confined and unconfined aquifer strata; The springs; The river hydrology (Potamology); The drainage area; The river dynamics; The river hydrological regime; The liquid and alluvial flow; The thermal and freezing regime of rivers; Limnology; The dynamics, balance and thermal regime of lake water. Practical activities include the following topics: The main river basins in Romania; The variation of groundwater levels; The classification of springs on the basis of their mineralogical composition; Practical elements of potamology – delimitation of river basins and achievement of distribution chart for basin and inter-basin areas; compiling the hydrographic network density map; The measurement and processing of river water level; The measurement and processing of river water speed; The measurement and processing of liquid flow; The measurement and processing of alluvial flow; The distribution of lakes on Earth; Fieldtrip: The Preajba – Făcăi Lacustrine Complex.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers to practical activities)

COURSE TITLE: GENERAL GEOGRAPHY OF TOURISM

CODE: D11GTL103
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Acquiring the ability to correctly use the concepts specific to the tourism phenomenon approach and organizing a proper value system with internal logic appropriate to the subject matter; Identification, definition and description of the main notions, concepts, laws, processes and geographic phenomena, as well as the basic methods of the field of tourism geography.
COURSE CONTENTS: Theoretical notions related to the geography of tourism; Tourism – subject of knowledge and geographic research; Challenges and opportunities for the development of Romanian tourism in the European context; Tourism Geography; Romania – geo-touristic visiting card; World Tourism Organization; Types and forms of tourism; Viable policies and strategies in the field of tourism. Seminar activities include the following topics: Taxonomic units of the tourist region – types of regions, areas and tourist centers (the principles of geographic regionalization with application in the tourist region, the methodology of the regional tourist analysis); Indicators of tourist density at the level of the territory and of the population within the European states; Indicators of the tourism potential of the markets; The tourist infrastructure of tourism: structure of accommodation capacity; Case Study: EU countries; Tourist employment rate in the European states; The main tourist destinations on the Globe; Structure of tourist flows; The main supplying countries of tourists and receiving

countries; Trends in tourist circulation; Tourist regions based on dominant features; The mountain tourism market; Case studies: Austria; Seaside tourism market; Case studies: Spain; The cultural tourism market; Case studies: France; Developing a brochure for tourism promotion of the X state/ region/ city; Developing a thematic touristic circuit.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers to seminars activities)

COURSE TITLE: METHODS AND TECHNIQUES OF ANALYSIS OF GEOGRAPHICAL DATA

CODE: D11GTL104
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Analysis and interpretation of qualitative and quantitative geographical data and information in a socio-economic and territorial context; Develop graphic and cartographic materials using ITC methods and programs; Making a diagnosis of certain geographic aspects; Analyzing, writing and presenting the obtained data.
COURSE CONTENTS: General concepts of the geographic research; Fundamental concepts of data analysis; Sources and models for analyzing secondary geographical data; The main research methods used in geography; Stages of research to conduct a physical geography study; Research methods and techniques used in human geography studies; Stages in preparing a research report. Practical activities include the following topics: The geographic matrix; Statistical series analysis – physical geographic data and their graphical representation; Statistical series analysis – human geography data and their graphical representation; Observation as a research method in geography – conducting a structured observation in the field; Cartographic method-cartogram; Cartographic method-carto-diagram; Qualitative analysis – elaboration of a questionnaire.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers to practical training activities)

COURSE TITLE: GEOMORPHOLOGY WITH GEOLOGY ELEMENTS

CODE: D11GTL105
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): To use fundamental knowledge in the field to explain and interpret the main processes and phenomena; To identify, define and describe the main notions, concepts, laws, processes and geographic phenomena, as well as the basic methods used in the field; To analyse and interpret qualitative and quantitative geographic data and information in a socio-economic and territorial context; To use basic geographic principles and methods for the analysis of territorial systems; To explain geographic phenomena in accordance with the needs of each public or private actor.
COURSE CONTENTS: General notions; Planetary geomorphology; Tectonic geomorphology; Major structural units of Romania and their geological evolution; Exogenous agents and processes; The relief created by the river system; Petrographic relief; Structural relief; Volcanic and pseudovolcanic relief; Climate relief; Littoral relief; Submarine relief and islands. Practical activities include the following topics: Minerals; Magmatic rocks; Metamorphic rocks; Sedimentary rocks; Classification, description, properties; Geological maps; Scale, legend, content; Analysis of the map of the distribution of limestones and other karst rocks in Romania and the location of the karst relief; Identification of fault and fold formations on geological maps and determination of their influences on the relief; Hypsometric map; Slopes map; Mapping the density of the fragmentation of the relief; Depth mapping of the relief; Drawing up maps rendering the delimitation of the tectonic units in Romania, according to the geological map of Romania, scale 1:1.000.000; Drawing up maps rendering the delimitation of the orogen units in Romania, following the geological map of Romania, scale 1:1.000.000.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to practical training activities)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: GENERAL PHYSICAL AND HUMAN GEOGRAPHY

CODE: D11GTL208
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Interpretation of relations between the geosystem and neighboring systems (cosmic space and inner terrestrial system); Formation of a synthesis image of Terra's layers (lithosphere, reliefosphere, atmosphere, hydrosphere, biosphere, anthroposphere) and the relationships between them; Defining, analyzing and interpreting anthropogenic phenomena in the context of complex interrelation with the natural framework; the use of terms, concepts, methods and techniques of investigation specific to human geography; highlighting territorial disparities at global level and regional peculiarities; presenting the factors that influenced the patterns of development and the consequences on the

demographic, ethnic, cultural, economic, geopolitical profile.

COURSE CONTENTS: Geography: object, principles, methods, laws; Geosystem; Characteristics of the Universe; Structures of the Universe; Solar System; The shape and dimensions of the Earth; Earth's rotation and revolution; The internal structure of the Earth; Geophysical properties of the Earth; Lithosphere; Earth relief; Atmosphere; The general circulation of the atmosphere; Hydrosphere; Ocean – atmosphere relationship; Biosphere; Pedosphere; Geographic environment laws; Global laws; Specific laws; Human Geography – branch of geographic science; Operational Components in Human Geography; Models and methods of analysis in human geography; The main features that define the population and human settlements; Typology and resource classification; Agriculture; Industry; Transport and communications; International economic exchanges; Tourism; Geopolitics; Elements of social and cultural geography. Seminar activities include the following topics: Characteristics of the geosystem; Relationships of continuity, discontinuity and threshold; Examples of methods and principles used in geography; Exercises: the shape and dimensions of the Earth; Geographic coordinates; Applications on the Earth's movements and their influences on the Earth's surface; Analysis of plaque tectonics and associated phenomena: volcanism and earthquakes; Interpretation of the map on the spread of volcanoes and earthquakes on the Globe; Importance and role of a research project in human geography, stages accomplishment; Presentation of data sources and information in achieving a good research project in human geography; Methods of analysis, deontological norms, techniques for obtaining tables, diagrams, cartograms and other graphic representations; Presentation of research projects.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – practical assignment)

COURSE TITLE: CLIMATOLOGY

CODE: D11GTL209

ECTS CREDITS: 5

TYPE OF COURSE: compulsory, fundamental

COURSE OBJECTIVE(S): To use fundamental knowledge in the field in order to explain and interpret the main processes and phenomena; To elaborate professional projects focusing on the geographic elements, processes and phenomena related to certain territories and time intervals; To acquire methods and techniques for collecting, processing and analyzing data; To specify the basic concepts and methods in the achievement of graphic materials; To apply fundamental knowledge in interpreting geographic reality; To analyze, write and transmit the resulting data; To explain and interpret certain geographic phenomena in accordance with the needs of each public or private actor.

COURSE CONTENTS: Climatic genetic factors: radiation factors; Climatic genetic factors: physical-geographic factors; Climate genetic factors: dynamic factors and anthropogenic factors; Air temperature – geographical distribution; Geographical distribution of air humidity; Geographic distribution of cloud cover; Geographical distribution of liquid and solid atmospheric precipitations; Climate classification; Classification criteria; The hot climate zone; The temperate and cold climate zones; Climatic risk phenomena; Global climate change. Practical activities include the following topics: Presentation of methods for the processing of climatological data; Processing of temperature climatic data – Monthly multiannual average temperature, Variability of annual average temperature, Evolution trend of annual average temperatures rendered by gliding averages method; The histogram; Processing data on relative humidity; Processing data on atmospheric precipitation – Monthly, seasonal and half-year averages, Variability of annual rainfall amounts (Hellman Criterion), Evolution trend of annual amounts by gliding averages method; Péguy Climogramme; Walter – Lieth Climogramme; Processing data on atmospheric pressure; Wind data processing.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Oral examination (70% of the final grade – answers during the examination, 30% of the final grade – evaluation of the practical activity)

COURSE TITLE: OCEANOGRAPHY

CODE: D11GTL210

ECTS CREDITS: 5

TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): to define the concepts and processes of the ocean environment; to gain knowledge about the relief of ocean basins; to present the ocean basins structure and water masses dynamics; to correlate the physical and chemical properties of ocean and marine waters; to achieve cause-effect correlations in the context of World Ocean level increase; to achieve detailed knowledge of the Black Sea – marine relief, sea and coastal area.

COURSE CONTENTS: The World Ocean – introductory elements; The relief of marine and ocean basins; The regional geography of the World Ocean; The seas of the World Ocean; The marine and ocean waters dynamics; The chemical properties of ocean and marine waters; The physical properties of ocean and marine waters; The global sea level rise; The Black Sea; Romania's Black Sea coastal

area. Practical activities include the following topics: The map of sea classification and distribution on ocean basins by surface and depth; The cartographic chart of ocean currents; The continental-oceanic joints and shoreline types; The cartographic map of islands in the Atlantic Ocean – classification by origin and surface; The cartographic islands in the Pacific Ocean – classification by origin and surface; The analysis of water temperature and salinity distribution on the surface of the World Ocean; The global sea level rise between 1990 and 2100, according to different SRES scenarios (IPCC) – overlapping liner chart; The Influence of Global Ocean oscillations on Earth deltas – case studies; The state of the Romanian coastal environment – SWOT analysis; The variation of the Romanian shoreline – distribution of multi-annual erosion rates.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to practical laboratory work)

COURSE TITLE: GIS

CODE: D11GTL211
ECTS CREDITS: 4
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Use of specific software to achieve cartographic products; To use of spatial modeling and spatial data bases using ArcGis 9.3 software and QGis software; Using attribute-type databases for spatial modeling; Generating specific layers used in human geography and physical geography
COURSE CONTENTS: Introduction to geographic information systems; Mapping projection systems and Georeference; Creating databases for territorial analysis; Managing geographic data; The main geoprocessing tools; Using spatial analysis for geographic data processing; Digital maps. Practical activities include the following topics: Creating relationships between tabular data; Using rasters in a geodatabase; Inclusion of geographic data sets; Compilation and recording of data; Data collection and import; Assigning coordinates using street addresses or routes Compiling and recording data: Creating and modifying objects, Creating layers using a scanned map, Editing attribute data; Compilation and recording of data: Editing of routes and geometric networks, Verification of data for error correction, Coordinate system and projection; Digital mapping and visualization: Labeling of elements on the map, Creating graphics in a map; Geographic analysis: Table data, column addition, data calculation; Joining tables, Extracting certain portions of the layer; Geographic analysis: Derivatization of data from an elevation, TIN/ DEMs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written evaluation (70% of the final grade – exam, 30% of the final grade – evaluation of practical activity)

COURSE TITLE: WORLD ECONOMIC GEOGRAPHY

CODE: D11GTL212
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): to gain knowledge about the relations among the structure, repartition and output of the economic activities in connection with the geographical space; to use the fundamental information of the domain in order to explain and analyse the main processes and phenomena; to elaborate professional projects, the research topic being represented by various geographic elements, processes and phenomena that refer to particular territories and periods; to apply the principles and methods specific to the domain in the framework of specialised IT applications in order to achieve and analyse required graphic or cartographic products.
COURSE CONTENTS: The concept of economic geography; The state and its components; the world political map; The fundamental principles in the repartition of production factors at global level; Geo-economic typology of states; Economical-geographical data on the primary sector of economy; the role and functions of agriculture; The natural, technical-economic and social-demographic factors that influence agriculture; the characteristics of land use/land cover categories; The cultivation of cereals; cereal stocks and cereal world trade; The industrial crops; The perennial cultivated plants; The animal husbandry; The structural types of agriculture and the agrarian landscapes; The most important agricultural regions of the world; The sectors complementary to agriculture: hunting and fishing activities; ecologic perspectives; Economical-geographical characteristics of the secondary sector of economy; The evolution of the industrialization process and its consequences; Economical-geographical characteristics of the consumer goods industry; The main industrial regions of the world; The transportation and the communication routes; The world trade; The tourism and the tourist activities. Practical activities include the following topics: World land use and land cover; structural disparities at regional level; Regional differences concerning the role of the demographic and technical-economic factors in agriculture; The comparative evolution of wheat, maize and rice production and trade at global level and in the main countries; The viticulture economy; The plants used for stimulating beverages/ food products; The world livestock and its characteristics in relation with the natural and economic conditions; SWOT matrix use for the characterization of the agricultural capitalization at regional level; The air transportation and its characteristics; The maritime transportation and

port characteristics; The main international organisations in the promotion of economic relations; Globalization: dynamic perspective and contrasting aspects; the KOF Index of Globalization; Types of states depending on development level; the Human Development Index (HDI).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final grade – exam answers, 40% of the final grade – final answers at practical training)

COURSE TITLE: GEOMORPHOSITES
CODE: D11GTL213
ECTS CREDITS: 3
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): This course presents geoconservation aspects, providing examples of geosites from the world and from Romania. Geoconservation term is to be understood as it was presented by C. Sharples in 2002, as the conservation of natural diversity of geological, geomorphological, pedological elements and processes, and the maintaining the natural amplitude and evolution rate characteristic to each process and element.
COURSE CONTENTS: Geoconservation-definitions and evolution of the term; Geomorphosites in North America: touristic potential and reasons for its variation associated to geological and geomorphological features; Geomorphosites in Europe; Geomorphosites in Asia; Geomorphosites in Romania. Practical activities include the following topics: Identifying the educational and scientific values of a potential geomorphosite; Identifying environmental protection and functional values of a potential geomorphosite; Compiling maps of distribution of sedimentary rocks (sandstones, conglomerates), igneous rocks, of karst generating rocks from Romania and use of these maps to find the sites with touristic potential; Use of geological maps to identify the position of structural traits (faults, folds, etc.) and their influence in the landscape.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – final examination, 30% of the final grade – practical activities)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: POPULATION GEOGRAPHY
CODE: D11GTL316
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Fundamenting the theoretical knowledge system of the Population Geography; analysing the diversity of natural, territorial and structural diversity of the world population from the spatial and time perspective; good use of the methods for gathering, processing and analysing the statistical date; interpretation of qualitative and quantitative geographical information considering the social and economic context.
COURSE CONTENTS: Introductory notions; Spatial distribution of the population; Population natural dynamics; Natural demographic balance; Population number; Spatial mobility; Population structures: on areas of residence, gendre, age groups, social-economic, racial, ethnic, linguistic, religion; Population and social-economic development. Practical activities include the following topics: World countries – definition, geographical characteristics, territorial and demographic typology; Evolution of population number on continents in the 20th century; Population fertility; Natural increase of the European population; Population density; Age pyramid; Social and professional structure of the population; Distribution of human races; Country topology depending on the ethnical structure of the population; Distribution of main religions; Index of human development; Geographical distribution of refugees and asylum-seekers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – projects during the practical assignments)

COURSE TITLE: BIOGEOGRAPHY
CODE: D11GTL317
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Interpretation of distribution patterns of living organisms in correlation with historical and ecological factors, the way of formation and evolution of biogeographical areas and criteria of biogeographic regionalization.
COURSE CONTENTS: Diversity of organisms over time; Spatial variation of biodiversity; Number of species; Biodiversity concentration centers; Elements of chorology; Means of dissemination of living organisms; The biogenetic center; The distribution limit of the species; Barriers to species spreading; The ecological adaptive skills; Types of biogeographical areas; Endemism; The influence of ecological factors on the distribution of living organisms; Biomes; Biogeographic regionation in the world and in Romania. Practical activities include the following topics: Classification of living organisms and nomenclature of taxonomic units: Taxonomic classification of plants and animals, scientific names of taxonomic units; Interpretation of determination keys; Elements regarding vascular plant morphology, indicator of plant adaptation to environmental conditions; Determination in the fields of representative species specifying the area, the ecological conditions and their importance;

Practical application – The Botanical Garden; Appreciation of species ecology and indicating plant value: humidity scale; heat scale, light scale, degree of acidity and soil trophicity; nitrogen scale; Indicator species (calcareous plants, oxifils, halophiles, psamophiles); Sequence of vegetation levels/areas; Analysis of the biothermal index on vegetation levels/areas; Biogeographical profile – synthesis representation of the distribution of organisms under the influence of environmental factors; Vegetation map; Methods of vegetation mapping; Using aerophotograms in vegetation mapping; Mapping of biogeographical areas; Interpretation of distribution patterns of species at various scales; Phytogeographical spectrum and zoogeographic spectrum.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – practical assignment)

COURSE TITLE: TOURISM MARKETING

CODE: D11GTL318
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): To acquire knowledge and concepts specific to the development of marketing in the field of tourism services; To offer marketing methods and tools that allow marketing planning and elaboration of the marketing plan.
COURSE CONTENTS: Tourism Marketing –Content and Functions; Marketing environment of tourism enterprise; Tourist market; Behavior of the service consumer and the staff of service providers; Tourism marketing policies and strategies in seasonality conditions; Tourism Product Policy; Tourism distribution policy; Pricing policy and rates in tourism; Promotion policy in tourism; Staff policy; Tourism Marketing Plan. Seminar activities include the following topics: The emergence and development of marketing; Tourism Market – Estimation Indicators, Methods and Research Techniques; Seasonal planning of tourism activity; Prices in tourism, pricing strategies in tourism; Promotional campaigns of tourism companies.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – practical assignment)

COURSE TITLE: MANAGEMENT OF TOURISM COMPANIES

CODE: D11GTL319
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): To observe and identify solutions for initiating, financing and coordinating tourism development projects; To understand the evolutionary process of a tourist destination (TALC model); To acquire a specific managerial tool: visit and discover programs.
COURSE CONTENTS: Local and regional development management: models, processes and procedures; Management of tourism activity at macroeconomic and territorial level; Destination Management Organizations (OMDs); Mechanism of public-private partnership; Analysis of trends in the behavior of tourism consumer; Strategic management of the tourism destination; The lifecycle of the tourism destination; Control and monitoring; Brand management; Management of clusters, consortia and networks in tourism; Attestation of Romanian resorts. Seminar activities include the following topics: Stakeholders – balance of power and interests; Diagnosis of resources and skills; Tourism and social identity; Anatomy of tourist experience; Transport and tourism destinations; Case study: spatial reconfiguration of the tourism destination under transport pressure; Decision-making methods used in tourism investments; The lifecycle of the tourism destination; Case Studies; Portfolio management of tourism products and services; Case study: evaluation of scores for attestation of tourism destinations (national and local interest resorts).
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written examination (80% of the final grade – exam, 20% of the final grade – practical assignment)

COURSE TITLE: TOURISM ECONOMY

CODE: D11GTL320
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): To explain tourism phenomena and processes based on the concepts of demand and supply of tourism products; To describe the ways of designing and marketing the tourism product; To use a system of indicators for the interpretation of tourism specific phenomena.
COURSE CONTENTS: Tourism – economic and social activity; The tourism market; The technical and material basis of tourism; Human resources in tourism; Tourism services; Economic efficiency in tourism. Seminar activities include the following topics: Theoretical aspects – commenting on the fundamental notions of tourism; Determination of demand elasticity; Tourism function; Determination of tourism circulation indicators; Determination of indicators of density of tourism activity; Determination of seasonality indices; Determination of the price of the tourism product and the capacity utilization rate; Determination of economic efficiency indicators in tourism units.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – practical assignment)

COURSE TITLE: SOCIAL AND CULTURAL GEOGRAPHY

CODE: D11GTL321
ECTS CREDITS: 6
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): fundament the theoretical knowledge system in the domain of social and cultural geography; logical and coherent perception of the influences that the environment has upon society and humans; use the fundament knowledge of the domain to explain and interpret the main processes and phenomena; acquire the methods and techniques to select, process and analyze geographical data; describe spatial behaviors of human groups.
COURSE CONTENTS: Introductory notions; Geography of behavior; Specific forms of deviations: the geopolitics of taste; Medical geography: morphological differences of human body – expression of climatic conditions; Diseases specific to climatic zones; Cultural geography; Cultural landscapes; The geography of ethnic groups; Linguistics geography; Geography of religions; International dimension of confessional conflicts; The geography of genre; The geography of living. Seminar activities include the following topics: Questionnaire as research method in social geography; Questionnaires: gathering field information, quantification and interpretation; Case study: the perception of the population about the sanitary system in Romania; Food insecurity around the world; The incidence of diseases in Romanian as a result of life styles after 1989; The analysis of social networks; Ethnic disparities around the world; Ethnic and linguistic areas in Europe; Confessional conflict areas.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written verification (70% of the final grade – responses at exam, 30% of the final grade – activity during practical works)

COURSE TITLE: REGIONAL GEOGRAPHY

CODE: D11GTL322
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, optional
COURSE OBJECTIVE(S): to identify, define and describe the main concepts, processes and geographical phenomena, as well as the basic methods used in the domain of regional geography; acquire the skills to use the techniques, principles, methods and instruments of geographical research to find solutions for territorial dysfunctions; to use and apply the basic methods and principles of GIS for generating cartographic material; to identify the geographical methods and to use the specific terms to conceptualize, realize and interpret the geographical studies they elaborate.
COURSE CONTENTS: Introduction to principles and research methods; Delimitation of regions: types and delimitation criteria; Region – entity and functions; The typology of geographical regions according to structural criterion: homogenous, polarization and anisotropic; Theories of regional development; Elements of regional planning: typology and regional flows: categories of regions; The main parts and the structure of territorial planning. Practical activities include the following topics: Types and examples of regions delimitated according to the structural criterion: homogenous, polarization and anisotropic regions; Models to establish and calculate the influence areas of growth poles; Principles and methods used in regional geography: chorems; Analysis of territorial disparities: labour force, infrastructure and their impact on the development of socio-economic component; SWOT analysis of SW Oltenia region for the issuance of development strategies
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final grade – written examination, 30% of the final grade – practical activity; 30% of the final grade – activity and responses during lectures)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: GEOGRAPHY OF EUROPE

CODE: D11GTL426
ECTS CREDITS: 3
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): acknowledgements of the overall physical features; understanding the physical, human and economic regional differences.
COURSE CONTENTS: The course aims at familiarizing the students with the overall physical features of the continent and especially with the regional differences in terms of social, cultural and economic values. Practical activities include the following topics: Elaboration of physico-geographic records of European regions; Table correlation of tectonic units and subunits with Europe's current situation; The altimetric qualification of the European territory and the realization of the mountain morphological ideogram; Hydrographic map of Europe with delineation of primary and secondary water catchments; Comparative study between the Danube and the Rhine with the realization of the longitudinal profile on the hydrographic sectors; Achieving the bio-pedo-climatic profile for the European regions; Regional differentials of demographic density and regional differentiation of the urbanization index in Europe.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – evaluation of practical activity)

COURSE TITLE: PROTECTION AND CONSERVATION OF TOURISM RESOURCES

CODE: D11GTL427
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): To observe the "critical moment" of anthropogenic impact in the disturbance of wildlife, the drastic reduction of the natural environment with all its consequences; To identify the legal inconsistency manifested sometimes in the regulation of the legal regime of protected natural areas, wild flora and fauna; To provide solutions and proposals for improving the activity of preventing and combating illegal activities in this field.
COURSE CONTENTS: Nature Conservation – Major Concern of the Contemporary World; The concept of sustainable development in tourism; The main international documents on nature protection; Protection of natural areas within the European Union; The role of the Council of Europe in this area; International organizations with attributions and competences in the field of nature protection; Liability for non-compliance with the rules on the regime of protected natural areas; Conservation of natural habitats and wild flora and fauna species; Aspects of environmental degradation induced by tourism; Main actions to protect and preserve the environment and tourism potential; Romania's tourism potential and specific forms of tourism; Natural tourism resources; Anthropogenic tourism resources; The main forms of tourism; Major impacts of tourism on the environment; Environmental support capacity. Seminar activities include the following topics: Categories of protected natural areas in the world; Strict natural reserve/ wild area: National park; Monument of nature; Habitat/ species management area: Landscape/ Marine Protected Landscape; Protected area with managed resources; Sites of universal heritage; Reservations of the biosphere; Natura 2000 sites; RAMSAR sites; Geoparks; National system of protected natural areas; Administration of the network of protected natural areas and other natural heritage assets in Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – evaluation of seminar activity)

COURSE TITLE: POLICIES AND STRATEGIES OF TOURISM DEVELOPMENT

CODE: D11GTL428
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): To acquire the ability to use correctly the concepts specific to the tourism and sustainable development approach and to organize its own system of values with an internal logic appropriate to the subject matter; Understanding the correlation between tourism resources, environment, population and sustainable economic development; Understanding the slogan of sustainable development: "To think globally, to act locally" and its application to tourism.
COURSE CONTENTS: Ecotourism vs. Mass tourism; The concept of Sustainable Development; Ecology in Tourism or the Ecology of Tourism; Sustainable Tourism; Tourism + Sustainable Development = Sustainable Tourism; Sustainable tourism: Sustainable tourism as a business opportunity in times of crisis; Sustainable tourism and green economy. Seminar activities include the following topics: Tourism and sustainable development – concepts; Genetic factors of sustainable tourism development; Sustainable tourism structure and measurement indicators; Criteria for assessing sustainability capacity in tourism; Sustainable tourism development policies and strategies; Case study: Elements of a tourism development strategy; Ecotourism or sustainable tourism; Typology of protected areas in Romania; Sustainable development of the tourist areas; Tourism resources and SWOT evaluation; Tourism phenomena and risk processes; Sustainable development of tourism products and sustainable management of tourist activity; Elaboration of a report on *The tourism management of the X natural/ national park in Romania*.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – evaluation of seminar activity)

COURSE TITLE: ACCOUNTANCY IN TOURISM

CODE: D11GTL429
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): To acquire basic accounting notions, knowledge and understanding of the methods specific to the accountancy, of the terminology specific to the financial-accounting field; To facilitate communication between managers who are not economically trained and economists; To acquire knowledge to manage tourism business.
COURSE CONTENTS: Object and method of accountancy; Accountancy representation of heritage and financial results; Documents and accounting records; Account and double entry in accounting; Inventory of assets, equity and liabilities; Trial balance. Practical activities include the following topics: Object and methods specific to accountancy; Balance Sheet on Patrimony: Fixed Assets; Balance sheet assets: current assets; Balance Sheet on Patrimony: Debt; Balance changes: volume changes; Balance Changes: Changes in Structure; The accounting documents; Elements characteristic of the account structure; Double entry

and account correspondence; Accounting analysis; Inventory of the patrimony; Trial balance.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam, 30% of the final grade – evaluation of practical activity)

COURSE TITLE: URBAN AND RURAL GEOGRAPHY

CODE: D11GTL430
CREDITS: 5
DISCIPLINE TYPE: fundamental, compulsory
COURSE OBJECTIVE(S): to define the rural and the urban spaces; to gain knowledge about the elements regarding the spatial-residential and productive organisation of the above-mentioned media; to determine the rural and urban typology; to specify the stability and instability elements appeared between the rural and the urban environments; to identify stable strategies, effective in the promotion and development of the rural communities; to gain knowledge about the geo-ecological and economic requirements connected to the rural and urban sustainable development.
COURSE CONTENTS: Introductory notions; Research directions in the Romanian urban and rural geography; specialised international institutions and organisations; Urbanisation and the urbanisation level; Urban dynamics; Individualization criteria, urban concentration origin, components and forms; The role of the natural and social-economic factors in the internal structuring of the city; functional zones: location and dynamics; Urban economy; Urban functions; The importance of the natural components in the functioning of the rural space; The social-economic components of the rural space; The adjustment of the agrarian structures to the modern rural economy; Rural landscapes and agricultural regions; The sustainable development of rural spaces. Practical activities include the following topics: The Romanian urban settlements; Ranked functional hierarchy; Demographic dimensions of the Romanian cities/ towns; Urbanisation rate; Dynamics and distribution of world urban agglomerations; Hierarchy and centrality – the hierarchy of European cities; Changes of the urban network within the middle and lower Danube sectors, during the post-communist period; Functional typology of the urban settlements within Dolj County; the nomogram of the urban functions; Dispersion of the rural settlements; The dispersion index; The morpho-structural typology of the rural settlements; Dysfunctions and sustainable development within the Romanian rural space; Case-study: technical infrastructure and utility elements within Dolj County.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers at practical training)

3RD YEAR, 1ST SEMESTER

COURSE TITLE: REGIONAL GEOGRAPHY OF ROMANIA (THE CARPATHIANS AND THE SUBCARPATHIANS)

CODE: D11GTL535
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Analysis of the geographic components of the Carpathians and Sub-Carpathians as coordinating elements of Romania's landscape; Studying the biopedoclimatic, hydrological, human and economic features of the Romanian mountainous and submontainous areas.
COURSE CONTENTS: General features and characteristics of the Carpathians; Criteria for regionalization; The Eastern Carpathians: physical and socio-economic characteristics; North Carpathian Group (Carpathians of Maramureş and Bucovina), Central Group of Oriental Carpathians (Moldavian-Transylvanian Carpathians), Southern Group of Oriental Carpathians (Carpathians of the Curvature); The Southern Carpathians: particularities of physical and economic-social geography; Bucegi Group, Făgăraş Group, Parâng Group; Retezat-Godeanu Group; The Western Carpathians (Banat Mountains, Poiana Ruscă Mountains, Apuseni Mountains) – complex geo-graphic features; The Romanian Subcarpathians (The Moldavian, Curvature and Getic Subcarpathians): particularities of physical and economic-social geography. Practical activities include the following topics: Main geographic research on the Carpathians and Sub-Carpathians; Discussions on the general geographical features of the Romanian Carpathians and Sub-Carpathians; Comparative presentations of the Carpathian and Sub-Carpathian branches.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (70% of the final grade – written evaluation, 30% of the final grade – discussions and debate participation)

COURSE TITLE: ENVIRONMENTAL GEOGRAPHY

CODE: D11GTL536
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): structural acknow-ledgement of the geographic environment; understanding of the functional processes within earth system; acknowledgement of systemic modification and the evolutional pattern of geographic environment; understanding the functional units of the ecosphere.
COURSE CONTENTS: Systematic organization of geographic environment; Abiotic structure of the environment; Systematic hierarchical organization of biotic components; Biotope-biocoenosis integrated level in the environment; Energy, matter and information as interchangeable elements in the

environment; Laws of environmental functionality, processes and phenomena of state and environmental dynamics; Energy circuits in the environment; The geological circuit of the matter; Gaseous media of macronutrients in the environment; Sedimentary circuits of macronutrients; Eco-efficient ecological systems; The ecological functions of the forest ecosystem; Terrestrial functional units of the environment; Functional aquatic environment units. Practical activities include the following topics: The Earth radiative balance (Qt); Qs short wave radiation and Qt long wave radiation; Biogeochemical Circuit of oxygen, carbon, nitrogen, calcium, phosphorus, sulfur.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – written examination, 30% of the final grade – practical evaluation)

COURSE TITLE: POLITICAL AND HISTORICAL GEOGRAPHY
CODE: D11GTL537
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): use of fundamental knowledge of the domain to analyze and explain the geographical phenomenon and relations; use of specific terminology.
COURSE CONTENTS: Major geopolitical concepts; Determinant factors in geopolitics; Risks and threats to the security of human society; Forms of terrorism; Geopolitics of the Black Sea; The geopolitics of failed states and global climate change; The great change. Seminar activities include the following topics: Capital cities with a geopolitical role; Geopolitical advantages of the states; Geopolitical concepts of center and periphery; Case study: the Triade (Japan, Rusia, USA); Peripheral states (China, India, Brazil); States with emergent economies; The geopolitical evolution of Romania during the Cold War under the influence of communism; The role of UE and NATO for Romania and its ascension on the world geopolitical stage; The evolution of terrorist attacks; Case studies; Causes of contemporary acts of terrorism; Forms of terrorism; Methods to fight terrorism; The main conflict areas in the world; Asymmetric conflicts; The geopolitical effects of global warming; Relation between geopolitics and religion; The geopolitics of seas; The geopolitical role of natural resources; Geopolitical position of Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (60% of the final grade – examination, 30% of the final grade – seminars; 10% of the final grade – activity and responses during lectures)

COURSE TITLE: TOURISM HERITAGE OF ROMANIA
CODE: D11GTL538
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): definition and description of the main notions of tourism potential; presenting the types of tourism potential of Romania; highlighting the influence of tourism potential on tourism flows in Romania; applying the methods of analyzing the tourism potential; assessing the tourist regions of Romania according to the evaluation of the tourist potential.
COURSE CONTENTS: Introductory elements regarding Romania's tourism potential; The natural tourist potential of Romania's relief; The natural tourism potential of the Romanian climate; The natural tourism potential of Romania's water resources; Romania's biogeographical tourism potential; Anthropogenic Tourism Potential of Romania; Romania's tourism infrastructure; Tourist flows in Romania; Types and forms of tourism in Romania; Tourist regionalisation of Romania; Presentation of the tourist potential of Romania in various tourist promotional materials and video documentaries. Practical activities include the following topics: Analysis of tourism potential concepts; Cartographic analysis of Romania's natural tourism potential; Cartographic analysis of Romania's anthropogenic tourism potential; The tourism infrastructure of Romania; Tourist flows in Romania; Calculation of tourist attractiveness for each tourist region in Romania; The TecDev assessment method for tourist resorts; Romania's tourist regions; taxonomic units of the tourist region: definitions, examples; Analysis of tourism forms specific to each type of tourism potential in Romania; Ways to Promote Romania's Tourism Potential in Advertising Materials; Elaboration of a report on *The capitalization of the tourist potential of the X area/ county/ city in Romania*.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to practical training activities)

COURSE TITLE: ECOTOURISM
CODE: D11GTL539
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): to explain and interpret the ideas, processes, phenomena, states and trends specific to micro- and macroeconomic activity in contexts specific to the knowledge-based society; to develop specific tourism skills (customer relationship, drawing a tourist guide portfolio, tour operator, etc.); to acquire specialty notions about understanding the concept of ecological tourism and protected natural area; to understand the legislative and institutional framework for the

sustainable development of tourism and ecotourism in Romania and the world.
COURSE CONTENTS: Ecotourism vs; mass tourism; Ecosystem = Biotope + Biocenose; Ecosphere: concept, features; Sustainable development – Eco-development – viable models for sustainable tourism; Tourism in terms of sustainability; Directions in ecotourism development; The concept of sustainable tourism development; Theoretical connections related to tourism arrangements; Analysis and diagnosis of the territory subject to tourism planning; Tourism facility in the ecological perspective; Features of tourism facilities. Practical activities include the following topics: Ecotourism - a model for the sustainable use of tourism resources; Trends in ecotourism market; Ecotourist profile; International organizations active in the field of ecotourism; National Ecotourism Associations and Organizations; Ecotourism programs; Valuing ecotourism resources worldwide; Ecotourism Resources in Romania: Development and Promotion of Ecotourism in Protected Areas in Romania – case study; Ecotourism technical and material basis in Romania; Ecotourism circulation in Romania; General and touristic planning of the territory – presentation and direct analysis of case studies on tourism development; The greening of the tourist act – an imperative; The relation between the components of the geographical environment and the issues of the territorial tourism arrangements.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written examination (70% of the final grade – examination, 30% of the final grade – practical activities)

COURSE TITLE: MONTANOLOGY AND MOUNTAIN TOURISM
CODE: D11GTL540
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): Cultivating a fair attitude to natural landscapes and traditional local communities.; Acquiring the principles underpinning ethical codes and rules of conduct in mountain tourism; Developing skills for investigating the mountain tourism market and implementing its marketing, analyzing the profile of the mountain tourism market, tourism flows and resources in the mountainous areas.
COURSE CONTENTS: Montanology and mountain tourism; Types of tourism activities in mountain areas; Ethics and mountain tourism – convergences and contradictions; Mountain resorts; Mountain tourism market and marketing in mountain tourism; Management of activities in mountain tourism; Mountain tourism in protected natural areas; Destinations for mountain tourism on the Globe; European Mountain Planning Strategies; European strategy for tourism in the Alps; Mountain tourism and mountain farming; Carpathian Convention – support for the sustainable development of the Carpathian region; The network of protected natural areas in the Carpathians; Potential for practicing mountain tourism in the Carpathian Mountains; VASICA – Vision and Strategies in the Carpathian Area; The impact of mountain tourism activities on the environment. Seminar activities include the following topics: The mountain tourism potential; Case Study: The Carpathians of Romania; The resources of the mountainous world; Case study: Potential of the Himalayan and Andes Mountains; Mountain tourism offer in Romania – the main mountain resorts; Mountain farming – a factor for the development of mountain tourism; Mountain tourism and cultural heritage; Planning mountain tourism activities; Case study – project; Marketing in mountain tourism; Prospecting Case Study – Project.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers to seminar activities)

COURSE TITLE: GUIDE TECHNIQUES
CODE: D11GTL541
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): Understanding and describing the tourism guide profession; Highlighting the professional integration of the guide in the activity of a travel agency; Highlighting activities of a tour guide; Understanding the conduct of a thematic tour guide; Highlighting the communication and marketing techniques in the tourism guiding activity.
COURSE CONTENTS: Tourism guide-general information; Professional integration of the travel guide; Travel agency-organization and activities; Types of tourist guides specific activities; Organizing and conducting thematic, local/ national/ international travel guides; Communication and marketing in tourism guide activity. Practical activities include the following topics: The psychology of the group of tourists and the prospecting of the tourists' needs and the service offered to them; Portfolio of the guide: the technical worksheet of a tourist circuit, the price analysis; Creating a record sheet for tourist guides; Good practices of travel guides; Analysis of a tourism offer and an internal/ external tourism program; Animation tests; Exercises for the management of the tourist groups and critical situations.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers to seminar activities)

3RD YEAR, 2ND SEMESTER

COURSE TITLE: REGIONAL GEOGRAPHY OF ROMANIA (HILLS AND PLAINS)
CODE: D11GTL643
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Defining and describing the main notions, laws, processes and geographic phenomena, explaining their genesis and evolution, assessing the consequences they have on the natural and anthropogenic geographic systems.
COURSE CONTENTS: Transylvanian Depression, Moldavian Plateau and Siret Corridor, Dobrogea Plateau, Western Plain and Hills, Getic Piedmont, Mehedinti Plateau, the Danube and the Danube Delta: general characteristics and boundaries, evolution and features of the relief, climate, hydrography, vegetation, fauna, soils, reserves and natural resources, population and human settlements, industry, agriculture, communication routes and tourism potential. Seminar activities include the following topics: Transylvanian Depression, Moldavian Plateau and Siret Corridor, Dobrogea Plateau, Western Plain and Hills, Getic Piedmont, Mehedinti Plateau, the Danube and the Danube Delta; Debates on: general characteristics and boundaries, evolution and features of the relief, climate, hydrography, vegetation, fauna, soils, reserves and natural resources, population and human settlements, specificity of natural resources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers at practical training)

COURSE TITLE: EVALUATION OF TOURISM SOURCES
CODE: D11GTL644
ECTS CREDITS: 5
TYPE OF COURSE: specialization, compulsory
COURSE OBJECTIVE(S): highlight the touristic reality by identifying and grading the natural and cultural attractions, according to the demands on the regional and international market; identification of the role of major operational components of tourism system; proper use of the methods and techniques needed to a study for prospecting tourism resources.
COURSE CONTENTS: Concepts, methods and techniques of tourism prospecting; Primary and secondary tourism offer; Prospecting the natural tourism resources; Prospecting and managing cultural tourism resources; Regional tourism prospecting; Tourism market and its prospecting; Tourism demand; Peculiarities of tourism demands; Prospecting tourism demands; Tourism consumption – characteristics, prospecting; Development and management of tourism products. Practical activities include the following topics: inventory of tourism attractions within a particular area; Flagship vs. supporting attractions; Questionnaire for perception of the attractiveness of a tourism destination; Prospecting rural tourism resources; Prospecting ecotourism resources Prospecting leisure tourism resources.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (50% of the final grade – test, 20% of the final grade – practical assignments; 20% of the final grade – project)

COURSE TITLE: ORGANIZATION OF TOURISM SPACE
CODE: D11GTL645
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The use of the main definitions, concepts, general principles and notions regarding the organization of the touristic space, as well as the geographic components of touristic space organization, in order to discuss the issues of territorial organization at international, national or local level.
COURSE CONTENTS: The concept of tourism organization and planning; Objectives, principles and strategies of tourism development; Spatial development policies for tourism; Methods of touristic planning; Framework legislation on tourism and spatial planning; Framework Content of Territorial Planning and Urbanism Documentation; Tourism organization and planning of seaside areas; Organization and planning of mountain areas; Tourism planning of spa centers and spa resorts; Planning agro-ecotourism spaces; Touristic planning of historical and archaeological sites; Touristic planning of nature parks and reserves; Touristic planning of periurban areas (mixed-tourism and recreational). Practical activities include the following topics: International and European Tourism Legislation; Elements and notions of tourism planning; Debate on Master Plan for National Tourism in Romania, 2007-2026: COURSE OBJECTIVE(S), proposals, current status; Explanations, examples and proposals regarding the tourist regionalization of Romania: territorial taxonomic units; Organizing and planning the seaside in Bulgaria; Differences, patterns and advantages/ disadvantages as compared to the Romanian seaside; The Romanian model for the organization and development of mountain areas; Case study: Rucăr-Bran corridor; The analysis of the touristic organization of Băile Herculane: past and present, constraints and development opportunities; European model for agro-ecotourism development: examples and possibilities of application in Romania; Practical application: forms of tourism development in the urban and periurban area of Craiova municipality.

LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – written evaluation, 30% of the final grade – research project)

COURSE TITLE: COMMERCIAL LAW AND LEGISLATION IN TOURISM

CODE: D11GTL646
ECTS CREDITS: 5
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): Using the concepts, theories, techniques and tools specific to the legal framework in the interpretation and understanding of economic and legal phenomena in the field of economic activity; Implementation of specific Romanian and European legislation as well as other international legal instruments; Use of the legislation in force in the analysis of legal situations, in their correct legal classification and in their resolution.
COURSE CONTENTS: Commercial Law in the Romanian Law System; Enterprise – Business Management; Professional and merchant category; The physical trader; Legal trader; Professional Obligations of Tradespeople Professionals; Trade Fund; Merchant affiliates; Companies regulated by Law no; 31/1990 – the main form of business management; Establishment of companies regulated by Law no; 31/1990; The functioning of companies regulated by Law no; 31/1990 – general notions; Termination of companies regulated by Law no; 31/1990 – general notions. Seminar activities include the following topics: Commercial Law in the Romanian Law System; Enterprise – Business Management; Professional and merchant category; The physical trader; Legal trader; Professional Obligations of Tradespeople Professionals; Trade Fund; Merchant affiliates; Companies regulated by Law no; 31/1990 – the main form of business management; Establishment of companies regulated by Law no; 31/1990; The functioning of companies regulated by Law no; 31/1990 – general notions; Termination of companies regulated by Law no; 31/1990 – general notions.
LANGUAGE OF INSTRUCTION: Romanian.
ASSESSMENT METHOD(S): Written verification (70% of the final grade – written evaluation, 30% of the final grade – seminar activities)

COURSE TITLE: TOURISM PROMOTION AND INTERPRETATION

CODE: D11GTL647
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): analysis, interpretation, writing and presentation of the data and issues of tourism promotion and interpretation within the touristic economic and managerial context; application of modern methods of investigation of tourism promotion and interpretation in order to solve specific problems; developing the communication skills and the operationalization of the knowledge acquired through the elaboration and presentation of papers focused on case studies related to the course subject.
COURSE CONTENTS: Introductory elements of tourism promotion: tourist products and promotional mix; Communication in tourism; Tourism advertising; Tourism marketing; Public Relations – the promotional role; Sales promotion; The personal selling and sales force; Publicity and its market- Types of brands and strategies for using them; Using promotional techniques in tourism; Tourism Interpretation – Definition, Principles, Challenges; Models and techniques of tourism interpretation; Research strategies on the characteristics and motivations of visitors. Practical activities include the following topics: Types of advertising; Content analysis of public relations campaigns in tourism; Analysis of slogans and logos for the promotion of tourist products, units and destinations; Analysis of advertising videos in tourism; Analysis of tourist advertisements; Country tourist brands; Analysis of Romania's tourism promotion campaigns; Tourism pricing strategies: sales promotion techniques; Project 1: Develop an interpretation plan for a heritage site; Project 2: Develop a campaign to promote a heritage site online.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers to practical training activities)

COURSE TITLE: GEOGRAPHY OF SANITARY RESOURCES AND MEDICAL TOURISM

CODE: D11GTL648
ECTS CREDITS: 5
TYPE OF COURSE: specialization, optional
COURSE OBJECTIVE(S): To use standard criteria and methods for assessing factors, processes, models and solutions; To acquire methods and techniques for collecting, processing and analyzing data; To make databases respecting the principles and methods of geographic analysis; To specify basic concepts and methods in the achievement of graphic materials; To explain and interpret the results of geographic research according to the type of research and the studied area.
COURSE CONTENTS: Introduction to medical tourism; Definitions and concepts; History and development of health and wellness; Geographical and regional analysis of health and wellness tourism; Contemporary leisure, lifestyle and society; Demand and motivation of health, wellness and medical tourists; Marketing challenges: targeting and branding; Planning and management issues; Future trends and predictions; The international context for health, wellness and medical tourism;

Medical Tourism Ethical, Legal & Social Concerns. Practical activities include the following topics: Medical tourism – marketing concepts and strategies; Macro Economics – Facts & Comparative Analysis; Project – working teams: Main destions of medical tourism; Types of medical tourism; Comparative studies regarding the sanitary resources from different European and non-European states; Quality Standard in Medical Tourism; Analysis of the technical-material basis and of the tourist circulation in the spa resorts in Romania; Strategies for the development of spa and medical tourism in Romania.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written verification (50% of the final grade – answers during the examination, 40% of the final grade – evaluation of the practical activity; 30% of the final grade – activity during the semester)

FIELD: INFORMATICS
PROGRAMME TITLE: ADVANCED TECHNIQUES FOR INFORMATION PROCESSING
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED DATABASE SYSTEMS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Explain the role of relational databases in development of new technologies in data bases; Understanding the variety ways that data can be mapped and organized; Obtain skills to analyse data models; Learning the fundamental concepts related to the new database; Acquire practical skills related to working with object-oriented databases management systems, distributed, multimedia, deductive, temporal, spatial, etc.; Familiarize students with information concerning the use of data warehouses, OLAP and OLTP systems in economic applications.
COURSE CONTENTS: 1. Distributed databases; 2. Object-Oriented Databases; 3. Object Relational Databases; 4. Deductive Databases; 5. Data warehousing; 6. Multidimensional databases; 7. OLAP (On-line Analytical Processing); 8. Multimedia databases; 9. Temporal databases; 10. Spatial databases; 11. Decision support systems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (60% of the final grade – written test; 40% of the final grade – laboratory)

COURSE TITLE: COMPUTER VISION

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Knowledge of fundamental concepts of image analysis; Description of several important computer vision algorithms; Acquiring the necessary knowledge for constructing image analysis specific applications.
COURSE CONTENTS: 1. OpenCV library. Installation and generalities; 2. Loading, printing and saving images; 3. Creation of a GUI application using QT for image processing; 4. Accessing values for pixels from an image; 5. Image processing using classes; 6. The histogram of an image; 7. Defining regions of interest in images; Image content detection using the histogram; 8. Transformation of images by morphological operations; 9. Line, contour and component extraction; 10. Interest point detection; 11. Video processing
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Written test

COURSE TITLE: DISTRIBUTED COMPUTING – PRINCIPLES AND ALGORITHMS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: mandatory
COURSE OBJECTIVE(S): present numerical algorithms primarily for solving systems of equations or optimization problems; study algorithms that recognize high parallelization; address broader issues of communication and synchronization; implement algorithms in known programming languages.
COURSE CONTENTS: 1. Distributes systems: definition and proprieties, hardware and software concepts, communication protocols; 2. Examples: Chandy-Lamport, Lai-Yang, Wave, Terry, etc.; 3. Structure and functionality, architecture, synchronization problems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (70% of the final grade – written test; 30% of the final grade – laboratory)

COURSE TITLE: ADVANCED TOPICS IN COMPUTER NETWORKS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: specialty, optional
COURSE OBJECTIVE(S): This course will address subjects as: modern network infrastructure functioning; network management; cloud computing; software defined networks.
COURSE CONTENTS: 1. Internet architecture; Layering; End-to-end Argument Principle; 2. TCP architecture; Congestion control; 3. Quality of Service (QoS); Taxonomy; Token Bucket; Reservation Protocol (RSVP); 4. Analysis of Network Traffic; Data capture; Name resolution; Colorizing the packets; Using values; Using statistics tools; ARP and IP analysis; UDP/TCP analysis; HTTP and DNS analysis; 5. Software Defined Networks (SDN); Architecture; Applications; OpenFlow framework; 6. Network management; Standards; Organizational, information, communications and functional model; SNMP network management; Network Management System (NMS) design: functional requirements, architecture, discovery module, performance manager, fault manager; NMS client design; 7. Cloud computing; Introduction; History; Infrastructure as a Service (IaaS); Platform as a Service (PaaS); Software as a Service (SaaS); Cloud storage providers: Dropbox, OneDrive, Google Drive, iCloud.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (50% of the final grade – written test; 50% of the final grade – laboratory)

COURSE TITLE: ETHIC AND PROFESSIONAL DEONTOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility; Performing complex professional tasks in order to find effective and deontological solutions; Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labour market requirements.
COURSE CONTENTS: 1. Object, functions and issues of professional ethics and professional deontology; 2. Ethical and professional concepts of great philosophers; 3. Basic notions of professional ethics; 4. Professional Ideal and Its Types; 5. Debt and consciousness, their dialectical correlation in professional activity; 6. Moral experience in professional activity; 7. Use and perfection (excellence) in professional activity; 8. Problems of ethics and the moral character of professional activity; 9. Behavioural rules and their implications in the professional sphere; 10. Ethics applied; 11. New orientations in ethics and professional deontology; 12. Ecological ethics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – examination; 30% of the final grade – seminar activities)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: HUMAN COMPUTER INTERACTION

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: fundamental, mandatory
COURSE OBJECTIVE(S): Proper modelling of human-computer interaction problems (with applications in linguistics and recognition of speech and speaker); Developing interactive and user-centred applications; Evaluating software applications using usability and ergonomics criteria.
COURSE CONTENTS: 1. Human-Computer Interfaces; Interface and Interaction; Input/ Output Devices; 2. Designing Human-Computer Interaction; Human Abilities; Interaction as Information Processing; Ergonomic Criteria; Interaction Styles; Definition of Usability; How to Improve Usability; 3. User Interfaces; Types of User Interfaces; Direct Manipulation Interfaces: Windows, Icons, Menus; Tools for Creating User Interfaces; 4. Intelligent Dialogue Systems; The Understanding Computer; Intelligent Dialogue Systems; 5. Natural Language Interfaces; Computational Linguistics; Syntactic and Semantic Analysis; Machine Translation; 6. Voice-user Interfaces; Voice Synthesis Technologies: Speech Synthesis with Java FreeTTS, Natural Language Generation; Speech Recognition Technologies: Hidden Markov Models, Speech Understanding, Voice Recognition; Microsoft Speech API; Java Speech API.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written test; 30% of the final grade – laboratory)

COURSE TITLE: CRYPTANALYSIS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: specialty
COURSE OBJECTIVE(S): Analysis of Information Security Systems. Assessing the degree of penetration for classical models; Cryptanalysis of information security systems based on cryptographic models with asymmetric keys; Cryptanalysis of information security systems based on secret cryptographic models; Analysis and optimizations for the most used information processing systems.
COURSE CONTENTS: Audit of Information Security Systems: The notion of security systems analysis; Defining; Classic models; Current Models: Security level audit; Security policies in distributed systems; Algebraic Cryptographic Analysis; Symmetrical encryption systems analysis; Asymmetric encryption systems analysis; Pseudo-Alert Generator Systems; Digital signatures analysis; Analysis of security systems in computer networks; Banking Security Systems (Online Payments, Cards) analysis; Standards and methodologies for defending attacks against information security systems; Security models used in maximum protection environments: User security; Security analysis of individual computing systems; Cryptographic models used to secure network structures; Security analysis in computer networks; WAN; Security of parallel computing systems; Implementations of classical models in distributed systems; Methods of providing information security to protect against Viruses, Worms and Trojan Horses; Detection of network penetration; Application-level security analysis; Hardware security systems analysis.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: ELECTRONIC COMMERCE AND MARKETING

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: optional, complementary
COURSE OBJECTIVE(S): The basic concepts of e-commerce and marketing; Knowledge, understanding and mastering specific tools e-Commerce; Internet bussiness management.

COURSE CONTENTS: 1. Internet business management; 2. Web Services to Internet Business; 3. Internet Business Models and Integration Requirements; 4. Identity Management: Enterprise, E-commerce and Government applications and their implications for privacy; 5. The Open-source movement; 6. Webmarketing of Internet Business.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (project and written paper)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: JAVA ENTERPRISE APPLICATIONS DEVELOPMENT
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: mandatory, specialty
COURSE OBJECTIVE(S): The course aims at acquainting students with the basic knowledge, methods and techniques for the development of high performance enterprise applications, technologies specific to the Java Enterprise Edition platform. At the end of the course the students must be able to demonstrate: the ability to design and implement server side web applications that use Java EE specific technologies; the ability to understand and use object-relationship mapping techniques in the context of enterprise applications, as well as the implementation of primary operations CRUD (Create, Read, Update, Delete); the ability to design and implement a high-performance web application that complies with the MVC architecture.
COURSE CONTENTS: 1. Introduction to Enterprise Application Development; 2. Basic web applications development using Java EE: Servlets; Java Server Pages (JSP); JavaServer Pages Standard Tag Library (JSTL); Filters; 3. Basic Spring Framework concepts: Spring Applications Architecture; Inversion of Control (IoC); Dependency Injection (DI)Aspect Oriented Programming (AOP); 5. Object Relational Mapping (ORM): Java Persistence API (JPA): Entities; Relationships; Constraints; Implementing CRUD operations; 6. Web application development using Spring MVC: Spring MVC framework architecture; Requests Mapping; Forms Processing; Views.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: DISTRIBUTED SERVICES ORIENTED ARCHITECTURES
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: elective, specialty
COURSE OBJECTIVE(S): The course aims at acquainting students with the basic knowledge, methods and techniques related to distributed service oriented architectures, the modalities of implementation and proper application to concrete situations of these methods and techniques. At the end of the course the students must be able to demonstrate: the ability to design and deploy a distributed application based on platform independent messages (e.g. SOAP, REST), and / or distributed objects, using, where appropriate, declarative elements; the ability to understand and use, in the context of distributed applications, the generation of dynamic code, dynamic compilation and reflection; the ability to design and implement a distributed application able to maintain state (stateful).
COURSE CONTENTS: 1. Introduction in Service Oriented Architecture (SOA); 2. Web Services: Basic Concepts; SOAP – Simple Object Access Protocol; WSDL – Web services description language; Web Service discovery (UDDI); RESTful Web Services; 3. Building Web Services with JAX-WS: Overview of Java API for XML Web Services; Creating Web Services and Clients with JAX-WS; Types Supported by JAX-WS; 4. Building RESTful Web Services with JAX-RS: Overview of JAX-RS API; JAX-RS annotations; Data binding rules in JAX-RS; Creating Web Services Sever – Side with JAX-RS; Implementing CRUD operations; Creating Web Services Clients with JAX-RS; 5. Web Services Security: Securing SOAP Web Services; Securing RESTful Web Services; 6. Testing Web Services.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Verification (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: ADVANCED INFORMATION SECURITY TECHNIQUES
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: elective, specialty
COURSE OBJECTIVE(S): Analysis of current security systems and their limitations; Vulnerability analysis of current used systems; Actual and modern solutions for the high level information security models.
COURSE CONTENTS: 1. Authentication Techniques for: data storages (local and remote); data transfer; data access (one security level, hierarchically defined); 2. Digital Declaration study: actual level of knowledge; proposed solutions; security level analysis; 3. Actual techniques for Intranet Security; 4. Actual techniques for Internet Security; 5. Copyright techniques for: data distribution and utilization; software production and distributions; electronic coins; 5. The way of software construction, from users necessity to specifications and milestones implementations: security study for each level; classically mistakes on software security construction; modern attacks on software usage.
LANGUAGE OF INSTRUCTION: English

ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: MACHINE LEARNING

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Acquiring the necessary knowledge to implement and apply machine learning techniques for solving real world problems; The presentation of the mathematical fundaments about optimization algorithms; Getting to know how to use the techniques and algorithms for optimization for solving certain applications; The provision of knowledge about the use of libraries containing numerical optimization methods.
COURSE CONTENTS: 1. Introduction; 2. R – the language and software; 3. Supervised learning – an overview; 4. The design of learning machines; 5. Linear methods for classification and regression; 6. Support vector machines; 7. Neural networks; 8. Decision trees; 9. Ensemble methods; 10. Clustering; 11. Evaluation and selection of models; 12. Missing data; 13. Variable selection and reduction.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written paper)

COURSE TITLE: OPTIMIZATION TECHNIQUES

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: specialised, optional
COURSE OBJECTIVE(S): Presentation of mathematical optimization methods with and without restrictions; Study of optimization methods based on evolutionary computation.
COURSE CONTENTS: 1. One-dimensional line search descent methods: Golden section, Powell's quadratic interpolation, bisection method, Newton's method; 2. First order multidimensional line search descent methods: steepest descent method, Fletcher-Reeves conjugate gradient; 3. Second order multidimensional line search descent methods: modified Newton's method, quasi-Newton methods; 4. Associative Constrained non-linear optimization: Kuhn-Tucker conditions, penalty methods, admissible steering method; 5. Introduction to evolutionary computation: basic notions, coding methods, evolution operators (selection, crossover, mutation, reinsertion); 6. Special classes of genetic algorithms: contraction algorithms, variable population algorithms, constrained algorithms, messy genetic algorithms, virus evolutionary genetic algorithm; 7. Evolutionary strategies: generalities, evolutionary operators, evolutionary strategies types, convergence study; 8. Evolutionary programming: general aspects, population representation, optimization applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30% of the final grade – laboratory)

2^ND^ YEAR, 1^ST^ SEMESTER

COURSE TITLE: EXPLORATORY DATA ANALYSIS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: complementary
COURSE OBJECTIVE(S): Understanding was statistical learning is, how to apply statistics into practice, introduction on machine learning and their use in real life problems.
COURSE CONTENTS: 1. Introduction; Descriptive Statistics; 2. Advanced Linear and Additive Models; 3. Multivariate Exploratory Techniques; 4. Anomaly detection; 5. Artificial neural networks.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (written exam and laboratory exam)

COURSE TITLE: COMPUTATIONAL INTELLIGENCE

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: advanced, mandatory
COURSE OBJECTIVE(S): study of some models for representation and processing of uncertain and imprecise knowledge; presenting the most representative types of neural networks; knowledge of optimization methods based on evolutionary computation.
COURSE CONTENTS: 1. Fuzzy sets: definitions, operations, fuzzy numbers; 2. Uncertainty: possibility and necessity measures, belief functions; 3. Approximate: reasoning: knowledge representation, Generalized Modus Ponens; 4. Fuzzy logic control systems: structure, fuzzy controllers models; 5. Neural computing methods: neural network structure, perceptron model, back propagation network, bidirectional associative memories, unsupervised learning; 6. Evolutionary computation principles: algorithm structure, selection and evolution operators, evolutionary computation applications; 7. Hybrid methods: neuro-fuzzy, neuro-evolutionary, fuzzy-evolutionary.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30% of the final grade – laboratory)

COURSE TITLE: ADVANCED SYSTEMS FOR DOCUMENTS MANAGEMENT

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: optional, specialty
COURSE OBJECTIVE(S): skill to install and configure an advanced system for documents management; capacity to use the main

functionalities of a ECM System; learn to personalize the Web Applications that use an ECM System; learn to define and use predefined workflows on actual business objects used in enterprise applications.
COURSE CONTENTS: 1. Content management; 2. ECM Architecture; 3. Searching inside a repository; 4. Users and groups; ECM Security; 5. Objects and types; 6. Lifecycles; Workflows; 7. Customizing object types.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 50% of the final grade – laboratory)

COURSE TITLE: COMBINATORIAL ALGORITHMS OPTIMIZATION

CODE: D3TPIM419
ECTS CREDITS: 8
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The aim of this course is to give students an overview of some of the classical methods for solving combinatorial optimization problems. It will focus on the analysis of mathematical models from different areas and the application of the studied methods to concrete situations.
COURSE CONTENTS: 1. Graphs. Minimal length paths: Bellman-Ford and Dijkstra algorithms; Minimal spanning trees; The Kruskal and Prim algorithms; Dynamic Programming; Study of complexity; 2. Couplings in graphs. Bipartite graphs. Labeling in graphs; The Hungarian method; Flow networks; The maximum flow problem: Ford-Fulkerson, Dinic and Edmonds-Karp algorithms; Applications for liquid flow, assembly lines and transport through power networks; 3. Linear Programming: Examples; The Simplex algorithm; Integer linear programming; The method branch and bound; Applications in economics and finance; 4. Elements of games theory; Zero-sum games; Mixed strategies; The minimax theorem; Nash equilibrium; Cooperative and non-cooperative games; Applications.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30% of the final grade – seminary)

FIELD: INFORMATICS
PROGRAMME TITLE: METHODS AND MODELS IN ARTIFICIAL INTELLIGENCE
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED DATABASES
CODE:
ECTS CREDITS: 8
TYPE OF COURSE: complementary, mandatory
COURSE OBJECTIVE(S): Explain the role of relational databases in development of new technologies in data bases; Understanding the variety ways that data can be mapped and organized; Obtain skills to analyze data models; Learning the fundamental concepts related to the new database; Acquire practical skills related to working with object-oriented databases management systems, distributed, multimedia, deductive, temporal, spatial, etc.; Familiarize students with information concerning the use of data warehouses, OLAP and OLTP systems in economic applications.
COURSE CONTENTS: 1. Distributed databases; 2. Object-Oriented Databases; 3. Object Relational Databases; 4. Deductive Databases; 5. Data warehousing; 6. Multidimensional databases; 7. OLAP (On-line Analytical Processing); 8. Multimedia databases; 9. Temporal databases; 10. Spatial databases; 11. Decision support systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (60% of the final grade – written exam; 40 of the final grade – laboratory)

COURSE TITLE: SCIENTIFIC RESEARCH METHODOLOGY IN COMPUTER SCIENCE
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: mandatory baseline
COURSE OBJECTIVE(S): Inspiring the students towards research activities; Encouragement of the students to deeply study research subjects and domains of their choice; Learning to write a research paper.
COURSE CONTENTS: 1. What is research?; 2. How to pick a research subject; 3. How to read scientific articles; 4. Problem formulation; 5. Evaluation and validation; 6. Conference and journal publishing; 7. Writing technical reports (incl. dissertation); 8. Paper presentation; 9. Writing grant proposals; 10. Ethics
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquium (oral examination + laboratory work)

COURSE TITLE: DATA MINING
CODE:
ECTS CREDITS: 8
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): understand the basic concepts and techniques of Data Mining; offer the skills to use data mining frameworks for solving practical problems; offer the skills to implement data mining algorithms.
COURSE CONTENTS: 1. Introduction to Data Mining: Architecture of Data Mining systems; Stages of the Data Mining Process; Data mining primitives; 2. Data preprocessing techniques: Data cleaning; Data transformation; Data selection; 3. Data warehouse: Basic concepts; Multidimensional data model; OLAP operations; 4. Mining Boolean Association Rules: Basic concepts; Algorithms for mining association rules: APRIORI Algorithm; FP-growth Algorithm; 5. Mining Fuzzy Association Rules: Basic concepts; Algorithms for mining fuzzy association rules; 6. Cluster Analysis: Basic concepts; k-means algorithm; k-medoids algorithm; 7. Classification: Basic concepts; Decision trees; Evaluating Classifiers; 8. Mining Sequential Patterns: Basic concepts; Algorithms for mining sequential patterns.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (50% of the final grade – written exam; 50 of the final grade – laboratory)

COURSE TITLE: COMPUTER VISION
CODE:
ECTS CREDITS: 8
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): Knowledge of fundamental concepts of image analysis; Description of several important computer vision algorithms; Acquiring the necessary knowledge for constructing image analysis specific applications.
COURSE CONTENTS: 1. OpenCV library. Installation and generalities; 2. Loading, printing and saving images; 3. Creation of a GUI application using QT for image processing; 4. Accessing values for pixels from an image; 5. Image processing using classes; 6. The histogram of an image; 7. Defining regions of interest in images; 8. Image COURSE CONTENTS detection using the histogram; 9. Transformation of images by morphological operations; 10. Line, contour and component extraction; 11. Interest point detection; 12. Video processing
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (written paper)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: HUMAN COMPUTER INTERACTION
ECTS CREDITS: 8
TYPE OF COURSE: fundamental, mandatory
COURSE OBJECTIVE(S): Proper modeling of human-computer interaction problems (with

applications in linguistics and recognition of speech and speaker); Developing interactive and user-centered applications; Evaluating software applications using usability and ergonomics criteria
COURSE CONTENTS: 1. Human-Computer Interfaces; Interface and Interaction; Input/ Output Devices; 2. Designing Human-Computer Interaction; Human Abilities; Interaction as Information Processing; Ergonomic Criteria; Interaction Styles; Definition of Usability; How to Improve Usability; 3. User Interfaces; Types of User Interfaces; Direct Manipulation Interfaces: Windows, Icons, Menus; Tools for Creating User Interfaces; 4. Intelligent Dialogue Systems; The Understanding Computer; Intelligent Dialogue Systems; 5. Natural Language Interfaces; Computational Linguistics; Syntactic and Semantic Analysis; Machine Translation; 6. Voice-user Interfaces; Voice Synthesis Technologies: Speech Synthesis with Java FreeTTS, Natural Language Generation; Speech Recognition Technologies: Hidden Markov Models, Speech Understanding, Voice Recognition; Microsoft Speech API; Java Speech API.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30 of the final grade – laboratory)

COURSE TITLE: WEB TECHNOLOGIES AND E-LEARNING

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: mandatory complementary
COURSE OBJECTIVE(S): The basic concepts, methods and models of Computer Assisted Instruction (CAI); Knowledge, understanding and mastering specific tools of the Web Technologies and E-learning; Internet information about educational programs and projects.
COURSE CONTENTS: 1. Process design and specific programs for e-learning; 2. Models and techniques for performing computer-assisted instruction; 3. Educational programs, virtual universities; 4. Online education and distance learning; 5. ISDN networks: virtual networking environments and e-learning; 6. Online publishing of a website.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (project and written paper)

COURSE TITLE: ETHIC AND PROFESSIONAL DEONTOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility; Performing complex professional tasks in order to find effective and deontological solutions; Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labor market requirements.
COURSE CONTENTS: 1. Object, functions and issues of professional ethics and professional deontology; 2. Ethical and professional concepts of great philosophers; 3. Basic notions of professional ethics; 4. Professional Ideal and Its Types; 5. Debt and consciousness, their dialectical correlation in professional activity; 6. Moral experience in professional activity; 7. Use and perfection (excellence) in professional activity; 8. Problems of ethics and the moral character of professional activity; 9. Behavioral rules and their implications in the professional sphere; 10. Ethics applied; 11. New orientations in ethics and professional deontology; 12. Ecological ethics.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – examination; 30 of the final grade – seminar activities)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: NEURONAL AND EVOLUTIONARY COMPUTING MODELS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: specialized, mandatory
COURSE OBJECTIVE(S): Study of main types of neural networks and their use in supervised and unsupervised training; Learning principles underlying evolutionary computation and their application in optimization problems
COURSE CONTENTS: 1. Grammars Introduction to neural computation: characteristics of neural networks, history of neural computation, biological neuron, architecture and usage of a neural network; 2. Networks with a single layer: simple perceptron, variants of simple perceptron, multiple perceptron; 3. Unidirectional multi-layer networks: back propagation with one hidden layer, back propagation with multiple hidden layers, variants of back propagation; 4. Associative memories : linear association networks type, bidirectional associative memories (MAB), types of MAB, Hopfield networks with discrete time, auto-associative recurrent memory; 5. Networks with radial activation functions: network structure, network training; 6. Networks with unsupervised training: competitive learning, k – means grouping methods, ISODATA algorithm, Kohonen networks; 7. Introduction to evolutionary computation: generalities, basic notions, encoding methods, selection methods; 8. Evolution operators: selection, crossover, mutation, reintegration; 9. Special classes of genetic algorithms: contraction algorithm, algorithms with varying population size, constraints algorithms, messy genetic algorithms, virus – evolutionary

genetic algorithms; 10. Evolutionary strategies: generalities, evolutionary operators, types of evolutionary strategies, convergence study; 11. Evolutionary programming: generalities, representation of individuals, applications in optimization problems; 12. Genetic programming: representation of individuals, initial population, evolution operators, running programs.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30 of the final grade – laboratory)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: MACHINE LEARNING
CODE:
ECTS CREDITS: 8
TYPE OF COURSE: complementary, optional
COURSE OBJECTIVE(S): Acquiring the necessary knowledge to implement and apply machine learning techniques for solving real world problems; The presentation of the mathematical fundaments about optimization algorithms; Getting to know how to use the techniques and algorithms for optimization for solving certain applications; The provision of knowledge about the use of libraries containing numerical optimization methods.
COURSE CONTENTS: 1. Introduction; 2. R – the language and software; 3. Supervised learning - an overview; 4. The design of learning machines; 5. Linear methods for classification and regression; 6. Support vector machines; 7. Neural networks; 8. Decision trees; 9. Ensemble methods; 10. Clustering; 11. Evaluation and selection of models; 12. Missing data; 13. Variable selection and reduction
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (written paper)

COURSE TITLE: INTELLIGENT SYSTEMS FOR CONTROL AND CLASSIFICATION
CODE:
ECTS CREDITS: 8
TYPE OF COURSE: complementary, mandatory
COURSE OBJECTIVE(S): Study of main intelligent control systems based on fuzzy reasoning; Working with intelligent classification systems obtained with various combinations of fuzzy, neural and evolutionary methods.
COURSE CONTENTS: 1. Fuzzy sets: basic notions, operations (fundamental, based on t-operators); 2. Fuzzy numbers, fuzzy relations; 3. Uncertainty: possibility and necessity measures, belief and plausibility functions, Dempster's rule; 4. Knowledge representation: linguistic variables, fuzzy implications, rules representation; 5. Reasoning methods: generalized modus ponens, uncertain and imprecise reasoning methods; 6. Fuzzy logic control systems: structure, types of fuzzy control systems (Mamdani, Tsukamoto, Sugeno, Larsen), extended systems; 7. Adaptive Neuro-Fuzzy Inference System (ANFIS); 8. Evolutionary classification methods: consequence and associated certainty, training data classification, evolution of rules population; 9. Neuro-evolutionary classification methods: neural network structure, evolutionary determination of classification rules, refining of extracted rules.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30 of the final grade – laboratory)

COURSE TITLE: MATHEMATICAL OPTIMIZATIONS IN ARTIFICIAL INTELLIGENCE
CODE: D3MIAM417
ECTS CREDITS: 8
TYPE OF COURSE: complementary, compulsory
COURSE OBJECTIVE(S): The aim of this course is to give students an overview of the classical methods for solving numerical optimization problems. It will focus on the analysis of mathematical models from different areas and the application of the studied methods to concrete situations.
COURSE CONTENTS: 1. Combinatorial optimization: knapsack problem, traveling salesman problem, vehicle routing problem, allocation problems; Eulerian and Hamiltonian Graphs; Algorithms; 2. Linear Programming: Examples; Simplex algorithm; Applications in economics and finance; 3. Nonlinear Programming: Optimization problems with or without constraints; Optimality criteria and duality; Lagrange multipliers; Least squares; Newton Method; 4. Convex Optimization: Formulation of quadratic minimization problems, with or without constraints; Descent methods; Gradient method; Conjugate Gradient Method; 5. Interpolation and digital signal processing; Applications in telecommunications, music, image processing; 6. Applications in control theory and games.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written exam; 30 of the final grade – seminary)

FIELD: MATHEMATICS
PROGRAMME TITLE: APPLIED MATHEMATICS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: TOPICS IN THEORY OF CATEGORIES

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): To enable the students with the language of theory of categories, as well to present more mathematical results in the specific language of theory of categories.
COURSE CONTENTS: A. Notion of category. Examples. Subcategory. Dual category. Duality principle. Product of categories; B. Special morphisms in a category. Kernel (cokernel) for a couple of morphfisms; C. Functors. Exemples. Remarcable functors. Functorial morphisms. Equivalent categories; D. Representable functors; adjoint functors; E. Products (coproducts) of objects in a category; F. Inductive (projective) limits of objects in a category; G. Fibred product; fibred coproduct; H. Injective(projective) objects; I. Applications of theory of categories in mathematical analysis and topology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Final written exam (continuous evaluations can be considered)

COURSE TITLE: SPECIAL TOPICS ON FUNCTIONAL ANALYSIS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): Main results of functional analysis and some applications from PDE's and convex functions theory are presented.
COURSE CONTENTS: 1. Banach spaces and linear operators. Linear an continous operators, the norm of an operator, equivalent norms. Uniform boundedness principle (Banach-Steinhauss); 2. The open map theorem, the closed graph theorem. The inverse of an linear and bounded operator; 3. The spectrum and the resolvent of an operator. Compact operators. Integral operators; 4. Hilbert spaces and orthogonal sums. Bases on Hilbert spaces. Orthogonal projections, the adjoint of an operator; 5. The diagonalization of a self-adjoint and compact operator. The spectrum of the self-adjoint and compact operators; 6. Hilbert Schmidt's theorem of spectral decomposition. Applications to Sturm-Liouville's problems; 7. Hahn-Banach's theorems. Consequences. Convex sets; 8. Separation theorems, Krein-Milman's theorem. Local convex spaces; 9. Weaker topologies. Alaoglu-Bourbaki's theorem. Reflexive spaces. The case of the Lp spaces, p>1; 10. Nonlinear functional analysis theory. Differenţial calculus on Banach spaces. Elements of convex analysis on Banach spaces. The minimum of the convex functionals; 11. The fixed point theorem of Brouwer, Schauder and Schaeffer. Applications to PDE's; 12. Applications of functional analysis to PDE's. The convolution product, Dirac sequences, Weierstrass's approximation theorems; 13. The Fourier transforms. Schwartz's space, The Cauchy problem for the diffusion equation; 14. Dirichlet and Neumann problems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: APPLIED NONLINEAR ANALYSIS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): We develop some of the main techniques and principles in the modern nonlinear analysis, at the interplay with mathematical physics and numerical analysis. The course is conceived as a fundamental instrument and guide to do research in modern nonlinear analysis.
COURSE CONTENTS: A. Logistic equations: Examples; The Keller-Osserman condition; Blow-up boundary solutions; Existence and uniqueness theorems for large solutions; The asymptotic behavior of the explosive solution; The Conjecture of H. Brezis; B. Lane-Emden-Fowler singular type equations: Elliptic equations with singular term; The Crandall-Rabinowitz-Tartar theorem; Case of convection terms; Similarities with the logistic equation; C. Nonlinear eigenvalue problems for nonhomogeneous differential operators; Elements of spectral theory for nonlinear operators; Orlicz-Sobolev spaces; Nonhomogeneous differential operators; Concentration of the spectrum; Open problems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: MATHEMATICAL MODELING WITH DIFFERENTIAL EQUATIONS

CODE:
ECTS CREDITS: b
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): To familiarize the students with models in mechanics, biology or economy, described by differential equations; To provide the methods in order to analyze such kind of models.
COURSE CONTENTS: A. Modeling by ordinary differential equations: C_1. Modeling the motion of the material point; C_2. Modeling the mass-spring system oscillations; C_3. Modeling the mass-spring-dashpot system oscillations; C_4. Modelling population dynamics; B. Modeling by partial differential equations: C_5. Elementes of mechanics of continua: the geometry of the deformation,

displacement vector, infinitezimal stress tensor; C_6. General principles; C_7. The Cauchy Equations. Boundary conditions; C_8. Constitutive laws; C_9. The 3D-model in elastostatics; C_{10}. The antiplane model; C_{11}. The plane model; C_{12}. Classical problems in elastostatics; C_{13}. Modeling the contact between a deformable solid and a rigid obstacle; C_{14}. Modeling the contact between a deformable solid and a deformable foundation.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

COURSE TITLE: ETHICS AND PROFESSIONAL DEONTOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility. Performing complex professional tasks in order to find effective and deontological solutions. Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labor market requirements.
COURSE CONTENTS: Object, functions and issues of professional ethics and professional deontology; Ethical and professional concepts of great philosophers. Basic notions of professional ethics; Professional Ideal and Its Types; Debt and consciousness, their dialectical correlation in professional activity; Moral experience in professional activity; Use and perfection (excellence) in professional activity; Problems of ethics and the moral character of professional activity; Behavioral rules and their implications in the professional sphere; Ethics applied; New orientations in ethics and professional deontology; Ecological ethics.
SEMINAR AND COURSE CONTENTS: Genesis and the content of the notions of "ethics" and "moral"; Professional virtues and professional vice; The notion of "equity" and its ethical values in professional activity; The notion of "perfection" and ways of obtaining it; Principles of ethics and professional integrity; Quote and plagiarism, the right to criticism, confidentiality, censorship and self-censorship; Professional Conflict and Solving It; Deontological regulations; Ethical/ ethical code for geography specialists.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral verification – 70% of the final grade, seminar activities – 30% of the final grade

COURSE TITLE: DYNAMICAL SYSTEMS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): Presentation of fundamental results regarding the dynamical systems associated to ordinary differential equations.
COURSE CONTENTS: C1: The phase plane: orbits, equilibria, separatrices; C2: The classification of plane linear systems. Topological conjugation, topological equivalence; C3: The Liapunov-Poincaré-Perron theorem on hyperbolic equilibria; C4: Stable and unstable manifolds of a hyperbolic equilibrium. The Hartman-Grobman theorem; C5: The Morse lemma: transforming functions into quadratic forms. Homogenous differential systems : the Euler theorem, polar coordinates, desingularisation; C6: Central manifolds of a non-hyperbolic equilibrium. System reduction in stability analisys; C7: Lyapunov stability: first approximation, Lyapunov functions, Hamiltonian systems; C8: Limit-sets: α, ω. Homoclinic, heteroclinic orbits. Limit-cycles; C9: The Poincaré map. The Bendixson-Poincaré theory; C10: Periodic solutions and their center-stable manifolds; C11: Plane vector fields. Their index; C12: Nonautonomous dynamical systems: applied to shooting problems (steady solutions for a semilinear heat equation, nonlinear Dirac field equations); C13: Nonautonomous dynamical systems: applied to fluid mechanics (vortices in bounded regions); C14: The graphic displaying of orbits: software systems.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

1ST YEAR, 2ND SEMESTER

COURSE TITLE: NUMERICAL ANALYSIS FOR PARTIAL DIFFERENTIAL EQUATIONS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): We introduce the fundamental methods of approximation of PDE and we analyse their stability and consistency
COURSE CONTENTS: 1. Introduction: Types of PDE. Elliptic equation. Boundary conditions. Heat equation, wave equation, convection-diffusion equation; 2. Fundamental notions: Convergence. Consistency. Stability. Lax's theorem; 3. Finite difference schema for equations of evolution: Parabolic equation. Explicit and implicit methods. Hyperbolic equation. Ecuaţii parabolice. Explicit and implicit methods. Stability and convergence. Applications; 4. Finite element method: Lagrange finite element. Mesh of a regular domain. Families of triangulations. Approximation of the solutions of elliptic equation; 5. Convergence of the finite element method: Cea's Lemma. Condtions of convergence. Interpolation Lagrange in Sobolev spaces. Error evaluation in Lagrange interpolation. Error evaluations for finite element method; 6. Parabolic equation: Semi-discretization and total-discretization. Trapezoidal method. Stability. Convergece; 7. Hyperbolic equation: Semi-

discretization and total-discretization. Newmark method. Stability. Convergece.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: EQUATIONS OF EVOLUTION
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): We study the theory of existence, uniqueness, regularity and asymptotic behavior of solutions of evolution equations, linear and semi-linear.
COURSE CONTENTS: 1. Introduction; 2. Unbounded operators. Semigroups. Hille-Yosida theorem. Classical and weak solutions of linear homogeneous and nonhomogeneous equations of evolution; 3. Diagonalized and sectorial operators in Hilbert spaces. Scales of functional spaces. Fundamental properties; 4. Semi-linear heat equation: local and global existence. Explosion in finite time; 5. Semi-linear wave equation: local and global existence. Explosion in finite time; 6. The study of the asymptotic behavior of solutions. LaSalle invariance principle.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

COURSE TITLE: ORDERED ALGEBRAIC STRUCTURES
CODE:
ECTS CREDITS: 6
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): To enable the students with the fundamental results from theory of ordered groups and rings, the category of ordered sets and the category of distributive bounded lattices and with the some categories of algebras of classical logic (Boole, Heyting, Stone, Hilbert) and fuzzy (residuated lattices, MV-algebras, BL-algebras).
COURSE CONTENTS: A. The category of orderes sets; B. The category of bounded distributive lattices; C. The category of ordered groups and rings; D. The category of some ordered algebras of classical logic (Boole, Stone, Heyting, Hilbert, etc); E. The category of some ordered algebras of fuzzy logic (Residuated lattices, MV-algebras, BL-algebras).
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

2ST YEAR, 1ST SEMESTER

COURSE TITLE: SPECTRAL THEORY OF DIFFERENTIAL OPERATORS
CODE:
ECTS CREDITS: 8
TYPE OF COURSE: Compulsory
COURSE OBJECTIVE(S): The main goal of the course is to introduce students to the spectral theory of differential operators, starting with the case of linear operators, continuing with the case of nonlinear operators and concluding with presenting some results regarding the spectrum of nonlinear and nonhomogeneous operators.
COURSE CONTENTS: 1. The spectrum of the Laplace operator: Description; The isolation and simplicity of the first eigenvalue; The variational characterization of the first eigenvalue; 2. The spectrum of the p-Laplace operator: Description; The isolation and simplicity of the first eigenvalue; The variational characterization of the first eigenvalue; 3. The spectrum of weighted Laplace and p-Laplace operators; 4. Spectral problems related to the p(x)-Laplace operators: Definition of the variable exponent Lebesgue and Sobolev spaces; Basic properties of variable exponent Lebesgue and Sobolev spaces; The study of some eigenvalue problems involving p(x)-Laplace type operators; Comparison with the case when p(x)=constant; 5. Spectral problems related to nonhomogeneous operators in Orlicz-Sobolev spaces: Definition of Orlicz and Orlicz-Sobolev spaces; Basic properties of Orlicz spaces; The study of some eigenvalue problems involving nonhomogeneous operators in Orlicz-Sobolev spaces.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

COURSE TITLE: FINANCIAL MATHEMATICS
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): The aim of the course is to to equip our students with a solid foundation in mathematics and in doing so provide them with practical knowledge that they can successfully apply to complicated financial models. The course develop derivative securities valuation, portfolio structuring, risk management and scenario simulation through the binomial pricing model and arbitrage pricing theory.
COURSE CONTENTS: C_1: Financial markets and derivative securities; No-arbitrage condition; Call options; Put options; Forward contracts; Examples; C_2: No arbitrage price of an option for the binomial model; Delta-hedging formula. Example; C_3: First Fundamental Theorem of Asset Pricing for a multiperiod, finite state model; Example; C_4: Computational considerations; Examples; C_5: Probability theory and discrete-time stochastic processes; Distributions; Random variables; Examples; C_6: Risk-neutral measure and option pricing; Expectation, information, and σ-algebras; Jensen's inequality; Exemple; C_7: Conditional expectations; Fundamental properties; Exemples; C_8: Martingales; The discounted stock price; The discounted wealth process; C_9: Risk-neutral pricing formula; Cash flow valuation; C_{10}: Markov

Processes; Lemma of independence; Exemples: Stock price, Non-Markov process; C_{11}: Change of measure; Radon-Nikodým derivative process; C_{12}: State price density; Optimal investment; Examples; C_{13}: Derivatives securities. Non-path-dependent derivatives; Stopping times; The Optional Sampling Theorem; C_{14}: Random walk; First Passage Times; Reflection Principle; Example.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

COURSE TITLE: RIEMANNIAN GEOMETRY

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): We aim to generalize the knowledge concerning differential calculus in the specific framework of Riemannian manifolds. The students should comprehend the concept of curvature; the constant curvature canonical manifolds such as the sphere S^2 and the hyperbolic half-plane will be presented as examples of non-euclidean geometries. We generalize in the new setting notions like right lines, measure, integral, divergence operator, gradient operator, Laplace operator. We present the exponential map and offer examples in the case of Lie fundamental groups (SO(3), SU(2), Spin(2)) and their corresponding Lie algebras.
COURSE CONTENTS: A. Differentiable manifolds (2 lectures): C_1: Introduction in the theory of differentiable manifolds; C_2: Lie groups as exemples of differentiable manifolds; B. Differential calculus on manifolds (3 lectures): C_3: Tangent vectors on differentiable manifolds; C_4: Tangent vector fields. The flow generated by a tangent vector field; C_5: Linear connection. Curvature tensor and torsion tensor; C. Riemannian structures (3 lectures): C_6: Riemannian manifolds; C_7: Levi-Civita connection; C_8: Canonical manifolds of constant curvature (S^n, R^n, H^n); D. Theory of geodesics on manifolds (3 lectures): C_9: Geodezic curves; C_{10}: Jacobi fields. Exponential map; C_{11}: Variational theory of geodesics. The first and second variation formula; E. Differential operators on manifolds (3 lectures: C_{12}: Integration on compact Riemannian manifolds; C_{13}: Canonical differential operators on Riemannian manifolds; C_{14}: Green formula on compact Riemannian manifolds.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: BIFURCATION THEORY AND APPLICATIONS IN ECONOMY

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S):We present of concepts and fundamental results of the bifurcation theory of continuous and discrete dynamical systems and their application to models from biology and economics.
COURSE CONTENTS: 1. Topologic equivalence of dynamical systems. Topologic classification of equilibria and fixed points. Bifurcation and bifurcation diagrams. Structural stability. Normal forms. Center manifolds. Models from biology and economy: Van der Pol, Hodgkin-Huxley, prey-predator, business cycle models; 2. Codimension one bifurcation of equilibria in continuous-time dynamical systems: saddle-node bifurcation, Hopf bifurcation; 3. Codimension one bifurcation of fixed points in discrete-time dynamical systems: fold bifurcation, flip bifurcation, Neimark-Sacker bifurcation; 4. Bifurcations of homoclinic and heteroclinic orbits. Andronov-Leontovich theorem, Shil'nikov theorems, Melnikov integral; 5. Codimension two bifurcation of equilibria in continuous-time dynamical systems: cusp bifurcation, Bautin bifurcation, Bogdanov-Takens bifurcation, fold-Hopf bifurcation, Hopf-Hopf bifurcation; 6. Codimension two bifurcation of equilibria in discrete-time dynamical systems: cusp bifurcation, generalized flip bifurcation, bifurcatia Neimark-Sacker bifurcation, resonance, fold-flip bifurcation. Numerical analysis of bifurcations. The XPP software.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Colloquim

2ST YEAR, 2ND SEMESTER

COURSE TITLE: ELEMENTS OF CRYPTOGRAPHY

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): To have a knowledge of the basic notions and principles of cryptology; to know the major cryptosystems with secret key, DES and AES; to study the most popular public-key cryptosystems and their security; to apply mathematical notions in solving applicative problems.
COURSE CONTENTS: A. Basic notions (2 courses): C_1: *Basic notions*. Information security and cryptography. Basic concepts. Brief history of cryptography; C_2: *Special classes of functions*: One way functions, trapdoor, hash. *Detecting error and methods of correction.Generating random numbers.* B. Symmetric-key encryption (4 courses): C_3: *Symmetric-key encryption*. Substitution cyphers: monoalphabetic (Cezar, affine), polialphabetic (Vigenere, Playfair, Hill). Cryptanalysis of such ciphers; C_4: *Data Encryption Standard* (*DES*). Product ciphers. Feistel cipher. Description of the cryptographic scheme DES. Utility of DES. Cryptosystems related with DES; C_5: *Various attacks on DES*. Meet in the middle, differential and linear cryptanalysis; C_6: *Advanced Encryption Standard*

(*AES*). History. Description of the finalist cryptosystems for AES (Mars, RC6, Serpent, Twofish). AES. C. Public-key cryptography (5 courses): C_7: Basic notions. The security of secret-key cryptosystems. Symmetric-key vs public-key cryptography; C_8: *RSA public-key cryptosystem*. Description. Implementation. *RSA* encryption in practice; C_9: *Security of RSA*. Relation to factoring. Small encryption exponent *e*. Message concealing. Another attacks; C_{10}: *El Gamal public-key cryptosystem*. Description. Security of discrete logarithms. Generalized El Gamal encryption; C_{11}: *Knapsack public-key encryption*. Merkle-Hellman encryption.Chor-Rivest public-key encryption; D. Digital signature (2 courses): C_{12}: Introduction. Basic notions.A classification of digital signature schemes and short presentation. Types of attacks on signature scheme; C_{13}: *RSA* signature and possible attacks. El Gamal signature. Digital standard signature (*DSS*); E. Data base security and secret sharing (1 course): C_{14}: Basic notions. Examples.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: THE MATHEMATICS OF CONTACT MODELS

CODE:
ECTS CREDITS: 8
TYPE OF COURSE: compulsory
COURSE OBJECTIVE(S): To familiarize the students with modern techniques of variational calculus; To give variational formulations for a class of contact models; To introduce the notion of weak solution for each proposed mechanical model; To study the existence, uniqueness and stability of the weak solution.
COURSE CONTENTS: A. Abstract variational problems: C_1: Variational equations; C_2: Stationary variational inequalities; C_3: Evolutionary variational inequalities; C_4: Quasi-variational inequalities; C_5: Stationary mixed variational problems; C_6: Evolutionary mixed variational problems; C_7: Systems of variational inequalities; B. Boundary value problems in Contact Mechanics: C_8: Frictionless bilateral contact problems in elastostatics; C_9: Frictionless unilateral contact problems in elastostatics; C_{10}: Frictional bilateral contact problems in elastostatics; C_{11}: Contact problem with prescribed normal stress and dry friction, in elastostatics; C_{12}: Bilateral contact problems with slip dependent friction, in elastostatics; C_{13}: Frictionless bilateral contact problems, in viscoelasticity; C_{14}: Frictional bilateral contact problems, in viscoelasticity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination

FIELD: PHYSICS
PROGRAMME TITLE: THEORETICAL PHYSICS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: QUANTUM FIELD THEORY
CODE: D2MTPM101
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Approach of field theories within the Standard Model of fundamental interactions based on the path integral formalism combined with perturbation theory straight-forwardly applicable to concrete situations of physical interest.
COURSE CONTENTS: 1. Field equations and conservation laws; 2. Free real and respectively complex scalar field; Classical Lagrangian formulation; 3. Free real and respectively complex scalar field; Generating functionals and associated Green functions; 4. Perturbation theory; General case; Application to the a¨ 4 model in order one; 5. a¨ 4 model; First-order approximation of associated Green functions; 6. a¨ 4 model; Feynman rules; 7. Free Dirac field. Classical Lagrangian formulation; Solutions to the Dirac equations; Spin; 8. Free Dirac field; Generating functionals and associated Green functions; 9. Abelian gauge field; Classical Lagrangian formulation; 10. Abelian gauge field; Generating functionals and associated Green functions; 11. General methods for constructing consistent interactions in field theories; Gauge theories with vector fields; 12. Quantum electrodynamics; First-order perturbation theory; 13. Quantum electrodynamics; Feynman rules.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (70% of the final grade), global exam (30% of the final grade)

COURSE TITLE: DYNAMICS OF DEGENERATE SYSTEMS
CODE: D2MTPM102
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): To describe the Hamiltonian dynamics of degenerate systems (constrained systems).
COURSE CONTENTS: 1. Introduction; 2. Variational principles for non-degenerate systems; 3. Degenerate systems; Primary constraints; Regularity conditions; Equations of motion in the presence of primary constraints; 4. Secondary constraints; Dirac's algorithm; 5. First-class and second-class functions; Separation of first-class and second-class constraints; Irreducible and reducible constraints; 6. Variational principles for degenerate systems; 7. Second-class constraints; Equations of motion in the presence of second-class constraints; The Dirac bracket; 8. The First-class constraints; Gauge transformations; 9. Extended Hamiltonian; Extended action; 10. Gauge fixing; Physical degrees of freedom; 11. Fermi degrees of freedom; Canonical formalim in the presence of odd variables; Constrained systems with odd variables.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (35% of the final grade), global exam (65% of the final grade)

COURSE TITLE: METHODS AND MULTISCALE PROBLEMS IN NUMERICAL SIMULATION
CODE: D2MTPM103
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Appropriate description of multiscale physical processes for numerical simulation approach.
COURSE CONTENTS: 1. Introduction and examples of multiscale processes; 2. Probability theory and stochastic processes; 3. Ordinary differential equations; Stochastic Differential Equations; Partial differential equations; Markov chains; 4. Averaging and homogenization of equations; 5. Multilevel methods for finite element methods; 6. Numerical simulations for multigrid methods; 7. Multiscale numerical simulations performed for fluids and plasma fusion.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: INTRODUCTION TO GENERAL RELATIVITY
CODE: D2MTPM104
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Relativistic picture of the gravitational field and of its interactions with matter fields.
COURSE CONTENTS: 1. Riemannian manifolds and associated geometric objects; 2. Equations of motion as geodesics on curved spaces; 3. Einstein's field equations; 4. Lagrangian formulations for gravitational field; 5. Vacuum solutions for Einstein's field equations; 6. Perturbative computations in Hilbert-Einstein gravity.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY
CODE: D2MTPM105
ECTS CREDITS: 2

TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility. Performing complex professional tasks in order to find effective and deontological solutions; Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labor market requirements.
COURSE CONTENTS: 1. Object, functions and issues of professional ethics and professional deontology; 2. Ethical and professional concepts of great philosophers; 3. Basic notions of professional ethics; 4. Professional Ideal and Its Types; 5. Debt and consciousness, their dialectical correlation in professional activity; 6. Moral experience in professional activity; 7. Use and perfection (excellence) in professional activity; 8. Problems of ethics and the moral character of professional activity; 9. Behavioral rules and their implications in the professional sphere; 10. Ethics applied; 11. New orientations in ethics and professional deontology; 12. Ecological ethics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (30% of the final grade), global exam (70% of the final grade)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: THEORY AND MODELING OF INSTABILITIES IN PLASMA
CODE: D2MTPM206
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Description of the main types of instabilities that are important for fusion plasmas in tokamaks.
COURSE CONTENTS: I. Fluid equations for low-frequency modes: Fluid motion perpendicular to the magnetic field; Conservation of the charge density and quasi-neutrality condition; The equation for energy; Finite Larmor radius effects; II. Analysis of low frequency modes; Drift waves; MHD type modes: modes of exchange, convective, twisting, kinetic Alfven waves; III. Kinetic description of low-frequency modes in non-homogeneous plasma fusion; Integration along unperturbed orbit; Drift kinetic equation; IV. Low-frequency modes in inhomogeneous magnetic fields; Toroidal mode structure; Influence of magnetic shear on drift waves; Drift kinetic equation; Gyrokinetic equation; Trapped particle instability; Reactive drift modes; Advanced fluid models; Reactive fluid modes for strong magnetic curvature; V. Instability associated with fast particles confined in toroidal systems; Dilution due to fast particles; "Fishbone" modes; Toroidal Alfven eigenmodes.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: HAMILTONIAN BRST SYMMETRY
CODE: D2MTPM207
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): To quantize first-class systems in the framework of the Hamiltonain Becchi-Rouet-Stora-Tyutin (BRST) formalism.
COURSE CONTENTS: 1. Introduction; 2. Graded differential algebras; Resolutions; Elements of homological perturbation theory; 3. First-class constraints; Equations of motion in the presence of first-class constraints; Algebraic structure of $C^{\infty}\left(\Sigma_{H}\right)$; Hamiltonian classical observables; 4. Hamiltonian BRST algebra; Basic requirements of the Hamiltonian BRST symmetry; Basic idea of the construction of the Hamiltonian BRST symmetry; Hamiltonian Koszul-Tate differential; Hamiltonian exterior longitudinal derivative; 5. Generalized Poisson bracket; BRST charge; Existence of the BRST charge; 6. Poisson algebra of BRST observables; Hamiltonian gauge-fixing procedure; Hamiltonian gauge fixed action; Hamiltonian path integral.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (35% of the final grade), global exam (65% of the final grade)

COURSE TITLE: KINETIC EQUATIONS
CODE: D2MTPM208
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Description and interpretation of the kinetic equations and of the transport in fluids.
COURSE CONTENTS: 1. The reduced distribution functions and correlations functions; 2. Vlasov equation; The mean field approximation; 3. Kinetic equation for weak coupling; Kinetic equation for dilute gases; 4. Kinetic equation for plasmas; 5. Properties of the kinetic equations; Hydrodynamics and transport; Balance equations; 6. Transport and autocorrelations functions; Critical phenomena; Percolations and fractals.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: MATHEMATICAL PHYSICS I
CODE: D2MTPM209
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Geometric meaning of the fundamental objects involved in Hamiltonian dynamics, field theory and general relativity.

COURSE CONTENTS: 1. Introduction; 2. Topological and differentiable manifolds; Tangent and cotangent spaces; Imersions, submersions and submanifolds; Tensors; 3. Vector bundles; Tangent and cotangent bundles; Vector fields Frobenius integrability theorem; Differential forms; De Rham complex; 4. Linear connections; Covariant derivatives; Curvatures; 5. Poisson algebras and manifolds; BF-like topological models and theirs associated Poisson structures.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: COHERENT OPTICS
CODE: D2MTPM210
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Knowledge and understanding phenomena in Coherent Optics.
COURSE CONTENTS: 1. Introduction to coherent optics; Complex representation of real polychromatic fields; 2. Interference in quasi-monochromatic light; The mutual intensity; 3. Propagation of mutual intensity; 4. The degree of coherence in the image of an extended incoherent quasi-monochromatic sources; 5. Calculation of mutual coherence for light from an incoherent source; 6. Temporal coherence and spatial coherence; 7. Polarization properties of quasi-monochromatic light; 8. The degree of polarization of light wave; 9. Wave equation for mutual coherence.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (50% of the final grade), global exam (50% of the final grade)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: NONLINEAR DYNAMICAL SYSTEMS
CODE: D2MTPM301
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Study of the integrability of nonlinear dynamical systems via symmetry methods.
COURSE CONTENTS: 1. Introduction; 2. Symmetries of the differential equations; 3. Variational and generalized symmetries of differential equations; 4. Invariants and classes of solutions; Similarity reduction method; 5. Symmetry groups and conservation laws; 6. Integrability of nonlinear dynamical systems; Lax method; 7. Soliton solutions for integrable dynamical systems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (35% of the final grade), global exam (65% of the final grade)

COURSE TITLE: MANY-PARTICLE PHYSICS
CODE: D2MTPM302
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Formulation of many-particle systems within the second quantization framework in the coherent state representation.
COURSE CONTENTS: 1. Second quantization; Many-body operators; 2. Second quantization; Creation and annihilation operators; 3. Second quantization; Fock space; Many-body operators in creation and annihilation operator representation; 4. Bosonic coherent states; Properties; 5. Fermionic coherent states; Properties; 6. Many-particle systems at finite temperature; Quantum grand canonical ensemble; 7. Many-particle systems at finite temperature; Imaginary-time path integral and partition function; 8. Many-particle systems at finite temperature; Coherent state path integral; 9. Many-particle systems at finite temperature; Partition function for many-particle systems in path integral form.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: MATHEMATICAL PHYSICS II
CODE: D2MTPM303
ECTS CREDITS: 7
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): To introduce and develop the rigorous algebraic framework of Mathematical Physics needed to describe and predict general results in High Energy Physics.
COURSE CONTENTS: 1. Main algebraic objects; 2. Fundamental and derivate categories of algebra; 3. Remarkable classes of algebras involved in theoretical physics; Lie algebras; Grassmann algebras; Clifford algebras; 4. Classification of Clifford algebras; 5. Classification of Lie algebras; 6. Representations of Lie groups/ algebras.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: PARTIALLY ORDERED SYSTEMS
CODE: D2MTPM304
ECTS CREDITS: 7
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE: Implementation of the theoretical aspects concerning partially ordered systems such as liquid crystals.
COURSE CONTENTS: I. Phase structures of calamitic liquid crystals; II. Phase transitions in

liquid crystals Charged particle in an electromagnetic field: action, equations of motion, conservation laws; III: 1 Synthesis of nematic liquid crystals; 2. Physical properties of nematic liquid crystals; 3. Applications; IV: 1. Chiral nematic liquid crystals; 2. Chiral nematics: physical properties and applications; V: 1. Non-chiral smectic liquid crystals; 2. Physical properties of non-chiral smectic liquid crystals; 3. Non-chiral smectic liquid crystals – applications.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: INTRODUCTION TO SUPERSYMMETRIES AND SUPERGRAVITY
CODE: D2MTPM305
ECTS CREDITS: 7
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Rigorous mathematical derivation of supersymmetric and locally supersymmetric field theories.
COURSE CONTENTS: 1. Irreducible representations of Poincare algebras; 2. Complex Clifford algebras; 3. Coleman and Mandula theorem; Supersymmetric extensions of the Poincare algebras; 4. One-particle representations of the supersymmetric algebras; 5. Quantum fields associated with supersymmetric algebras; SUSY-type theories; 6. Simple supergravity in D=4.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (40% of the final grade), global exam (60% of the final grade)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: LAGRANGIAN BRST SYMMETRY
CODE: D2MTPM406
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): To quantize gauge systems in the framework of the Lagrangian Becchi-Rouet-Stora-Tyutin (BRST) formalism.
COURSE CONTENTS: 1. Introduction; 2. Gauge invariances of the extended action; Gauge invariances of the total action; Gauge invariances of the Lagrangian action; 3. Gauge transformations; Noether identities; Trivial gauge transformations; Independent Noether identities; Generating sets; Open gauge algebras; 4. Algebraic structure of Lagrangian classical observables; Graded differential algebras; Elements of (co)homological algebra; 5. Lagrangian BRST algebra; Basic requirements of the Lagrangian BRST symmetry; Basic idea of the construction of the Lagrangian BRST symmetry; Lagrangian Koszul-Tate differential; Lagrangian exterior longitudinal derivative; 6. Antibracket; Classical master equation; Solution of the classical master equation; Non minimal solutions; 7. Gauge invariance of the solution to the classical master equation; Lagrangian gauge-fixing procedure; Lagrangian gauge fixed action; Lagrangian path integral; 8. Relationship between Lagrangian and Hamiltonian BRST symmetries.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (35% of the final grade), global exam (65% of the final grade)

COURSE TITLE: EXTENDED BRST SYMMETRIES
CODE: D2MTPM407
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Quantization of gauge systems in the setting of extended Becchi-Rouet-Stora-Tyutin (BRST) formalism.
COURSE CONTENTS: 1. Standard BRST symmetry; Brief review; 2. BRST-antiBRST symmetry: 2.1. Lagrangian BRST-antiBRST symmetry; The irreducible case; The reducible case; 2.2. Hamiltonian BRST-antiBRST symmetry. Batalin-Lavrov-Tyutin approach; Gregoire-Henneaux approach; 2.3. The equivalence between Lagrangian and Hamiltonian BRST-antiBRST formalisms; 3. sp(3) BRST symmetry: 3.1. Lagrangian sp(3) BRST symmetry. The irreducible case. The reducible case; 3.2. Hamiltonian sp(3) BRST symmetry; Generalization of Batalin-Lavrov-Tyutin formalism; Generalization of Gregoire-Henneaux formalism. Multi-level approach; 3.3. The equivalence between Lagrangian and Hamiltonian sp(3) BRST formulations; The irreducible case; The reducible case; 4. The equivalence between BRST-antiBRST and sp(3) BRST formalisms;. Hamiltonian approach. Lagrangian approach; 5. The equivalence between standard and sp(3) BRST formalisms; Hamiltonian approach; Lagrangian approach.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (25% of the final grade), global exam (75% of the final grade)

COURSE TITLE: INTERACTIONS IN FIELD THEORY
CODE: D2MTPM408
ECTS CREDITS: 6
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): Mathematical approaches to the problem of constructing consistent interactions in gauge field theories.
COURSE CONTENTS: 1. Standard formulation of the problem of constructing consistent interactions in gauge field theories; 2. Noether's method of solving the problem of constructing consistent interactions in gauge field theories; 3. Brief review of the anbracket-antifield BRST formalism; 4. Main cohomological results on the local BRST

cohomology; 5. Cohomological BRST reformulation of the problem of constructing consistent interactions in gauge field theories; Main equations of the deformation procedure; 6. Solving the main equations of the deformation procedure in terms of the local BRST cohomology in some generic cases; 7. Identification of the interacting gauge field theory from the fully deformed solution to the master equation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: THEORY OF SOLID STATE

CODE: D2MTPM409
ECTS CREDITS: 6
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): Description of theoretical aspects of solid state physics (specific terms, laws, and phenomena).
COURSE CONTENTS: 1. Schrodinger equation for crystalline solids; 2. Effective mass theory; Wave-packets in crystals and group velocity of electrons in solids; The effective mass theorem; 3. The electron gas; Electron-electron interactions in Rayleigh-Schroedinger perturbation theory; Spin-polarized electron gas and its region of stability; Failure of second-order perturbation theory; 4. Quasi-classical electron dynamics; Quasi-classical theory of electrical conductivity; 5. Magneto-transport Phenomena: Classical Magneto-transport Equations, Two Carrier Model, Dynamics of Electrons in a Magnetic Field; 6. Quantum Wells, Quantum Wires, Quantum Dots, Quantum Limit of Conductance, Quantum Capacitance & Quantum HALL Effect.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: SCIENTIFIC RESEARCH LABORATORY

CODE: D2MTPM410
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Development of students' scientific research skills; Elaboration and editing of a paper with a low difficulty level using some results from classwork activities; Oral presentation of this paper; Preparation and presentation of a scientific seminar on some scientific results obtained during classwork
LABORATORY CONTENTS: Classwork no. 1: Angular momentum-type constraints: constraint classification, ghost/ antighost spectrum, BRST charges, Hamiltonian BRST symmetry; Classwork no. 2: Hamiltonian BRST quantization of p-forms (Abelian and non-Abelian); Classwork no. 3: Consistent interactions in the Hamiltonian BRST formalism: general equations of the Hamiltonian deformation procedure, solution to the general equations, identification of the interacting theory. Examples: Chern-Simons-like models and BF theories; Classwork no. 4: First-class polynomial Poisson algebras: definition, the bracket structure, Jacobi identity, contracting homotopy, acyclicity of the Koszul-Tate differential, Hamiltonian BRST symmetry; Classwork no. 5: Spherically symmetric solutions of Einstein's equations without cosmological constant; Birkhoff's theorem; Classwork no. 6: Spherically symmetric solutions of Einstein's equations with cosmological constant; Birkhoff's theorem.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (100% of the final grade)

COURSE TITLE: ELABORATION OF THE MASTER DISSERTATION

CODE: D2MTPM411
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Completion, editing, and presentation of the master dissertation.
COURSE CONTENTS: 1. Choice and motivation of the dissertation topic; 2. Formulation of the objectives, working hypotheses, and research methodology; 3. Paper structuring and individual study of the chosen bibliography; 4. Research activities including specific computations; 5. Analysis and interpretation of the inferred results; formulation of conclusions; appendix-editing; 6. Completion of the paper by direct communication with the assigned supervisor; 7. Dissertation editing; elaboration of the oral presentation; 8. Solving other issues involved during the elaboration of the master dissertation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (100% of the final grade)

FIELD: PHYSICS
PROGRAMME TITLE: APPLIED PHYSICS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: NONLINEAR DYNAMICAL SYSTEMS

CODE: D2MAPHM101
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Study of the integrability of nonlinear dynamical systems via symmetry methods.
COURSE CONTENTS: 1. Introduction; 2. Symmetries of the differential equations; 3. Variational and generalized symmetries of differential equations; 4. Invariants and classes of solutions; Similarity reduction method; 5. Symmetry groups and conservation laws; 6. Integrability of nonlinear dynamical systems. Lax method; 7. Soliton solutions for integrable dynamical systems.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (35% of the final grade), global exam (65% of the final grade)

COURSE TITLE: MANY-PARTICLE PHYSICS

CODE: D2MAPHM102
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Formulation of many-particle systems within the second quantization framework in the coherent state representation.
COURSE CONTENTS: 1. Second quantization; Many-body operators; 2. Second quantization; Creation and annihilation operators; 3. Second quantization; Fock space; Many-body operators in creation and annihilation operator representation; 4. Bosonic coherent states; Properties; 5. Fermionic coherent states; Properties; 6. Many-particle systems at finite temperature; Quantum grand canonical ensemble; 7. Many-particle systems at finite temperature; Imaginary-time path integral and partition function; 8. Many-particle systems at finite temperature; Coherent state path integral; 9. Many-particle systems at finite temperature; Partition function for many-particle systems in path integral form.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (70% of the final grade), global exam (30% of the final grade)

COURSE TITLE: LASER MATTER INTERACTIONS

CODE: D2MAPHM103
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Understanding of fundamentals procceses and physical phenomena of laser matter intraction. Disccusion and expaining of experimental data.
COURSE CONTENTS: 1. Fundamentals of lasers; 2. Lasers used in thin film deposition; 3. Pulsed laser deposition technique; 4. Metals laser heating in reactive media; 5. Influence of laser spot; Radiative losses; Gaussian distribution in spot laser; 6. Laser absorption radiation; 7. Generated species at laser interaction with media; 8. Spectroscopic studies on plasma generated by laser; 9. Characterization of plasma generated by laser; 10. Growth of thin film by laser matter interaction; 11. Growth of biocompatible thin film by laser matter interaction.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (20% of the final grade), global exam (80% of the final grade)

COURSE TITLE: OPTICS OF ANISOTROPIC MATERIALS

CODE: D2MAPHM104
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): The main objective of the course is to accommodate students with the theoretical aspects, laws and experimental set-ups used in the optics of anisotropic materials such as liquid crystals.
COURSE CONTENTS: 1. Plane wave propagation in anisotropic materials; 2. The index ellipsoid; 3. Light propagation in uniaxial crystals; 4. Light propagation in biaxial crystals; 5. Oblique propagation in birefringent materials; 6. Quarter-wave plate and half-wave plate; 7. Induced anisotropy; 8. Optical activity; 9. Faraday rotation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY

CODE: D2MAPHM105
ECTS CREDITS: 2
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility. Performing complex professional tasks in order to find effective and deontological solutions. Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labor market requirements.
COURSE CONTENTS: 1. Object, functions and issues of professional ethics and professional deontology; 2. Ethical and professional concepts of great philosophers; 3. Basic notions of professional ethics; 4. Professional Ideal and Its Types; 5. Debt and consciousness, their dialectical correlation in professional activity; 6. Moral experience in

professional activity; 7. Use and perfection (excellence) in professional activity; 8. Problems of ethics and the moral character of professional activity; 9. Behavioral rules and their implications in the professional sphere; 10. Ethics applied; 11. New orientations in ethics and professional deontology; 12. Ecological ethics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (30% of the final grade), global verification (70% of the final grade)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: DIFFUSION OF POLLUTANTS IN THE ATMOSPHERE
CODE: D2MAPHM206
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Knowing the main pollutant diffusion models and equations that describe the diffusion of pollutants in the atmosphere.
COURSE CONTENTS: 1. Air pollution problems; 2. Sources of air pollution; 3. Statistical description of atmospheric turbulence; 4. Eulerian approach to describing diffusion; 5. Lagrangian approach to describing diffusion; 6. Turbulent diffusion.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (20% of the final grade), global exam (80% of the final grade)

COURSE TITLE: ADVANCED SEMICONDUCTORS, DIELECTRICS AND FERROELECTRICS
CODE: D2MAPHM207
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Students will be able to aproach the terminology, the laws and phenomena specific for advanced semiconductors, dielectrics and ferroelectrics, to explain and to apply them in new conditions.
COURSE CONTENTS: 1. Semiconducting heterostructures; Growing methods; Pseudomorphic structures; Hetero-sublayers; 2. Energy levels in heterostructures; Recombination mechanisms; 3. Semiconducting nanostructures: quantum dots, wires and wells; 4. Polarized semiconductors; Magnetic semiconductors; Organic semiconductors; 5. Dielectrics: Structure, chemical bonds, electric polarization mechanisms; 6. Electrical conduction in dielectrics; Metal-dielectric transition; 7. Dielectric breakdown; Dielectric relaxations; 8. Dielectric devices; 9. Introduction in quantum theory of ferroelectrics; 10. Introduction in thermodynamic theory of ferroelectrics; 11. Methods for studying the spontaneous electric polarization; 12. Ordering mechanisms; Ferroelectric domains; 13. Important ferroelectric materials; 14. Recent directions of research in the field of ferroelectrics.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (10% of the final grade), global exam (90% of the final grade)

COURSE TITLE: NMR AND ELECTRON MICROSCOPY
CODE: D2MAPHM208
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Theoretical and practical techniques of Nuclear Magnetic Resonance (NMR) and electron microscopy (EM) used in laboratory medicine and investigation.
COURSE CONTENTS: I. Basic principles of NMR: I.1 Structure of NMR spectra; I.2 Mathematical fundamentals and physical concepts of NMR; I.3 Fourier transform in NMR and data processing; I.4 Dynamic phenomena in NMR; I.5 Multipulse and multidimensional NMR; II. Medical applications of MRI: II.1 Fourier NMR imaging; II.2 MRI apparatus and instruments; II.3 Physiological bases of magnetic relaxation; II.4 Noise and image contrast in MRI; II.5 Effect of the movement in MRI imagery; II.6 Quick scan techniques; II.7 Magnetization transfer and rotating system; II.8 Phase MRI Imaging; II.9 Image artifacts in MRI; II.10 Flow Phenomena; II.11 Diffusion and perfusion. NMR investigations; II.12 Contrast agents in MRI imagery II.13 NMR spectroscopic techniques; Proton chemical shift imaging; II.14 Special security measures and MRI laboratory work; III. Electron microscopy: III.1 Electronic optics and electron microanalysis of samples; III.2 Electron microscopy and diffraction of surface electronic; III.3 Transmission electron microscopy applications in biology and medicine.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: INVESTIGATION METHODS APPLIED IN MEDICAL IMAGING
CODE: D2MAPHM209
ECTS CREDITS: 5
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): Knowledge of the physical processes and phenomena applied to biological systems especially to human body; Use of the principles and physical quantities to manipulate efficient and save the apparatus and medical devices by qualified people.
COURSE CONTENTS: 1. Introduction to medical imaging physics; 2. Structure of matter and application to biology/ medical imaging physics; 3. Medical imaging apparatus; 4. Laser applied in medicine. Radiation effects on life science; 5.

Ionized and non-ionized radiation: characteristics, interaction to tissue, radioprotection, medical applications; 6. Physical principles of medical Imaging (radiography, ultrasounds, computed tomography, magnetic resonance imaging, PET); 7. Medical imaging; Ultrasounds; Ultrasounds interaction with tissue; 8. X-ray diagnostics. Radiography. Computed tomography Wave equation for mutual coherence; 9. Magnetic resonance imaging; 10. Nuclear imaging; 11. Coherent optics. Tomography optics coherent; 12. Tomography optics coherent imaging.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (20% of the final grade), global verification (80% of the final grade)

COURSE TITLE: ACQUISITION AND EXPERIMENTAL DATA PROCESSING
CODE: D2MAPHM210
ECTS CREDITS: 5
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): Acquisition and processing of experimental data.
COURSE CONTENTS: 1. Types of data; Graphic representations; 2. Linear and nonlinear analysis; 3. Automatic data acquisition systems; 4. Programming languages (Labview, Simulink, Matlab); 5. Virtual experiments; 6. Interpolated and fitted data; Interpretation of results; Estimations; 7. Statistical data processing; 8. Automatic data processing using appropriate software.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (60% of the final grade), global exam (40% of the final grade)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: ELECTROMAGNETIC INTERACTIONS IN MATERIAL MEDIA
CODE: D2MAPHM301
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Students have to know the electromagnetic phenomena from the living world and to understand how the electromagnetic field interact with this world.
COURSE CONTENTS: 1. Insulators and conductors in electromagnetic media; 2. Magnetic properties of material media. The interaction with a magnetostatic media; 3. Stationary electric currents in conducting media; 4. Foucault currents; Pellicular effect; 5. Thermoelectric effects; 6. Electromagnetic waves in material media; 7. The electromagnetic radiation in material media.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (35% of the final grade), global exam (65% of the final grade)

COURSE TITLE: METHODS AND MULTISCALE PROBLEMS IN NUMERICAL SIMULATIONS
CODE: D2MAPHM302
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Appropriate description of multiscale physical processes for numerical simulation approach.
COURSE CONTENTS: 1. Introduction and examples of multiscale processes; 2. Probability theory and stochastic processes; 3. Ordinary differential equations; Stochastic Differential Equations; Partial differential equations; Markov chains; 4. Averaging and homogenization of equations; 5. Multilevel methods for finite element methods; 6. Numerical simulations for multigrid methods; 7. Multiscale numerical simulations performed for fluids and plasma fusion.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: METHODS AND TECHNIQUES FOR NANOMATERIAL CHARACTERIZATION
CODE: D2MAPHM303
ECTS CREDITS: 7
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE: Students will be able to approach, describe and use the modern techniques of physical properties characterization of materials at nanometric level.
COURSE CONTENTS: 1. Optical microscopy; 2. Scanning Electron Microscopy-SEM, Transmission Electron Microscopy-TEM; 3. Scanning Probe Microscopy (Scanning Tuneling Microscopy-STM, Atomic Force Microscopy-AFM); 4. X Ray Analyses (X-Ray Energy Dispersive X-Ray Spectroscopy-EDS, Wavelength Dispersive X-Ray Spectroscopy-WDS, X-Ray Diffraction-XRD); 5. Focalized Ion Beam (FIB); 6. Mass Spectrometry/ Residual Gases Analzsis (Masspec/ RGA); Secondary ion mass spectrometry (SIMS); 7. Fourier Transform Infrared Spectrometry (FTIR); 8. Auger Electrons Spectroscopy (Auger, AES); 9. Raman Spectroscopy.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: THERMAL PROCESSES IN MATERIALS
CODE: D2MAPHM304
ECTS CREDITS: 7
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE: A comprehensive understanding of concepts, laws and phenomena specific to thermal processes in materials.
COURSE CONTENTS: 1. Introduction; Various models for crystals vibrations; 2. Thermal

dilatations; 3. Caloric capacity; Several factor contributions; 4. Thermal conduction and conductivity; 5. Warming and cooling the materials in thermal experiments; 6. Cooling curves analysis; 7. Various techniques for thermal analysis of the materials; 8. Thermo-gravimetric analysis; 9. Material dilatation analysis; 10. Thermal conductivity and thermal diffusivity of solids.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (20% of the final grade), global exam (80% of the final grade)

COURSE TITLE: PLASMA PHYSICS AND MATERIALS PROCESSING

CODE: D2MAPHM305
ECTS CREDITS: 7
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE: Knowledge of plasma fundamentals, plasma applications and diagnostic methodes.
COURSE CONTENTS: 1. Introduction to plasma physics. Plasma parameters. Debye length. Quasineutrality of plasma; 2. Diffusion and mobility. Free diffusion. Ambipolar diffusion. One - dimensional timp dependent solution. One-dimensional steady state solution; 3. Kinetic theory of plasma. Fluid equations; 4. Diagnostics of plasma by Langmuir probes. Diagnostics of plasma by emission and absorption spectroscopy; 5. Mass spectroscopy; 6. Plasma chemistry and surface processing; 7. X-ray diffraction method. X-ray characterization of thin film. X-ray reflectometry; 8. Plasma sources; 9. Non thermal reactive plasma; 10. Atmosferic plasma pressure; 11. High pressures microdischarges; 12. High pressure plasmas; Dielectric barrier discharge; Corona discharge; 13. Polimer surface processing by low temperature plasma; 14. Cold plasma sterilisation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (20% of the final grade), global exam (80% of the final grade)

COURSE TITLE: KINETIC EQUATIONS

CODE: D2MAPHM406
ECTS CREDITS: 8
TYPE OF COURSE: mandatory, synthesis
COURSE OBJECTIVE(S): Description and interpretation of the kinetic equations and of the transport in fluids.
COURSE CONTENTS: 1. The reduced distribution functions and correlations functions; 2. Vlasov equation. The mean field approximation; 3. Kinetic equation for weak coupling. Kinetic equation for dilute gases; 4. Kinetic equation for plasmas; 5. Properties of the kinetic equations; Hydrodynamics and transport. Balance equations; 6. Transport and autocorrelations functions; Critical phenomena. Percolations and fractals; 7. The reduced distribution functions and correlations functions.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: NONLINEAR OPTICS

CODE: D2MAPHM407
ECTS CREDITS: 6
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Knowledge and understanding phenomena in nonlinear optics.
COURSE CONTENTS: 1. Introduction; 2. The constitutive relation; 3. Review of quantum mechanics; 4. The susceptibility tensor; 5. Symmetry properties; 6. Resonant nonlinearities; 7. Wave propagation and processes in nonlinear media; 8. Dynamic optical nonlinearities in semiconductors; 9. The optical properties of artificial materials.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: PHYSICAL BASES OF THE APPLICATIONS OF THE LASERS IN MEDICINE

CODE: D2MAPHM408
ECTS CREDITS: 6
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): The main objective of the course is to accommodate students with the theoretical aspects, laws and experimental set-ups used in the physical bases of the applications of the lasers in medicine.
COURSE CONTENTS: 1. Lasers for biofotonics; 2. Properties of laser radiation; 3. Tissue optics; 4. Laser-tissue interactions; 5. Medical laser systems; 6. Medical applications; 7. Diagnostic uses of lasers.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (40% of the final grade), global exam (60% of the final grade)

COURSE TITLE: COHERENT OPTICS

CODE: D2MAPHM409
ECTS CREDITS: 6
TYPE OF COURSE: optional, deepening
COURSE OBJECTIVE(S): Knowledge and understanding phenomena in Coherent Optics.
COURSE CONTENTS: 1. Introduction to coherent optics. Complex representation of real polychromatic fields; 2. Interference in quasi-monochromatic light; The mutual intensity; 3. Propagation of mutual intensity; 4. The degree of coherence in the image of an extended incoherent quasi-monochromatic sources; 5. Calculation of

mutual coherence for light from an incoherent source; 6. Temporal coherence and spatial coherence; 7. Polarization properties of quasi-monochromatic light; 8. The degree of polarization of light wave; 9. Wave equation for mutual coherence.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current exam (30% of the final grade), global exam (70% of the final grade)

COURSE TITLE: SCIENTIFIC RESEARCH LABORATORY

CODE: D2MAPHM410
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Development of students' scientific research skills; Thinking and writing of a paper with low difficulty level using some results from classworks; Preparing and delivering the oral presentation of the paper; Preparing and presenting a scientific seminar on some scientific results obtained at classworks.
LABORATORY CONTENTS: Classwork no. 1: Characteristics of the ripple structure in nematic dyes-doped liquid crystals; Classwork no. 2: Magnetic properties of magnetorheological elastomers; Classwork no. 3: Study of the parameters for an optical coherent tomography set/up; Classwork no. 4: Ordinary differential equations; Partial differential equations; Stochastic differential equations; Physical models; Classwork no. 5: Quantitative analysis of pollutants using plasmas; Classwork no. 6: Dynamics of the mesoscale atmospheric circulation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (100% of the final grade)

COURSE TITLE: ELABORATION OF THE MASTER DISSERTATION

CODE: D2MAPHM411
ECTS CREDITS: 5
TYPE OF COURSE: mandatory, deepening
COURSE OBJECTIVE(S): Completion, editing, and presentation of the master dissertation.
COURSE CONTENTS: 1. Choice and motivation of the dissertation topic; 2. Formulation of the objectives, working hypotheses, and research methodology; 3. Paper structuring and individual study of the chosen bibliography; 4. Research activities including specific computations; 5. Analysis and interpretation of the inferred results; formulation of conclusions; appendix-editing; 6. Completion of the paper by direct communication with the assigned supervisor; 7. Dissertation editing; elaboration of the oral presentation; 8. Solving other issues involved during the elaboration of the master dissertation.
LANGUAGE OF INSTRUCTION: English
ASSESSMENT METHOD(S): Current verification (100% of the final grade)

FIELD: CHEMISTRY
PROGRAMME TITLE: CHEMISTRY OF BIOLOGICALLY ACTIVE COMPOUNDS
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED SEPARATIONS AND PURIFICATIONS OF BIOLOGICALLY ACTIVE COMPOUNDS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It aims to accustom future specialists with techniques of separation and purification of compounds that are of practical interest. They have important implications in modern manufacturing technologies or in the protection of environment.
COURSE CONTENTS: 1. Necessity for advanced separation and purification processes; The classification of separation methods; 2. Interphase equilibrium; Measure of separations efficiency; 3. Separation in the presence of ion exchangers; Selectivity and equilibrium exchange of ion exchangers; 4. Column liquid chromatography; 5. High-resolution gas chromatography; 6. Thin layer chromatography (TLC); Analytical applications; 7. Determinations by chromatogram; Automatic processing of chromatographic data; 8. Chromatographic extraction; 9. Solvent extraction particularities as a method of purification and concentration; 10. Concentration and inhibition of extraction; 11. Techniques of advanced concentration and purification by extraction; 12. Extraction systems used for advanced concentration and purification.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation

COURSE TITLE: BIOSENSORS BASED ON CHEMICHALLY MODIFIED ELECTRODES

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The discipline aims to train students about the construction and utilisation of sensible ion – selective sensors and their application in controlling the quality of life.
COURSE CONTENTS: 1. General characteristics of enzymatic sensors; 2. Types of biosensors; 3. Constructive and operating principles of enzymatic sensors; 4. Immobilization of enzymes; Enzymatic sensors response; 5. Enzymatic thermistors; 6. Microbial biosensors; 7. Amperometric biosensors; 8. Analytical applications of enzymatic sensors for determination of some compounds used as carbon sourses in culture medium; 9. Utilisation of biosensors in the control of quality of environment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written exam (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: ECOTOXICOLOGY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course aims at providing students with basic principles of Ecotoxicology. The intention of the course is for students to: classify the pollutants according to their chemical structure and fate in the environment; understand the effects of pollutants at different ecological levels; understand the principles of toxicity testing, risk assessment and monitoring; develop skills of specific experimental investigation; build capacity for data analysis, synthesis and communication of scientific information.
COURSE CONTENTS: a. Pollutants and their fate in ecosystems; b. Effects of pollutants on individual organisms; Toxicity testing; c. Effects of pollutants on populations and communities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 60% of the final grade – final written exam; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation

COURSE TITLE: INORGANIC SYNTHESES AND STRUCTURAL ANALYSIS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The aim of this course is the presentation and understanding of several modern synthesis methods and structure analysis methods for inorganic compounds, of the relationship between their structure and properties, as well as their main applications. Based on theoretical notions, several syntheses of inorganic compounds of technical interest will be performed. Their structure and properties will be evidenced.
COURSE CONTENTS: a. Theoretical considerations on fine inorganic synthesis control; b. Inorganic compounds with catalytic properties: synthesis, properties, industrial applications; c. Inorganic compounds with electrical properties; Conductors, semiconductors, superconductors, insulators: synthesis, properties and applications in electrotechnics, space technologies, informatics; d. Inorganic compounds with magnetic properties; Metals and alloys, oxides of transition metals etc; Synthesis, properties and applications; e. Inorganic compounds with biological properties; Synthesis, properties and applications; f. Cluster compounds;

Synthesis, properties and applications; Bi-, tri-r, tetra-, penta-, and hexa-nuclear clusters; Nonstoichiometric compounds: rutile and fluorite-type mono- and di-oxides, sulphurs, tellurides; Synthesis, structural characteristics, applications; g. Other inorganic compounds with technical applications; Composite materials; Synthesis, properties and applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – exam; 30% of the final grade – lab examination

COURSE TITLE: ETHICS AND PROFESSIONAL DEONTOLOGY

CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialty discipline, compulsory
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility; Performing complex professional tasks in order to find effective and deontological solutions; Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labor market requirements.
COURSE CONTENTS: a. Object, functions and issues of professional ethics and professional deontology; b. Ethical and professional concepts of great philosophers; c. Basic notions of professional ethics; d. Moral experience in professional activity; e. Problems of ethics and the moral character of professional activity; f. Behavioral rules and their implications in the professional sphere; g. New orientations in ethics and professional deontology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – verification; 30% of the final grade – seminar activity)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: MOLECULAR AND BIOMOLECULAR ELECTROCHEMISTRY OF BIOLOGICALLY ACTIVE COMPOUNDS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course aims: to make students to acquire fundamentals of electrode phenomena (electrochemical oxidation and reduction of organic compounds); to familiarize students with an interdisciplinary field of electrochemistry and organic chemistry. In laboratory work for this course will be determined: the shape of intensity-potential curves in simple systems, intensity equations of current-potential curves in simple systems and the corresponding voltammograms electrooxidation and/ or electroreduction of biomolecules.
COURSE CONTENTS: Electrochemical principles; Techniques for the investigation of electrode reactions; Manipulation of experimental parameters; Electrochemical oxidation mechanisms; Electrochemical reduction mechanisms; Electrochemical cleavage of simple bond; Electrochemical reduction of multiple bond; Electrochemistry of conjugated systems; Electrochemical oxidation processes; Electrocatalysis; Electrogenerated reagents; Electrochemistry of biomolecules.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (80% of the final grade – examination; 20% of the final grade – assessment of laboratory reports)

COURSE TITLE: BIOLOGICALLY ACTIVE MACROMOLLECULAR COMPOUNDS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Knowledge and appropriate use of subject-specific concepts: types of bioactive polymers that can be used as carriers for drugs, biological activity being performed or macromolecule as a whole, or small molecular compound; refer to the biocompatible polymer applications in various medical sectors and the importance polymers as potential substances bioactive.
COURSE CONTENTS: 1. Properties of biologically active polymers; 2. Biocompatibily of polimers; 3. Complecs polymer drugs; 4. Psysiologically active synthetic polymers; 5. Types of bioctive polimers; 6. Aplications of polymers in medicine.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – final written paper; 20% of the final grade – laboratory colloquium; 20% of the final grade – report documentation)

COURSE TITLE: ORGANIC SYNTHESIS APPLIED IN THE MEDICINE INDUSTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course describes some of the most important synthetic drugs. Drugs are listed by pharmaceutical effects. Among them are studied: antiseptics, disinfectants and chemotherapy drugs, central nervous system depressant drugs, central nervous system stimulant drugs acting on the vegetative nervous system, histamine and antihistamine drugs, drugs used in diseases the circulatory system, Medicines used in respiratory diseases and drugs used in diseases of the digestive apparatus. The last part is mentioned contrast and diagnostic substances used in medical investigations. In each class of substances were chosen examples of compounds whose chemical syntheses are described and applications that they have.

COURSE CONTENTS: 1. Introduction; Antiseptic drugs and disinfectants; Quaternary ammonium salts; Biguanide, furan, acridine and phenothiazine derivatives; 2. Bacteriostatic sulfonamides; History; Structure and biological activity relationship, synthesis methods, raw materials and intermediates; Representatives: isoxamide sulfonamide, pyrimidine sulfonamides, long-acting sulfonamides; 3. Antibiotics; Penicillins, penicillin structure, synthesis of penicillin V, iodometric determination of penicilineolor, ampicillin synthesis and microbiological determination; 4. Antibiotics; Cephalosporin: C cephalosporin synthesis, cephalothin, cephaloglycin and cephalexin; Streptomycins: structure, representatives, obtaining; Tetracyclines: structure, representatives, biochemical synthesis; 5. Antibiotics; Chloramphenicol; Structure, optical isomers, and biological activity; Synthesis of chloramphenicol; Synthesis of raw materials necessary to obtain chloramphenicol; Quantitative determination of chloramphenicol; Antimycotics; Synthesis of clotrimazole and buclosamide; 6. Antituberculosis drugs; Synthesis of PAS; The mechanism of action of PAS; Synthesis of isoniazid; Ethionamide synthesis; Synthesis of pyrazinamide; 7. Neurotonic drugs: phenoxyacetic acid derivatives; Local anesthetics: alkaloid with tropanic nucleus, obtaining of cocaine, procaine and cincocain synthesis; 8. Parasympathomimetics; Choline and methacholine; Core-imidazole alkaloids: pilocarpine, determination of the structure and synthesis; Spasmolytics; Atropine; Adifenine; Scopolamine-structure and synthesis; Synthesis of papaverine and the intermediaries by Pictet method; 9. General inhalation anesthetics: Hydrocarbons, halogen compounds, and ethers; General intravenous anesthetics: Barbiturates and thiobarbituric derivatives, synthesis of propanidid and hexobarbital; Hypnotic agents: tertiary amyl alcohol, chlorobutanol, ureides; Barbiturates: obtaining barbituric acid, barbital, phenobarbital; Diazepine derivatives: synthesis of nitrazepam; 10. Sedative drugs; Synthesis of phensuximide, phenytoin, trimethadione, chlorpromazine, carbamazepine; Derivatives of phenothiazine: phenothiazines, chlorpromazine; Tranquilizing drugs: meprobamat, hydroxyzine, diazepam, chlordiazepoxide, rudotel; 11. Antiparkinsonian drugs and myorelaxant drugs; Trihexyphenidyl, mefenexin, flexin; Antipyretic drugs; Phenacetin, aspirin, paracetamol, pyrazolidine -3,5-dione derivatives, Anthranilic acid derivatives, indomethacin sinthesis; Analgesics, narcotics; Obtaining and biological action of morphine; 12. Stimulant drugs acting on the central nervous system; Psychomotor stimulants: caffeine derivatives and purine-8-methylcaffeine; Synthesis of amphetamine and methamphetamine; Bulbar stimulants: nikethamide synthesis; Curarisant drugs; Curare alkaloids, quaternary ammonium salts; Drugs used in disorders of the circulatory system; Procainamide, nitroglycerine; Histamine and antihistamines: histamine synthesis, chlor-phenoxamine, Cyclizine.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Examination (written paper at the end of the course)

COURSE TITLE: PRACTICE

CODE:

ECTS CREDITS: 3

TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): Verify the applicability and consolidation of theoretical knowledge, skills and professional competencies training for successful labor market absorption.

COURSE CONTENTS: 1. Installations and technological flows with registration of normal working parameters used in biosynthesis industries; 2. The use of measurement and control equipment for verifying the technological phases parameters and the proper functioning of equipment, section or biotechnological processes; 3. Acquiring concepts of quality assurance of products; 4. Acquiring Labs working methods for controlling raw materials, intermediate and finished products, with possibility of some analyzes execution with high accuracy; 5. Organization and management of medical analysis laboratories.

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Verification (50% of the final grade – written paper; 50% of the final grade – practice notebook)

COURSE TITLE: BIOACTIVE COMPLEX COMBINATIONS

CODE:

ECTS CREDITS: 6

TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): This course aims to develop two aspects: (i) synthesis and analysis of inorganic compounds and (ii) coordination compounds of biocations involved in life processes. An in-depth investigation of biologically active coordinative compounds will be provided.

COURSE CONTENTS: 1. Coordination chemistry and its importance for biological structures; Ligands; Coordination numbers and stereochemistry of transition metal complexes; Chemical bond in complex compounds; Complex compounds stability; Chemical reactivity of complex compounds; 2. Chemical elements in biological systems; 3. Transition metals in enzyme active sites; 4. Biological ligands; 5. Coordination chemistry of cobalt in cobalamin; 6. Platinum-based complex compounds with antiviral and antitumor activity; 7. Therapeutic active complexes: preparations with aminoacids, calcium, aluminium, arsenic, antimony, bismuth, iron, cobalt, silver, gold, zinc,

mercury; 8. Synthetic chelates – models for biological systems
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written paper; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: SYNTHESIS AND RETROSYNTHESIS IN ORGANIC CHEMISTRY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course presents strategies for achieving the synthesis of organic molecules based on the variety of sintons. Target molecules are divided in sintons and based on known reaction mechanisms are chosen right sintons, or their equivalents in real molecules. After establishing of real reagents, are selected most suitable chemical transformations based on known organic reactions, which finally the target molecules are synthesized.
COURSE CONTENTS: 1. Overview; Target molecule; Retrosynthetic analysis; Split or disconnection; Sinton; Reagent; 2. Finding out strategic bonds from target molecules: split near a functional groups; Symmetry and disconnection; Split in a cyclic chain; Split to an heteroatom; Recognition of functional equivalence; Activation and protection; Defunctionalization; Stereo-chemistry; 3. Monofunctional sinton; Heteroatom split: monovalent functional exchange, reduction or oxidation, synthesis of alkanes, amines, alkenes, alkyne, trivalent functions by functional exchange; Split in aromatic series; Heteroatom double splitting; Carbon-carbon cleavage; 4. Multiple sinton: Split strategic bonds 1-2; Split strategic bonds 1-3; Split strategic bonds 1-4; Split strategic bonds 1-5; Split strategic bonds 1-6; 5. Synthesis of cycles: Trigonal cycles; Tetragonal cycles; Pentagonal cycles; Hexagonal cycles; Heterocycles; 6. Selectivity: Chemoselectivity; Regioselectivity; Diastereoselectivity; Enantioselectivity.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (written paper at the end of the course)

COURSE TITLE: NANOPOROUS HYBRID MATERIALS AND THEIR APPLICATIONS

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Presentation of the basic concepts of synthesis, characterization and applications of hybrid materials which have a great impact in many directions for future development. Students will be familiarized with both systematic and scientific approach on choosing and designing a hybrid material for a particular application as well as on finding new applications based on the characteristics and properties of the hybrid materials.
COURSE CONTENTS: 1. Hybrid materials; Introduction; 2. Nanocomposites polymer /inorganic particles; 3. Hybrid organic/ inorganic particles; 4. Intercalation compounds and clay-based nanocomposites; 5. Porous Hybrid Materials; 6. Procedures for obtaining sol-gel hybrid organic/ inorganic materials; 7. Materials based on polisilsesquinoxans; 8. Natural and artificial hybrid biomaterials; 9. Applications of hybrid materials in medicine; 10. Hybrid materials for optical applications; 11. Hybrid materials for electronic and electrochemical applications; 12. Surface protection by coatings based on inorganic/ organic hybrids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – written paper; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

FIELD: CHEMISTRY
PROGRAMME TITLE: APPLIED CHEMISTRY
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: ADVANCED SEPARATIONS AND PURIFICATIONS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It aims to accustom future specialists with techniques of separation and purification of compounds that are of practical interest. They have important implications in modern manufacturing technologies or in the protection of environment.
COURSE CONTENTS: 1. Necessity for advanced separation and purification processes; The classification of separation methods; 2. Interphase equilibrium; Measure of separations efficiency; 3. Separation in the presence of ion exchangers; Selectivity and equilibrium exchange of ion exchangers; 4. Column liquid chromatography; 5. High-resolution gas chromatography; 6. Thin layer chromatography (TLC); Analytical applications; 7. Determinations by chromatogram; Automatic processing of chromatographic data; 8. Chromatographic extraction; 9. Solvent extraction particularities as a method of purification and concentration; 10. Concentration and inhibition of extraction; 11. Techniques of advanced concentration and purification by extraction; 12. Extraction systems used for advanced concentration and purification.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation

COURSE TITLE: NANOPOROUS HYBRID MATERIALS AND THEIR APPLICATIONS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Presentation of the basic concepts of synthesis, characterization and applications of hybrid materials which have a great impact in many directions for future development. Students will be familiarized with both systematic and scientific approach on choosing and designing a hybrid material for a particular application as well as on finding new applications based on the characteristics and properties of the hybrid materials.
COURSE CONTENTS: Hybrid materials – Introduction; Nanocomposites polymer/ inorganic particles; Hybrid organic/ inorganic particles; Intercalation compounds and clay-based nanocomposites; Porous Hybrid Materials; Procedures for obtaining sol-gel hybrid organic/ inorganic materials; Materials based on polisilsesquinoxans; Natural and artificial hybrid biomaterials; Applications of hybrid materials in medicine; Hybrid materials for optical applications; Hybrid materials for electronic and electrochemical applications; Surface protection by coatings based on inorganic/ organic hybrids.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – written examination; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report

COURSE TITLE: INORGANIC SYNTHESES AND STRUCTURAL ANALYSIS

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The aim of this course is the presentation and understanding of several modern synthesis methods and structure analysis methods for inorganic compounds, of the relationship between their structure and properties, as well as their main applications. Based on theoretical notions, several syntheses of inorganic compounds of technical interest will be performed. Their structure and properties will be evidenced.
COURSE CONTENTS: a. Theoretical considerations on fine inorganic synthesis control; b. Inorganic compounds with catalytic properties: synthesis, properties, industrial applications; c. Inorganic compounds with electrical properties; Conductors, semiconductors, superconductors, insulators: synthesis, properties and applications in electrotechnics, space technologies, informatics; d. Inorganic compounds with magnetic properties; Metals and alloys, oxides of transition metals etc; Synthesis, properties and applications; e. Inorganic compounds with biological properties; Synthesis, properties and applications; f. Cluster compounds; Synthesis, properties and applications; Bi-, tri-r, tetra-, penta-, and hexa-nuclear clusters; Nonstoichiometric compounds: rutile and fluorite-type mono- and di-oxides, sulphurs, tellurides; Synthesis, structural characteristics, applications; g. Other inorganic compounds with technical applications; Composite materials; Synthesis, properties and applications.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 70% of the final grade – written exam; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report

COURSE TITLE: ECOTOXICOLOGY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory

COURSE OBJECTIVE(S): The course aims at providing students with basic principles of Ecotoxicology. The intention of the course is for students to: classify the pollutants according to their chemical structure and fate in the environment; understand the effects of pollutants at different ecological levels; understand the principles of toxicity testing, risk assessment and monitoring; develop skills of specific experimental investigation; build capacity for data analysis, synthesis and communication of scientific information.
COURSE CONTENTS: a. Pollutants and their fate in ecosystems; b. Effects of pollutants on individual organisms; Toxicity testing; c. Effects of pollutants on populations and communities.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): 60% of the final grade – final written exam; 20% of the final grade – continuous assessment of lab activity; 20% of the final grade – oral presentation

COURSE TITLE: ETHICS AND PROFESSIONAL DEONTOLOGY
CODE:
ECTS CREDITS: 4
TYPE OF COURSE: specialty discipline, compulsory
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility; Performing complex professional tasks in order to find effective and deontological solutions; Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labor market requirements.
COURSE CONTENTS: a. Object, functions and issues of professional ethics and professional deontology; b. Ethical and professional concepts of great philosophers; c. Basic notions of professional ethics; d. Moral experience in professional activity; e. Problems of ethics and the moral character of professional activity; f. Behavioral rules and their implications in the professional sphere; g. New orientations in ethics and professional deontology.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (70% of the final grade – verification; 30% of the final grade – seminar activity)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: ENVIRONMENTAL ELECTROCHEMISTRY
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Understanding of redox principles involved in environmental chemistry; Knowledge and understanding of electrochemical techniques involved in pollutant treatment and environmental remediation; Knowledge of electrochemical systems with favorable impact on the environment or involved in the evaluation of environment quality.
COURSE CONTENTS: a. Redox reactions and the environment; b. Environmental remediation processes using membranes; c. Electrochemical treatment of waste water; d. Electrokinetic remediation of soil; e. Electrochemical sensors for environmental quality monitoring; f. Environmental friendly electrochemical cells for power generation and storage.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade –written exam; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

COURSE TITLE: UNCONVENTIONAL METHODS (CLEAN) USED IN ORGANIC SYNTHESIS
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Presentation of unconventional and green methods used in the synthesis of organic compounds. The advantages of these methods are compared with the results obtained in the synthesis of the same compounds in the classical organic synthesis.
COURSE CONTENTS: 1. Introduction; Overview of solvents: solvent use in organic chemistry (nucleophilic reagents, catalysts, solvated agents – kinetic effects and effects on equilibrium position, oxidizing and/ or dissociation agents). Solvents classification; 2. Organic syntheses without solvents; Organic reactions on solid supports; Syntheses without solvent, support, catalyst; Free solvent phase transfer catalysis; 3. Sonochemical organic syntheses; Overview about ultrasounds; Cavitation phenomena; Equipments; Ultrasound advantages; Types of sonochemical synthesis; 4. Organic syntheses with the help of microwaves; Overview of microwaves; Electric field effect on substances; The advantages of using microwaves; Types of reactors; Microwave applications in organic synthesis; 5. Combinatorial organic chemistry; Introduction; Syntheses and combinatorial libraries; Methods of separation of compounds from combinatorial library; Methods of synthesis of combinatorial libraries; Synthesis of combinatorial libraries; Examples.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam

COURSE TITLE: REDOX PROCESSES INVOLVED IN THE DISSOLUTION OF MINERALS AND THEIR EFFECT ON THE ENVIRONMENT POLLUTION
CODE:
ECTS CREDITS: 7
TYPE OF COURSE: specialty discipline, optional
COURSE OBJECTIVE(S): Students should be able to address and explain the processes and phenomena

specific to contamination of the environment with toxic metals, arsenic, antimony, etc.; Using expertise to conduct experiments. Explaining and interpreting experimental results; Application of modern concepts and theories in the field of environment for the development of new projects using a wide range of innovative solutions.
COURSE CONTENTS: 1. Kinetics of mineral dissolution processes; Major redox couples and distribution of active redox species; 2. Surface characteristics and their effect on the dissolution of minerals; The model of complexation of active groups on the surface; 3. Applications of complex modelling of active groups on the surface for the dissolution of minerals; The Generalized law of dissolution; Catalysis of redox reactions by the surface of minerals; 4. Redox dissolution of minerals; 5. The implications of mineral dissolution; Effect of mineral dissolution on bio-geo-chemical cycles of elements; Effect of mineral dissolution on plant and animal health.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 30% of the final grade – lab examination)

COURSE TITLE: PRACTICE

CODE:
ECTS CREDITS: 3
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Deepen the theoretical knowledge and develop practical skills acquired during study period.
COURSE CONTENTS: 1. Technological flux analysis; 2. Evaluation of technological process impact on the environment; 3. Handling measuring and control devices to check the characteristic parameters of technological process; 4. Analysis and application of environmental protection laws and regulations; 5. Study of the documentation procedure for environmental authorization; 6. Human resources management in host institution.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (50% of the final grade – oral examination; 50% of the final grade – practice notebook)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: CORROSION INHIBITORS AND FIELDS OF USE

CODE:
ECTS CREDITS: 7
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The course is aimed at students from the Faculty of Science, the second year, the first semester, Master: Environmental Quality. This subject provides information about: (i) the theoretical aspects of corrosion processes based on fundamental principles of thermodynamics and on mechanisms of electrochemical reactions; (ii) better corrosion management using inorganic and organic inhibitors with a high protection degree. Laboratory work relates the following aspects: the determination of corrosion rate of metals in various aggressive environments, in the absence and in the presence of inhibitors; the calculation of activation parameters related to dissolution reactions.
COURSE CONTENTS: 1. Corrosion and combat it; 2. Corrosion protection by inhibitors; 3. Impact Factors on corrosion inhibition process; 4. The action mechanism of corrosion inhibitors; 5. Application areas of corrosion inhibitors; 6. Corrosion inhibitors for acidic and alkaline environments; 7. Other areas of application of corrosion inhibitors; 8. Corrosion inhibitors for water; 9. Corrosion prevention in organic media; 10. Methods used for testing of corrosion inhibitors efficiency.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam and oral examination (70% of the final grade – exam; 20% of the final grade – assessment during the semester; 10% of the final grade – assessment of laboratory reports)

COURSE TITLE: PHYSICAL METHODS OF TRACES ANALYSIS

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): It aims to accustom future specialists with the techniques of analysis of very low concentrations (10^{-6}- 10^{-4} M) known as traces. They have special implications in modern manufacturing technologies or in environmental protection.
COURSE CONTENTS: 1. Influence of elements in traces on the properties of different materials; 2. Atomic absorption spectrometry (AAS); 3. X-ray fluorescence; 4. Electron probe microanalysis; 5. Mass spectrometry; 6. Polarographic key; 7. Radiopolarography; 8. Stripping analysis; 9. Kinetic methods in traces analysis; 10. Use of enzymes in traces analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – laboratory exam; 10% of the final grade – documentation)

COURSE TITLE: CHEMICAL-ANALYTICAL CONTROL OF THE ENVIRONMENT QUALITY

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): Training of specialists and their familiarization with the case study in choosing the method of analysis, chemical analysis methodology, quality standards and regulations for

chemical-analytical control of the environment quality.
COURSE CONTENTS: 1. Overview; Sampling and samples preparation for measurement of pollutants; 2. Analytical methods using detector tubes for fast sampling with direct reading; 3. Methods of the atomic spectrometry; Analytical application for pollutants determination; 4. Methods of the molecular spectrometry; Analytical application for pollutants determination; 5. Separation methods used in the chemical-analytical control of the environment quality; Examples of chromatographic separations for pollutants determination; 6. Aspects of automation in analytical control of pollutants; 7. Quality control and quality assurance of physico-chemical methods of analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – written examination; 20% of the final grade – evaluation of practical skills; 10% of the final grade – scientific report)

COURSE TITLE: THE LEGISLATION REGARDING ENVIRONMENTAL PROTECTION

CODE:
ECTS CREDITS: 5
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): The objective of the discipline is the acquiring of the concepts of environmental legislation by the students.
COURSE CONTENTS: Introduction to Law; The law; Definition and Etymology; Legal norms and its sources; Introduction to environmental law; Object definitions and concepts specific to the environment; Functions; Fundamental principles and sources of environmental law; Place and role of environmental law in the legal system; The legal environmental law; Environmental protection; Institutional framework; Environmental protection – goal and scope; Protection of natural resources and biodiversity; Environmental regulation of hazardous activities; Legal liability in environmental law; Concept, forms and legal liability in environmental law system; Tort liability in environmental law; Regulations by special laws of strict liability in environmental law; Civil action in environmental protection; Liability offenses; Criminal liability in environmental law; The specific of environmental penalties; Renewable energy; Definition, classification and shapes; National legislation on renewable energy regime; Renewable energy market; Community legislation and international environmental law; Harmonization of Romanian legislation with the EU legislation; Study on the American legal system; State responsibility.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Verification (30% of the final grade – continuous evaluation; 70% of the final grade – final evaluation)

COURSE TITLE: INDUSTRIAL POLLUTANTS AND METHODS DEPOLLUTION

CODE:
ECTS CREDITS: 6
TYPE OF COURSE: fundamental, compulsory
COURSE OBJECTIVE(S): getting acquainted with and characterizing the main industrial pollutants; getting acquainted with the problems regarding industrial pollution and with the methods regarding its prevention and abatement.
COURSE CONTENTS: 1. Pollution Sources, the Nature of Pollutant Agents and Effects of Atmospheric Pollution; 2. Industrial Pollutant Gases: Carbon Monoxide, Nitrogen Oxides, Sulphur Oxides, Hydrogen Sulfide; 3. Pollutant Organic Compounds Resulting from Industrial Processes; 4. General Methods of Industrial Gases Purification; 5. Catalytic Technologies Applied in Air Protection; 6. Processes and Procedures of Industrial Wastewaters Treatment; 7. Catalytic Methods of Chemically Polluted Waters Treatment.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Exam (70% of the final grade – exam; 20% of the final grade – lab examination; 10% of the final grade – paper [documentation])

FIELD: GEOGRAPHY
PROGRAMME TITLE: TOURISM AND SUSTAINABLE DEVELOPMENT
MASTER'S DEGREE

1ST YEAR, 1ST SEMESTER

COURSE TITLE: TOURISM AND REGIONAL DEVELOPMENT

CODE: D11TDDM101
ECTS CREDITS: 7
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Acquiring the ability to correctly use the concepts specific to the regional development approach of tourism and the complex process of regionalization and organization; Identifying, defining and describing the main notions related to the regional development of tourism, regional taxonomic units, concepts, laws, processes and geographic phenomena, as well as the basic methods of the field.
COURSE CONTENTS: Introductory elements, types of regions, definitions, role of regions; Criteria for delimiting the geographic regions; The principles of tourist regionalization; Romania and the regional development instruments; Tourist regions of Romania; The basic objectives of the regional development policies applicable in the field of tourism; Romania – towards a model of a regional-sustainable tourist destination; Myths of regionalization; Strengths of Romania's regionalization – towards a model of a regional-sustainable tourism destination. Seminar activities include the following topics: Analysis of regional concepts, tourist region, area, tourist point, etc.; The methodology of regional tourism analysis: tourism indicators used in quantitative tourism analyses; Analysis and types of tourist regions; Regionalization vs. Decentralization The European Tourism Regionalization – examples; Romania's tourist regionalization; the taxonomic units of the tourist regionalization: definitions, examples; The tourist infrastructure of Romania; Elaboration of a paper on the *Regionalization of the X area/ county/ city of Romania*.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers seminars)

COURSE TITLE: POLICIES AND STRATEGIES FOR SUSTAINABLE DEVELOPMENT

CODE: D11TDDM102
ECTS CREDITS: 4
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Analysis of disparities: causes, effects, mode of manifestation; Presentation of the main instruments of sustainable development policy; Developing the students' ability to understand the functioning of each policy.
COURSE CONTENTS: The fundamentals of sustainable development; Concept, principles, objectives; Pillars of sustainable development: human resources (population) and natural resources; Pillars of sustainable development: capital, technology (innovation), information; Sustainable development indicators; Paradigms in Sustainable Development: Poverty Economy: North-South and East-West Differences, Social and Economic Asymmetries and Inequalities; Controversy between private / social advantages, errors, frauds, failures; National Strategy for Sustainable Development in Romania; Costs of sustainability; Possibilities of self-support and need for support; European funds and funding. Seminar activities include the following topics: Objectives and principles of sustainable development; Typology and tools of sustainable development; Sustainable development priorities: education, conservation of energy resources, environmental protection; Limits and costs of sustainable development; Positive and negative externalities; Economics, society and environment in the context of sustainable development; Structural Adjustments – National Strategies; Structural instruments and social cohesion; Local and regional development.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (50% of the final grade – answering during the examination, 50% of the final grade – answers at the seminary activity)

COURSE TITLE: GEODEMOGRAPHIC RESOURCES IN TOURISM

CODE: D11TDDM103
ECTS CREDITS: 6
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Investigating, analysing, interpreting and evaluating the geodemographic component within the tourism system; Identifying and analysing the link between geodemography and tourism, as well as the argumentation of the role of the human factor in the development of tourism; Differentiated interpretation of various demographic types in the emergence and development of tourist flows; Development of skills and knowledge necessary to work in tourism industry through the demographic component.
COURSE CONTENTS: Introductory notions; Population distribution; Physical and geographic, economic and socio-historical factors of the differentiated distribution of the world population; Numerical evolution of the population; Population-resources ratio; Population density; Demographic structures; The ethno-linguistic structure of the population and the impact on tourism supply; Migrations; Causes, dimensions, classification, consequences; Demographic risks; Areas of potential major conflicts; Typologies of the world population; Disparities of the human development

index and implications in tourism activity; Indicators of human resources; Workforce in tourism; The intrinsic and extrinsic qualities of the tourism decision-makers. Seminar activities include the following topics: Numerical evolution of the population on continents in the 20^{th} -21^{st} centuries; Demographic transition; Regional and national differences; The demographic trap; Causes and perspectives of the population numerical projection; Density of the population: general, net, pure, urban, rural, physiological; Spatial differences; General demographic balance - spatial differentiation; Demographic indicators; Correlations between the level of economic development and the share of urban population; Population structure by age group and gender; Analysis of structures by economic sectors; Crime and unemployment; Areas of potential conflict; Income of the population and the allocation of funds for tourism.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – answering during the examination, 30% of the final grade – answers at the seminary activity)

COURSE TITLE: WINE TOURISM. POTENTIAL AND SUSTAINABLE CAPITALIZATION

CODE: D11TDDM104
ECTS CREDITS: 4
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): to gain knowledge about the conceptual framework of the sustainable capitalization of vine and wine potential through tourist activities; to become familiar with and analyse the most important infrastructure and touring models linked to wine tourism offer and demand; to become initiated in the correct use and systemic interpretation of notions connected to wine science and to wine tourism components, in the present legislative, scientific and practical framework; to become familiar with the present practical-applicative characteristics of wine tourism; to elaborate professional and/or research projects by innovatively using various qualitative and quantitative methods that are specific to the tourist sector; to apply the principles and methods specific to the domain in the framework of specialised IT applications in order to achieve and analyse required graphic or cartographic products.
COURSE CONTENTS: Introduction in vine and wine tourism; The conceptual framework of wine tourism; The main characteristics of demand and offer within the wine tourism context; The initiation and development of wine tourism products; The main actors on the wine tourism market; Traditional capitalization of vine potential and modern wine tourism in Europe; case studies: France, Italy, Spain; Wine tourism in the *New World of Wine*; Traditional capitalization of vine resources and wine tourism potential in Romania. Seminar activities include the following topics: The main wine regions/estates in Romania and their relationships with the tourist infrastructure; Means and forms of promotion for the Romanian wine tourism: present state and perspectives; Stimulating and restrictive elements connected to the Romanian wine tourism; Perception of the value and of the sustainable capitalization of wine tourist potential in Oltenia; Wine estates with specialised tourist offer in Oltenia – fieldtrip;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers at seminar)

COURSE TITLE: RELIEF TOURISM POTENTIAL AND ITS CAPITALIZATION

CODE: D11TDDM105
ECTS CREDITS: 6
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Presentation of reports between relief and tourism activity under different aspects.
COURSE CONTENTS: Geomorphosites; Evaluation of geomorphosites; The report between tourist activity and relief; Assessment of the importance of relief for tourism; Tourism importance of meteorological processes; Tourism importance of gravitational processes; The tourist valances of the river relief, of the glacial relief; Coastal and Aeolian relief and importance for tourism; Petrographic, structural, volcanic relief; The tourist facilities in the mountainous areas and the favourability of the relief for ecological tourist facilities; The impact of the geomorphological processes on tourism facilities and the tourism facilities on the relief. Seminar activities include the following topics: Representation of relief elements on tourist maps; Identification of reliefs on geological maps; Identify relief forms on topographic maps; Identification of relief forms on tourist maps; The inventory morphosites; The morphosite description sheet; Mapping of geomorphosites in the mountainous area; Mapping of geomorphosites in low regions; Models of the mountainous area; Coastal and coastal space patterns; Application on the tourist maps with identification of the relief forms that constitute support and resource for tourism activities; Case study structural relief; Case studies - karst relief, glacial relief
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam answers, 30% of the final grade – final answers at seminar)

1ST YEAR, 2ND SEMESTER

COURSE TITLE: TOURISM AND SUSTAINABLE DEVELOPMENT

CODE: D11TDDM207
ECTS CREDITS: 7
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): To acquire the ability to use correctly the concepts specific to the tourism and sustainable development approach and to organize its own system of values with an internal logic appropriate to the subject matter; Understanding the correlation between tourism resources, environment, population and sustainable economic development; Understanding the slogan of sustainable development: "To think globally, to act locally" and its application to tourism.
COURSE CONTENTS: Ecotourism vs. mass tourism; The concept of Sustainable Development; Ecology in tourism or the ecology of tourism; Sustainable tourism; Tourism + Sustainable Development = Sustainable Tourism; Tourism in the perspective of sustainability; Sustainable tourism as a business opportunity in times of crisis; Sustainable tourism and green economy. Practical activities include the following topics: Analysis of tourism potential concepts: tourist region, area, tourist point, etc.; Methodology of regional tourism analysis: tourism indicators (tourist density, seasonality, average duration of stay, etc.;) used in quantitative tourism analyses; Tourist market: tourist supply and demand; Tourist potential vs. Tourist heritage; Travel Resources vs. Tourist attractions – examples; Romania's natural tourism potential; Romanian Anthropogenic Tourism Potential; Romania's tourism regionalization; taxonomic units of the tourist regionalization: definitions, examples; The tourist infrastructure of Romania; Tourist flows on the Romanian territory; Analysis of tourism forms specific to each type of tourist potential in Romania; Ways to promote Romania's tourist potential in advertising materials; Elaboration of a report on the Capitalization of the tourism potential of the X area/ county/ town of Romania.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to seminars)

COURSE TITLE: TOURISM CAPITALIZATION AND DEVELOPMENT OF LITTORAL REGIONS

CODE: D11TDDM208
ECTS CREDITS: 7
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): to define the specific notions regarding coastal regions; to compare patterns of tourism valorisation in coastal regions; to gain knowledge about the patterns of tourism development of the main Mediterranean coastal tourist destinations; to apply the indicators used in the tourist development of coastal regions; to gain detailed knowledge about the stages of coastal holyday planning on the Internet.
COURSE CONTENTS: The forms and the notions of coastal relief; The Mediterranean islands; Tourist planning of coastal areas – criteria, norms and landscaping patterns; Types of tourism specific to coastal regions; Tourist frequency and seasonality in coastal tourism; Development Strategies and International Projects on Coastal Tourism; Impact of tourist activities on coastal regions; Sustainability in coastal tourism; Romanian seaside tourism – evolution and perspectives. Practical activities include the following topics: Tourist capitalization of coastal regions: Europe, Africa, Asia, North America and South America; Tourist exploitation of the Mediterranean coastal regions: Spain, France, Italy, Croatia, Greece, Turkey; Indicators used in tourist development of coastal regions; Romanian seaside vs. Bulgarian seaside; Planning holidays with coastal destinations – simulation for the Mediterranean islands.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to practical laboratory work)

COURSE TITLE: MANAGEMENT OF NATURAL AND ANTHROPOGENIC HAZARDS WITH IMPACT ON TOURISM

CODE: D11TDDM209
ECTS CREDITS: 7
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Identifying, defining and describing the main notions, concepts, laws, processes and geographic phenomena, as well as the basic methods used in the field; Analysis and interpretation of qualitative and quantitative geographic data and information in a socio-economic and territorial context; Specification of the characteristic geographic methods and terminology for conceptualizing, realizing and interpreting the elaborated geographic studies; Critical, constructive interpretation and evaluation of the solutions offered to the social actors.
COURSE CONTENTS: Introductory elements: defining notions and concepts, classifications; Concerns at national and international level; Geological and geophysical risks: earthquakes, volcanic eruptions, tsunami; Prediction and evaluation; Identification and application for Romania; Geomorphological hazards: slope processes (avalanches, landslides, collapses, drops, stones), erosion processes; Risk evaluation; Possible climate hazards in the cold season of the year (blizzard, snow, frost, etc.) and throughout the year (fog); Risk evaluation; Possible climatic hazards during the hot season of the year (haze, fog, extreme heat, heat, drought and dryness) and

throughout the year (fog); Risk evaluation; Biological hazards: epidemics, rodent invasions and grasshoppers; Risk evaluation; Technological hazards: industrial accidents, nuclear, oil, conflict, terrorism; Risk evaluation. Seminar activities include the following topics: Natural and anthropogenic hazards; Seismic hazards; Geomorphological and soil degradation; Avalanches; Climate hazards; Addressing the climate risk phenomena in Romania; Hydro-meteorological hazards; Integrated environmental element assessment in the context of floods; Technogenic hazards.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to seminars)

COURSE TITLE: LEGAL AND INSTITUTIONAL FRAMEWORK OF TOURIST ACTIVITIES

CODE: D11TDDM210
ECTS CREDITS: 7
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): to use the concepts, theories, techniques and instruments specific to the law area in order to understand and interpret the economic and legal phenomena connected to the legal and institutional framework of tourist activities; to gain capacity of operating with data and information specific to the domain, in theoretical and practical terms; to apply the specific Romanian and European legislation, as well as the other international legal instruments; to use the current legislation in the analysis of legal situations, in their correct legal framing and in deciding on the proper resolution.
COURSE CONTENTS: Trade companies – institutional framework for tourist activities; General notions; The establishment of trade companies; Conditions of the establishment; Formalities in the establishment of trade companies; The existence of the trade company as a legal entity; The acquirement of legal personality; The identification of the trade company; The legal capacity of trade companies; The organisation and functioning of the trade company; The deliberation and decision bodies; The administration and leadership bodies; The management control bodies; The transformation of the trade company; The bonds issued by trade companies. Seminar activities include the following topics: Trade companies – institutional framework for tourist activities; General notions; The establishment of trade companies; Conditions of the establishment; Formalities in the establishment of trade companies; The existence of the trade company as a legal entity; The acquirement of legal personality; The identification of the trade company; The legal capacity of trade companies; The organisation and functioning of the trade company; The deliberation and decision bodies; The administration and leadership bodies; The management control bodies; The transformation of the trade company; The bonds issued by trade companies; The cessation of the existence of a trade company.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (80% of the final grade – exam answers, 20% of the final grade – final answers at seminar)

2ND YEAR, 1ST SEMESTER

COURSE TITLE: MARKETING OF TOURISM SERVICES

CODE: D11TDDM312
ECTS CREDITS: 7
TYPE OF COURSE: study, optional
COURSE OBJECTIVE(S): to gain deeper knowledge and to strengthen the concepts specific to marketing development in the tourist services field; to offer the working methods and instruments that are specific to marketing and that allow the marketing activity planning and the elaboration of a marketing plan.
COURSE CONTENTS: The marketing in tourism – content and functions; The marketing conditions of the tourist business; The tourist market; The behaviour characteristic to the service consumers and to the personnel of service provider companies; Tourist marketing policy and strategies in seasonality conditions; Tourist product policy; Tourism distribution policy; Tourism prices and tariffs policy; Tourism promotion policy; Staff policy; The marketing plan in tourism. Seminar activities include the following topics: The origins and development of marketing; The tourist market – assessment indicators, research methods and techniques; The seasonal planning of tourist activities; The prices in tourism; price strategies in tourism; Promotional campaigns of the tourism company.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers at seminars)

COURSE TITLE: MANAGEMENT OF TOURIST DESTINATIONS

CODE: D11TDDM313
ECTS CREDITS: 7
TYPE OF COURSE: study, optional
COURSE OBJECTIVE(S): to communicate the macroeconomic management notions also at local and regional levels; to develop the abilities related to the comprehension and the analysis of issues implied by the strategic approach of tourist destinations development.
COURSE CONTENTS: The management of local and regional development: models, processes and procedure; The management of tourist activity at macroeconomic level and at territorial level; The financing of investments in tourist destination

development projects; The strategic management of the tourist destination: mission, vision, strategic objectives, strategic levels and competitive advantages; The strategic management of the tourist destination: typology of strategic operations – specialization, diversification, integration, internationalization, fusion and acquisitions; The analysis of the behaviour of tourism consumers; The life cycle of a tourist destination; Control and monitoring; Brand management; Tourism networks and clusters managements; Consortiums, alliances and partnerships. The seminar includes the following topics: Stakeholders – the balance of power and interests; The diagnosis of resources and competences; Transportation and tourist destinations; Evolution models of tourist destination enthronization/ urbanization; Decisional methods used in the financing of tourist investments; The life cycle of a tourist destination; case-study; The management of tourist portfolio of products and services (the offer promoted by a tourist destination); Tourism and social identity; The anatomy of tourist experience.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written examination (80% of the final grade – exam answers, 20% of the final grade – final answers at seminar)

COURSE TITLE: GIS UTILIZATION IN TOURISM

CODE: D11TDDM314
ECTS CREDITS: 7
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Use of specific software for mapping products and touristic services; the use of spatial modelling and spatial modelling databases. Developing the capacity to analyse and interpret data and metadata regarding tourism activities.
COURSE CONTENTS: Introduction to geographic information systems; Mapping projection systems and Georeference; Creating databases for territorial analysis; Managing geographic data; The main geoprocessing tools; Using spatial analysis for geographic data processing; Digital maps; GIS applications in tourism planning; GIS applications in ecotourism planning; GIS applications in tourism services management; Using GIS to inventory tourism resources; Monitoring and control of tourism activities; Using GIS in tourism marketing; GIS decision-making tool in tourism activities. Practical activities include the following topics: GIS data management; Compilation and recording of data; Digital mapping and visualization; Geographic analysis; Spatial modelling of tourism activity data.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Examination (100% essay)

COURSE TITLE: TOURISM IN PROTECTED AREAS

CODE: D11TDDM315
ECTS CREDITS: 6
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Developing skills to investigate the tourist market in protected areas and promote ecotourism marketing, analysis of ecotourism market profile, flows and tourism resources in protected areas.
COURSE CONTENTS: Types of tourist activities in protected areas; Mountain hiking, nature observation and photography – the main forms of practicing tourism in protected areas; Ethical codes and behaviour rules in protected natural areas; The natural potential of the protected areas; Tourism in protected areas and local communities. Seminar activities include the following topics: Tourist resources in protected areas in Romania; Case Study; Ecotourism activities; Ecotourism market and ecotourism marketing; The profile of the ecotourism market; Case study; Promoting tourist destinations in protected areas; Tourism in protected areas and mountain farming.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (70% of the final grade – exam, 30% of the final grade – practical assignment)

COURSE TITLE: DEVELOPMENT AND TOURIST CAPITALIZATION OF THE RURAL SPACE

CODE: D11TDDM316
ECTS CREDITS: 6
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): To use the main definitions, concepts, general principles and notions regarding the organization of the tourist space, as well as the geographic components of the organization of the rural tourist space; To identify the components of rural tourism; To render the historical context of the Romanian rural tourism, evolution, characteristics, current legislative framework; To achieve the internal and external analysis of the Romanian village for its design as a tourist product.
COURSE CONTENTS: Development and tourism valorisation of rural space; Definition, content, terminology, concept, strategy, comparative analysis between the European and Romanian rural areas; Romanian rural tourism; General characteristics: the assets and limits of the Romanian village as a unique tourist product destined for the domestic and world market; Romanian rural tourism; History, evolution, specifics, priorities, concrete measures to align with market requirements; Diagnosis of the Romanian village for the design of rural tourism products; Policies and models for tourism development in the rural environment; Rural tourism pensions; Tourist settlement of rural localities in Romania. Seminar activities include the following topics: Identification

of the components of rural tourism; Elaboration of scenarios for the capitalization of rural space through tourism – case studies; Possible transformations due to tourist activities in rural areas – case studies; Conceiving tourism development models for rural communities – case studies;
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (50% of the final grade – examination, 50% of the final grade – practical assignment)

COURSE TITLE: ETHICS AND PROFESSIONAL DEONTOLOGY

CODE: D11TDDM317
ECTS CREDITS: 4
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Use of specific elements of deontology and professional responsibility; Performing complex professional tasks in order to find effective and deontological solutions; Assuming effective multidisciplinary work techniques and vocational training for insertion and adaptation to labour market requirements.
COURSE CONTENTS: Object, functions and issues of professional ethics and professional deontology; Ethical and professional concepts of great philosophers; Basic notions of professional ethics; Professional Ideal and Its Types; Debt and consciousness, their dialectical correlation in professional activity; Moral experience in professional activity; Use and perfection (excellence) in professional activity; Problems of ethics and the moral character of professional activity; Behavioural rules and their implications in the professional sphere; Ethics applied; New orientations in ethics and professional deontology; Ecological ethics. Seminar activities include the following topics: Genesis and the content of the notions of "ethics" and "moral"; Professional virtues and professional vice; The notion of "equity" and its ethical values in professional activity; The notion of "perfection" and ways of obtaining it; Principles of ethics and professional integrity; Quote and plagiarism, the right to criticism, confidentiality, censorship and self-censorship; Professional Conflict and Solving It; Deontological regulations; Ethical code for geography specialists.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral verification (70% of the final grade – exam, 30% of the final grade – seminar activities)

2ND YEAR, 2ND SEMESTER

COURSE TITLE: REGIONAL COMPETITIVITY IN TOURISM

CODE: D11TDDM418
ECTS CREDITS: 6
TYPE OF COURSE: synthesis, optional
COURSE OBJECTIVE(S): to identify, define and describe the main concepts, notions and basic indicators used to analyse the regional competitiveness in tourism; use specific indicators to analyse the competitiveness of touristic destinations and products in order to increase their national and international value; to use and apply basic methods and principles of specific software to generate cartographic material; to identify the geographical methods and to use the specific terms to conceptualize, realize and interpret the geographical studies elaborated.
COURSE CONTENTS: Competitiveness – condition of success on market; Definitions and elements used for measuring regional competitiveness; Regional competitiveness in tourism – specific elements of tourism competitiveness; Competitiveness of touristic destinations – destinations and products, problems of marketing and consumers; The competitiveness of touristic products; Services – competitiveness factor in tourism; The competitiveness of Romanian and European tourism; Increasing the competitiveness of Romanian touristic product; National and regional competitiveness in conditions of crisis; Examples of success; Clusters as a support in increasing the competitiveness of touristic activity. Seminar activities include the following topics: Definitions and elements used for measuring regional competitive-ness: case study Romania; competitiveness index in tourism – case study Romania vs. Bulgaria; Touristic product – main component in marketing; Case study "Poiana Brașov"; Promoting touristic products that have an exceptional (unique) natural or anthropic component; Factors that influence competitiveness of touristic companies – creativity and innovation; touristic services and innovation; Analysing the Romanian touristic industry in the context of global economy; National and regional competitiveness in conditions of crisis; Examples of success; Field trip.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Project and written verification (40% of the final grade – project, 10% of the final grade – written examination; 30% of the final grade – practical activity; 10% of the final grade – activity and responses during lectures)

COURSE TITLE: QUALITATIVE AND QUANTITATIVE TECHNIQUES OF ANALYSIS AND PROGNOSIS IN TOURISM

CODE: D11TDDM419
ECTS CREDITS: 6
TYPE OF COURSE: synthesis, optional
COURSE OBJECTIVE(S): Assimilation of the conceptual structure regarding the typology of the research: quantitative and qualitative analysis, understanding the importance and correct correlation of the research typology with the information used in the analytical approach.

COURSE CONTENTS: Theoretical background: scientific research epistemology; Data theory, their typology and their interpretation in a research approach; Collection and analysis of data; The role of statistics in data analysis; Quantitative analysis methods; Qualitative methods of data analysis; Techniques for analysing the content of communication; Quantification, methods and techniques applied in research; Consequences, limits and errors of quantification. Seminar activities include the following topics: Practical application; Quantitative data analysis methods: cost identification, benefit identification, cost-benefit analysis, cost-effectiveness analysis, risk and uncertainty assessment; Qualitative methods of data analysis: interview, focus-group, opinion poll, participatory observation, internet mediated research; Forecasting Methods: Scenario Method; Statistical analysis tests; Text as a qualitative analysis tool; Image analysis.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Written verification (60% of the final grade – project, 40% of the final grade – practical activity)

COURSE TITLE: HERITAGE PLANNING AND MANAGEMENT

CODE: D11TDDM420
ECTS CREDITS: 7
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Understand the conceptual structure for practicing heritage planning and management in order to capitalize it for tourism; proper use of the notions specific for the disciplines; understand the research principles and methods and identification of the reality on the field; comparative analysis of the planning and management of heritage from various states and for different heritage categories.
COURSE CONTENTS: Natural and cultural heritage – basic terminology; World heritage Convention – key concepts; Heritage management – concept, principles, objects; Types of tourism planning; Management of natural and cultural heritage; Identification and delineation of areas with important heritage and location of tourism infrastructure; Planning and management of coastal areas; Planning and management of protected areas; Planning and management of mountainous areas; Models for planning balneal resorts; Planning and management of cultural sites; Planning and management of rural tourism; National policies for heritage management. Seminar activities include the following topics: Operational components of planning the tourism space; Diagnosis of the territory – premise of tourism planning; Receiving capacity of a territory; Indices and norms for tourism planning; Types of heritage planning and management; Case studies: coastal areas, protected areas, mountainous areas for winter sports, balneal resorts; Strategies for tourism planning.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (project)

COURSE TITLE: ASSESSMENT OF THE IMPACT OF TOURISM ACTIVITIES ON THE ENVIRONMENT

CODE: D11TDDM421
ECTS CREDITS: 7
TYPE OF COURSE: study, compulsory
COURSE OBJECTIVE(S): Understanding the concept of sustainable development and its applicative connotations; Analysing and comparing different definitions of environmental impacts; Investigating the contemporary issues of sustainable tourism with an emphasis on the "conflicting" objectives between tourism and the need for protection; Analysing and comparing different methods of environmental impact assessment of tourism in protected areas; Assessing the contribution of ecotourism to protecting biodiversity.
COURSE CONTENTS: Sustainable development of tourism activities; Between scientific paradigm and operational notion; Definitions; Conceptual Models of Sustainable Development; Evolution of the concept of "sustainable development" and territorial connotations; Indicators of the impact of tourism on the environment; Systems of environmental indicators; Tourism between economic activity and sustainable development; Typology of environmental impact tourism; Romania's Sustainable Tourism Strategy; Ecotourism in protected areas; Tourism – environment relationship. Seminar activities include the following topics: Environmental indicators – categories, representation; Categories of impacts of tourism on natural relief units; Cartographic representation of environmental dysfunctions induced by tourism activity; Sustainable Tourism in Protected Areas – case studies, on types of protected areas; Photo/ video projection – geographic spaces in different stages of implementation of environmental tourism; Sustainable development through sustainable tourism in ... – Presentations of students' papers.
LANGUAGE OF INSTRUCTION: Romanian
ASSESSMENT METHOD(S): Oral examination (70% of the final grade – examination, 30% of the final grade – projects)

COURSE TITLE: TOURISM PROMOTION AND IDENTITY

CODE: D11TDDM422
ECTS CREDITS: 7
TYPE OF COURSE: synthesis, compulsory
COURSE OBJECTIVE(S): Understanding how destination image creation strategies should be adopted throughout the lifecycle of the tourism product; Understanding price strategies; Knowing the strategic choices in distribution; Definition and

characterization of distribution channels; Knowing the elements of the communication system; Highlighting the requirements for effective communication and promotion.

COURSE CONTENTS: Introductory notions regarding tourist identity – destination image – tourist brand; Destination image-significance and representation patterns; Methods to measure the destination image; Destination management; The tourist market – tourist demand and consumption; The tourist market – the characteristics of the tourist supply; Tourism product – peculiarities and typology; Tourism product strategies; Creating a thematic travel product; Tourism pricing strategies; Tourism distribution strategies; Tourism advertising; Public relations in tourism; Promote sales of the tourist product. Seminar activities include the following topics: Analysis of tourism identity and image concepts; Influence of the events, films, celebrities, etc. on the image and promotion of a tourist destination; Actions and strategies applied to tourist destinations during times of economic crisis; The role of the state, alliances, clusters, networks in the promotion and development of tourist destinations; Analysis of Romania's tourism promotion campaigns; Elaboration of a report entitled "*Analysis of the X destination image in the online environment*".

LANGUAGE OF INSTRUCTION: Romanian

ASSESSMENT METHOD(S): Written examination (70% of the final grade – exam answers, 30% of the final grade – final answers to seminar activities)

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