UNIVERSITY "POLITEHNICA" OF BUCHAREST
FACULTY OF ENGINEERING IN FOREIGN LANGUAGES
MECHANICAL ENGINEERING in ENGLISH LANGUAGE, 2020-2021

CONTENT OF THE LECTURES FROM THE STUDY PLAN
14 Weeks/semester

Legend: "Ver" = evaluation form (E=exam in exam session, C or V = semester evaluation)
"C" = Lectures (hours/week); "S" = Tutorial; "L" = Labwork; "P"=Project
From the *optional subjects*, only one of the two will be taught, depending on students' choice.
The *facultative subjects* will be taught only if a sufficient number of students choose them, to form the group.

I Year, 1st semester

			Denumire RO	An 1/Sem 1	Ver	C	S	L	P	ECTS
1	1	UPB.12.F.01.O.001EM	Analiza matematica I	Calculus I	E	3	2			6
2	2	UPB.12.F.01.O.002EM	Algebra liniara	Linear Algebra	E	2	2			4
3	3	UPB.12.F.01.O.003EM	Grafica inginereasca I	Engineering Graphics I	C	1		2		4
4	4	UPB.12.F.01.O.004EM	Chimie generala	Chemistry	E	2	1			3
5	5	UPB.12.T.01.O.005EM	Stiinta materialelor I	Materials Science I	E	2		1		4
6	6	UPB.12.S.01.O.006EM	Comunicare profesionala (in lb. engleza)	Professional Communication	C		2			2
7	7	UPB.12.C.01.O.007EM	Cultura si Civilizatie Europeana I	European Culture & Civilization I	C	1	1			2
DISCIPLINE OPTIONALE										
8	8	UPB.12.F.01.A.008EM	Informatica aplicata	Applied Informatics	C	2		2		3
		UPB.12.F.01.A.009EM	Matematici discrete	Discrete Mathematics	C	2	2			3
9	9	UPB.12.C.01.A.010EM	Educatie fizica I	Physical Education I	V			2		2
		UPB.12.C.01.A.011EM	Limba straina b. (Franceza/Germana/Spaniola)	Foreign Language b (French/ German/Spanish)	V		2			2
DISCIPLINE FACULTATIVE										
	10	UPB.12.C.01.L.012EM	Limba engleză pentru studii academice inginerești I	English for Engineering Academic Study I	V	1	1			2
	11	UPB.12.C.01.L.013EM	Limba si cultura romana (pentru straini) I	Romanian Language (for foreign students) I	V		2			2
	12	UPB.12.C.01.L.014EM	Limba franceza pentru ingineri I	Langue francaise pour ingenieurs I	V		2			2
	13	UPB.12.C.01.L.015EM	Psihologie educaţionala	Psihologie educaţionala	E	2	2			5

CALCULUS I

Calculus 1 continues the theory of functions of one single variable (from the college); in the first part it contains: real and complex numbers, sequences and series of numbers, sequences and series of functions. In the second part, the differential calculus of functions of several variables is presented: partial derivatives, the differential, extrema and conditional extrema, implicit functions.
Topics: *Real numbers. Complex numbers. Series of real and complex numbers. Sequences of functions. Series of functions. Taylor Polynomials. Power Series. Elementary functions. Euclidian Spaces. Partial Derivatives. The Differential. Extrema of functions of several variables. Implicit functions. Conditional Extrema.*
Prof. Mircea OLTEANU / Simona DINU

LINEAR ALGEBRA

The course aims to enable good understanding and handling of the main linear and affine quadratic - based algebraic and geometric objects, and present them in direct relation with other sciences.
It provides basic knowledge of linear (vector) spaces and linear mappings, orthogonality (including the Gram Schmidt process, norming, orthonormal bases), spectral theory of linear operators (including eigenvalues, eigenvectors, the diagonal and the Jordan forms), orthogonal curvilinear coordinates, quadratic forms, free vectors and their main operations (including scalar, cross, mixed and double cross products), quadratic objects in 2D (conics), and linear & quadratic objects in 3D (including straight line, plane, and quadrics).

It emphasizes the relevance and consequences of the linear/quadratic character of the specific objects towards their efficient use in real-life models.
Topics: *Vector spaces. Linear transformations. Eigenvalues and eigenvectors. Bilinear and quadratic forms. Free vectors. Equations of straight line and plane. Changing of frames; conics. Quadrics.*
Prof. Vladimir BALAN / Simona DINU

ENGINEEING GRAPHICS I
The Engineering Graphics, on which designing, project making and manufacturing are based, is one of the most important study disciplines in superior technical education. Engineering Graphics is a science and a language too; it's a tool of knowledge, communication and social interaction. The components of this science are: Descriptive geometry, Technical drawing, and Computer graphics. Descriptive Geometry establishes laws which are to enable the representation of spatial objects and of spatial situations. These laws (rules) are coming directly from the elementary geometry. Technical drawing relies on orthogonal (orthographic) projection, which supplies the best conditions for describing shape of an object, and it is best fitted to make dimensioning, which is the second function of a technical drawing.
Topics: *The representation of the basic geometrical elements of the three-dimensional space by the double and three orthogonal projection. The box of projections, graphic elements of dimensioning. The surfaces generation. Sectioning and intersecting of surfaces. Threads' and flanges' representation, threaded fasteners.*
Prof. Ligia PETRESCU / Cristian PEREDERIC

CHEMISTRY
Nowadays an important accent is on the interdisciplinary character of the researchers. Chemistry is involved in all technical activities, not only at the level of materials, environmental protection, but also directly, through processes of chemical nature. The basic knowledge about chemical reactions and systems involved in chemistry is the key condition for understanding particular chemical aspects of different non-chemical engineering fields. The modern devices are based on new materials and a future engineer needs to possess knowledge about chemical structure and physic-chemical properties in order to be able to design new intelligent materials. This discipline insists on the structure and the properties of the most important materials in the nanomaterials era, on the possibility of spontaneous evolution of processes and insists also, on the electrode processes study, to understand the phenomena that govern device performance.
Topics*: Correlation between chemical structure and properties of materials (1.1. Ionic, covalent and metallic bonds formation. Examples of chemical substances used in electronics (in crystalline, amorphous, liquid, liquid crystal state). 1.2. Surface phenomena. Adsorption. Colloids. Sol-gel processes. Micro and nano-dispersions. Membrane processes. 1.3. The influence of chemical structure on electrical, magnetic and optical properties of the substances. Applications on chemical and biochemical sensors. 1.4. Organic macromolecular compounds with applications in electronic industry. 1.5. Organic/inorganic Semiconductors). Thermodynamics of chemical processes (2.1. Intensive and extensive state parameters. 2.2. Thermal effects of chemical processes at constant pressure and volume. Hess Law. Kirchhoff Law. 2.3. Thermodynamic functions: entropy, free energy, free enthalpy, correlated with chemical affinity. Chemical potential. 2.4. Phase Equilibriums, Phases Rule. Phase diagram for a pure compound. Vapor pressure. Using of Phase Diagrams in substances separation and purification 2.5. Chemical equilibrium. Principle of chemical equilibrium evolution. Relationship between thermodynamic functions and equilibrium constant). Kinetics of chemical reactions (3.1. Kinetic parameters: chemical reaction rate, rate constant, reaction order, molecularity, activation energy. Simple and complex reactions. 3.2. Homogeneous chemical reactions. Reactions of 1st and 2nd order. 3.3. Heterogeneous reactions. Corrosion of metals and semiconductors in dry gases. Catalytic reactions. 3.4. Chain reactions. Photochemical reactions. 3.5. Molecular theories in chemical kinetics. Molecular collisions.*

Theory of activated complex). Electrochemistry (4.1. Subject matter. Electrochemical cells. Electrical double layer. 4.2. Electrolytes. Ionic equilibrium. Electrical conductivity of electrolytes. 4.3. Electrochemical reactions. Electromotive force and thermodynamic functions of the reactions. Electrode potential. Electrodes types. Activity series of the elements. Polarization and over-potential. 4.4. Electrochemical power sources. Primary, storage and fuel cells. 4.5. Electrolytic processes in electronic devices technologies). Corrosion (5.1 Definition and classification 5.2. Chemical and electrochemical 5.3. Electrochemical corrosion. Thermodynamics and kinetics of corrosion process. 5.4. Anticorrosive protection methods).
Prof. Ileana RĂU

MATERIALS SCIENCE I
The main objective of the lectures is to give a general information on the metallic materials required for the mechanical engineer as well as for the metallurgist engineer to select materials and predict their behavior during service. To accomplish its task in using and selecting materials the engineer has to possess a solid knowledge on the physical and chemical bases of the properties of metallic materials. To this purpose the lectures give a deep insight in the structure (or internal architecture) of the material considered as a link between chemical composition, fabrication technology and properties of the metallic materials. Fundamental knowledge is provided on the influence of structure considered at various levels (macroscopic, microscopic, crystallographic, inter-atomic and subatomic level) for a better use of traditional metallic materials and to an opening to the use of advanced materials. Reliability in service of metallic products would be thus secured.
Topics: *Nature, structure and properties of metallic materials. Mechanical properties. Classification of engineering materials. Microscopic and crystallographic structure of metallic materials. Crystallographic planes and directions. Polymorphism and allotropy. Imperfections in real crystals. Lattice defects (point defects, line defects, plane defects). Elastic distorsions of the crystal lattice. Atomic vibrations in the crystal lattice. Nature of phases In engineering materials and their thermodynamic stability. Solid solutions. Intermetallic compounds, definite compounds, intermediate phases. Phase equilibrium diagrams of alloy systems. Structural transformations associated to solidification of metals and alloys. Structure of the melt. Solidification mechanism: homogeneous nucleation, heterogeneous nucleation, crystal growth. Defects found on metallic castings. Structural transformations associated to plastic deformation of metals and alloys. Strengthening mechanisms of metallic materials. Solid state transformations and heat treatments in steels and cast irons (Fe-C phase equilibrium diagrams, TTT diagrams, diffusionless martensitic transformation, type of heat treatments). Solid state transformations and heat treatments in alloy steels (influence of alloying elements, classification and representative groups of alloy steels). Solid state transformations and heat treatments in non-ferrous metals and alloys (precipitation hardening in Al, Mg, Ni, Ti, Cu alloys).*
Prof. Ioana GHERGHESCU

PROFESSIONAL COMMUNICATION
The practical course (seminar) English language – Professional Communication 1 is addressed to Romanian and foreign students in year I, of the FILS and it has as its general objective the development of the communicative competence of the students in English which is used as a medium of instruction in FILS. Stress is placed on the four fundamental components: listening, writing, reading and oral communication, developed on the basis of the adequate grammatical and lexical support corresponding to the required level. The teaching of this subject has the following secondary objectives: the capacity to use in real contexts communication situations adequate to simple/phraseological units incorporating cultural and civilization connotations, adequately using the necessary lexical and grammatical structures, with a focus on those structures encountered in the academic technical study in English.
Topics: *Grammar: Verb revision: Particularities in using the following tenses: Simple present, present perfect. Oral communication activities/ listening on various topics of general interest, acc*

to thematic units chosen / Grammar: Verb revision:: Particularities in using the following tenses: Simple past, past perfect. Reading activities and testing understanding of certain texts and exercises of vocabulary enrichment on various general interest topics, acc to thematic units chosen/ Grammar: Revision of passive voice. Oral communication activities/ listening on various topics of general interest, acc to thematic units chosen / Grammar: Revision of indirect speech. Reading activities and testing understanding of certain texts and exercises of vocabulary enrichment on various general interest topics, acc to thematic units chosen. / Grammar: Revision of conditional mood. Reading activities and testing understanding of certain texts and exercises of vocabulary enrichment on various general interest topics, acc to thematic units chosen. Exercises of word formation by affixation. / Revision /Final written test.
Prof. Doina COMANETCHI / Fabiola POPA

EUROPEAN CULTURE AND CIVILISATION I
The course is designed as an introduction to some major issues of European culture and philosophy, which may give an account of what does it mean to be European. The focus will be on the theoretical and historical roots of individualism, liberalism and rights versus collectivism, traditionalism and beliefs. This would increase students capacity for judging, assessing and understanding not only theoretical problems but also practical questions generated by their complex social engagements.
Topics: I. Greek cosmos; II. Medieval divine cosmos; III. Modern secular thought; IV. Contract, rights, individualism; V. Enlighment; VI. Social utopia, collectivism, and totalitarianism; VII. Post-comunism and post-modernism; VIII. EU and Globalization; IX. One Europe or several?
Prof. Ovidiu CARAIANI

APPLIED INFORMATICS
The course has as main objective to provide an overview of the computer operating systems. This course aims to introduce basic concepts and mechanisms of modern operating systems and virtualization. The emphasis is on principles and organization of operating systems, but also on practice, so as to illustrate key concepts in a practical context. At the end of the course, the students will understand some of the basic concepts concerning computers operating systems. At the end of the course, the students will be able to configure basic computer operating systems, interconnect two or more computers, and to apply basic security and protection to operating systems.
Topics: *As introduction/background, a brief reminder about computers organization and structures of computer systems. OS viewed as a service; OS as a resources manager; general organization of an OS. Process management, threads and multithreading, inter-processes communications. Memory management, allocation strategies, virtual memory. Input and Output devices; principles of I/O hardware; principles of I/O software; interfacing; devices management. Data storage management, file system structure; editing and file systems management, file system implementation, protection mechanisms, network based file systems. Virtualization systems. Networking and interconnection. Security issues.*
Prof. Constantin Viorel MARIAN

PHYSICAL EDUCATION I
The activity is intended for maintaining an optimal health condition of the students who practice physical training, in order to increase the work potential required by everyday activities; developing of the basic physical capacities and the specific capacities of the different sport branches; forming the habit of permanent and continuous practice of physical exercises and training in their spare time; educating the fair-play spirit, to form an efficient behaviour and a positive attitude, as well as a disciplined manner of life.
Topics: *Athletics: Elements of the running school, Jumping. Gymnastics: front and band exercises. Aerobic Gymnastics: exercise complexes. Applicative trails combined with running, balance,*

escalation, crawling, climbing, transport. Sports games: basketball, football, volleyball. The global practice of playing on small fields.
Prof. Carmen GRIGOROIU

ENGLISH FOR ENGINEERING ACADEMIC STUDY I
The discipline is addressed to all students of bachelor level year I of FILS – English stream; it has as its main objective the development of academic study skills in the context in which English is the medium of instruction in a technical university. The course and seminar aim to: develop the skills and level of proficiency in English for academic study of the engineering type, particularly reading with reflection on the structures and senses of different kinds of texts and other study materials, efficient note taking at courses and preparation for written/oral examinations. A range of specific objectives cover: successful effective communication in the university and in the working environment, the optimal efficient model of accessing different types of texts of the technical academic kind, text, paragraph and sentence structure with a view to developing writing skills in the academic environment, the development of specific academic lexis in the engineering context, as well as the appropriate grammatical support.
Topics: *Module 1- Introduction to the engineering academic study in English. Module 2 - Creating the necessary linguistic support with a view to forming adequate competences for the engineering academic study in English. Module 3 - Developing reading/accessing the scientific/technical texts for academic study. Module 4 - Developing writing skills and increasing students' awareness of the problems connected with writing in an engineering academic context.*
Prof. Yolanda-Mirela CATELLY

ROMANIAN LANGUAGE (FOR FOREIGN STUDENTS) I
The practical course (seminar) of Romanian Language, Culture and Civilization is addressed to the foreign students in the first year, enrolled at the Faculty pf Engineering in Foreign Languages and has the following general objective: the development of students' communication competence with a focus on the four fundamental skills: listening, writing, reading and speaking. Moreover, it is important to mention the following secondary teaching objectives: the capacity to use in real communication contexts simple and complex vocabulary structures with reference to cultural and civilization conotations, as well as the capacity to adequately use the grammar structures.
Topics: *Teaching pronunciation patterns. Greetings and introdction dialogues. Talking about you. The time, seasons and months of the year. Teaching basic grammar notions: the article, the plural of the nouns, the numeral, the gender of the nouns, prepositions, the present indicative of the verb. Teaching basic vocabulary in context and language functions.*
Prof. Mihaela PRICOPE / Ecaterina SAVU

I Year, 2nd semester

			Denumire RO	An 1/Sem 2	Ver	C	S	L	P	ECTS
10	1	UPB.12.F.02.O.001EM	Analiza matematica II	Calculus II	E	3	2			6
11	2	UPB.12.F.02.O.002EM	Fizica I	Physics I	E	2	1	1		5
12	3	UPB.12.T.02.O.003EM	Mecanica I	Mechanics I	E	2	1			3
13	4	UPB.12.F.02.O.004EM	Grafica inginereasca II	Engineering Graphics II	C	2		2		4
14	5	UPB.12.F.02.O.005EM	Limbaje de programare	Programming Languages	E	1		2		3
15	6	UPB.12.T.02.O.006EM	Stiinta materialelor II	Materials Science II	E	2		1		3
16	7	UPB.12.S.02.O.007EM	Comunicare în echipă I	Collaborative Work I	C		2			2
DISCIPLINE OPTIONALE										
17	8	UPB.12.C.02.A.008EM	Cultura si Civilizatie Europeana II	European Culture & Civilization II	C	1	1			2
		UPB.12.C.02.A.009EM	Etica si Integritate Academica	Ethics and Academic Integrity	V	1	1			2
18	9	UPB.12.C.02.A.010EM	Educatie fizica II	Physical Education II	V			2		2
		UPB.12.C.02.A.011EM	Limba straina b. (Franceza/Germana/Spaniola)	Foreign Language b (French/ German/Spanish)	V		2			2
DISCIPLINE FACULTATIVE										
	10	UPB.12.C.02.L.012EM	Limba engleză pentru studii acade	English for Engineering Academic Study II	V	1	1			2
	11	UPB.12.C.02.L.013EM	Limba si cultura romana (pentru straini) II	Romanian Language (for foreign students) II	V		2			2
	12	UPB.12.C.02.L.014EM	Limba franceza pentru ingineri II	Langue francaise pour ingenieurs II	V		2			2
	13	UPB.12.C.02.L.015EM	Pedagogie 1	Pedagogie 1	E	2	2			5

CALCULUS II

The lecture is a presentation of the theory of the integral of functions of several variables. The main topics are: the Riemann integral, improper Riemann integral, functions defined by integrals, double and triple integrals, line and surface integrals. The integral formulae (Green-Riemann, Gauss-Ostrogradski and Stokes) and an introduction to the field theory are presented too. The course contains also a brief introduction to the metric spaces theory and applications of the fixed point principle.

Topics: *Metric Spaces. Fixed Points and Contraction Principle. Discrete Dynamical Systems, Newton's Method, Fractals. Riemann Integral and Improper Riemann Integral. Functions defined by Integrals. Double and Triple Integrals. Vector Fields, gradient, divergence, curl. Parameterized Paths, Length of paths. Line Integrals, Poincare's Theorem. Parameterized surfaces, area of a surface. Surface Integral, Flux of a vector field. Green-Riemann Formula. Gauss-Ostrogradski Formula. Stoke's Formula.*

Prof. Mircea OLTEANU / Simona DINU

PHYSICS I

The ultimate goal of Physics I Course is to provide the students with an opportunity to develop their knowledge of the physical world through study in wave optics. Students will learn the concepts, principles and technical vocabulary associated with optics areas of very wide-ranging application. The course will describe the nature and properties of light, its propagation, light – matter interactions, the main optical phenomena and their applications. The students will acquire theoretical and practical knowledge about some modern equipments and techniques using optical phenomena.

Topics: *Fundamental concepts in optics: nature of light; light - matter interaction; Doppler effect of light; dispersion of light; ray model; optical path; reflexion and refraction; total internal reflexion; optical fibers, evanescent waves; Huygens-Fresnel Principle; Fermat's Principle. / Polarization of light: states of polarization, (linear, circular, elliptical); polarization by reflexion, applications: Brewster window, Brewster polarizer, polarization by absorption, Malus law: polaroid films; polarization by double refraction (birefringence): retarders; polarization by scattering; optical activity: polarimeter, liquid crystal displays. / Interference of light: principle of superposition, methods to superpose waves, light standing waves; interference of coherent waves propagating in*

arbitrary directions, Young's device, multiple beam interference; thin film interference, optical wedge, Newton's rings; spatial and temporal coherence of light. / Diffraction of light: Fraunhofer and Fresnel diffraction regimes; diffraction of light by a long, narrow slit, the halwave zone technique, light intensity distribution in the diffraction pattern (the phasor method); diffraction by a circular slit, the Airy disc, the Rayleigh criterion, the diffraction limit of optical systems; diffraction gratings, modern spectrometers; Fresnel diffraction by a circular slit./ Introduction to laser physics: the working principle of a laser, the main components of a laser and their roles, the working of a 3-level laser, example: the ruby laser, the working of a 4-level laser, example: the He-Ne laser.
Prof. Maria-Ana POPOVICI

MECHANICS I
This course gives students basic and advanced concepts in statics and kinematics.
Topics: *Sliding vectors; Statics of the particle; Centers of mass ;Statics of the rigid body ; Kinematics of the particle; Kinematics of the rigid body; Particular motions of the rigid body; Kinematics of relative motion.*
Prof. Victor BURACU

ENGINEERING GRAPHICS II
The course is intended to learn the rules and conventions used in views and sections, to learn how to use tolerances of size form and position, to realize permanent and separable fasteners, gearings and packing.
Topics: *Sectional views. Production dimensioning. The achievement of the execution drawing. Assembly drawing. Representation of the component parts of permanent and separable joints, gear and gearings, bearings and packing.*
Prof. Ligia PETRESCU / Cristian PEREDERIC

PROGRAMMING LANGUAGES
The students learn to use a programming medium such as Matlab and to apply the acquired programming skills to solve engineering problems.
Topics: *1. Programming Languages. 1.1. Basics. Classifications. 1.2. The execution of a program by the computer 1.3. The syntax of programming languages. 2.Design programs 2.1. Algorithm: construction, structure 2.2. Description of algorithms. Pseudocode: basic operations, control structures, data structures, subroutines 3. Introduction to programming in Matlab 3.1. MATLAB language features 3.2. Program structure in MATLAB / Octave 4. Basic Programming in MATLAB / Octave 4.1. Variables, constants; data types, assignment instructions 4.2. Operators and expressions; order of precedence 5. Flow control statements 5.1. Conditional expressions 5.2. Iterations. Definite loops. Indefinite loops 6. Functions 6.1. Declaration and definition of functions and procedures 6.2. User defined functions 6.3. Function handle*
Prof.

MATERIALS SCIENCE II
- Presentation of major nonmetallic materials families: ceramics, glasses, polymers, composite materials of different types, emphasizing the engineering properties of interest (elasticity, hardness, ductility, fracture toughness, refractoriness, transparence, thermal conductivity, electrical conductivity, electrical and magnetic properties, mechanical strength, etc.). All these properties are presented in connection with particular features of the materials as well as through the correlations between structure and properties of the materials both at microscopi and macroscopic level.
- Emphasizing and focusing upon key factors defining materials behavior, the role of molecular arrangement (order-disorder), ideal and real crystalline structures, defects of different structural scale approach. Main physical-chemical properties of materials are examined and discussed in direct connection with mechanical properties.

- Introduction to the newest materials, such as nanomaterials both as nanoceramics and nanocomposites due to the incredible development of the nanotechnologies in the last decades as well as to the applications in many domains requiring special mechanical properties (optics, biomedicine, electronics, mechanics and chemistry handling objects of nano size scale). In this way the students are online with the major progress constantly developed and improvement of materials performance, especially by increasing their durability and fiability.

Topics*: Introduction to the science of materials nonmetal. The chemical liason. Various states of the matter. Real crystal, defects. Polymers. Ceramics. Glasses and vitroceramics. Biomaterials . Composites. Composite binder systems. Cements and concretes. Thin layers.*

Prof. Adrian VOLCEANOV

COLLABORATIVE WORK I

The practical course continues the development of the four fundamental skills: listening, speaking, reading and writing. The main objective lies on the development of the student communicative competence in a professional environment.

Topics*: Intercultural communication. Phone conversations in professional environment. Working environment in the company/ career plan. Functions of academic writing. Writing short documents: e-mail/ memo/professional letters. Revision. Mid term examination. Final test.*

Prof. Doina COMANETCHI / Fabiola POPA

EUROPEAN CULTURE AND CIVILISATION II

The main objective of this course is to acquaint students with the basic issues of European philosophy and culture in order to get a picture of the idea of Europe. Secondly, to develop a proper way of freethinking based on analogies, debates and analytical comparisons focused on the main theoretical themes in European history and culture. The course is designated to introduce the undergraduate students to some major issues of European history and philosophy which may give an account of what does it mean to be an European. We will consider the texts both as contributions to the understanding of specific historical and cultural events, as well as attempt to analyze the relationship between different cultural assumptions. Is it possible to create a sort of "theoretical bridge" between conflicting values and cultural identities?

Topics: *1. Theory of Rights - Natural Rights Doctrine in Locke's works.- Human Rights Declaration.- Individual rights vs. collective rights. 2. Liberalism vs. Conservatism (I)- Classical liberalism and the principle of moral equality of individuals. - Individualism and liberty (John Stuart Mill).- Individual self-determination vs. national self-determination. 3. Liberalism vs. Conservatism (II)- Tradition, practical and theoretical reason.- Conservatism and organicism. 4. Nation-State.- Industrial Revolution and the nation-state building process.- People, Language, and Nation: Herder and Fichte.- Nation as imagined community. 5. Social Utopia and Totalitarianism in the twenties century (I)- Social utopia and human nature (Thomas More, Tommaso Campanella).- Ethical Socialism.- Marxism, egalitarianism, and social justice. 6. Social Utopia and Totalitarianism in the twenties century (II)- Nazism, race, people and volkgeist. -Collectivism and elitism. 7. Concluding course: One Europe or several?*

Prof. Ovidiu CARAIANI

PHYSICAL EDUCATION II

Enhance physical and intellectual effort capacity; Harmonious development of the body; Optimize health; Prevent the appearance of global and segmental physical deficiencies, Form and maintain correct body attitudes.

Topics: *Athletics: Elements of the running school, Jumping. Gymnastics: front and band exercises. Aerobic Gymnastics: exercise complexes. Applicative trails combined with running, balance, escalation, crawling, climbing, transport. Sports games: basketball, football, volleyball. The global practice of playing on small fields.*

Prof. Carmen GRIGOROIU

ENGLISH FOR ENGINEERING ACADEMIC STUDY II

The discipline is addressed to all students of bachelor level year I of FILS – English stream; it has as its main objective the development of academic study skills in the context in which English is the medium of instruction in a technical university. The course and seminar aim to: develop the skills and level of proficiency in English for academic study of the engineering type, particularly reading with reflection on the structures and senses of different kinds of texts and other study materials, efficient note taking at courses and preparation for written/oral examinations. A range of specific objectives cover: successful effective communication in the university and in the working environment, the optimal efficient model of accessing different types of texts of the technical academic kind, text, paragraph and sentence structure with a view to developing writing skills in the academic environment, the development of specific academic lexis in the engineering context, as well as the appropriate grammatical support.

Topics: *Module 1- Development of listening abilities Module 2 – Development of oral communication abilities necessary for the active and efficient participation in seminaries as well as for making oral presentations Module 3 – Creating autonomous study abilities*

Prof. Yolanda-Mirela CATELLY

ROMANIAN LANGUAGE (FOR FOREIGN STUDENTS) II

The practical course (seminar) of Romanian Language, Culture and Civilization is addressed to the foreign students in the first year, enrolled at the Faculty pf Engineering in Foreign Languages and has the following general objective: the development of students' communication competence with a focus on the four fundamental skills: listening, writing, reading and speaking. Moreover, it is important to mention the following secondary teaching objectives: the capacity to use in real communication contexts simple and complex vocabulary structures with reference to cultural and civilization conotations, as well as the capacity to adequately use the grammar structures.

Topics: *Socialising in Romanian. Teaching grammar notions: the the past tense, the verbal , the verbal voices, the future, elements of syntax. Expressing the cause, the aim, and the result. Teaching basic vocabulary in context and language functions.*

Prof. Mihaela PRICOPE

II Year, 1st semester

			Denumire RO	An 2/Sem 3	Ver	C	S	L	P	ECTS
19	1	UPB.12.F.03.O.001EM	Matematici speciale I	Mathematics for Engineers I	E	2	2			5
20	2	UPB.12.F.03.O.002EM	Probabilitati si Statistica	Probabilities & Statistics	E	2	1			2
21	3	UPB.12.F.03.O.003EM	Fizica II	Physics II	E	2		1		4
22	4	UPB.12.T.03.O.004EM	Rezistenta materialelor I	Strenght of Materials I	E	2	1	1		4
23	5	UPB.12.S.03.O.005EM	Introducere in ingineria mecanica	Introduction to Mechanical Enginee	C	1		2		4
24	6	UPB.12.T.03.O.006EM	Electrotehnica	Electrical engineering I	E	2	1			3
25	7	UPB.12.T.03.O.007EM	Mecanica II	Mechanics II	E	2	1	1		4
26	8	UPB.12.S.03.O.008EM	Comunicare în echipă II	Collaborative Work II	C		2			2
27	9	UPB.12.C.03.O.009EM	Microeconomie	Microeconomics	C	1	1			2
DISCIPLINE FACULTATIVE										
	10	UPB.12.C.03.L.010EM	Limba si cultura romana (pentru straini) III	Romanian Language (for foreign students) III	V		2			2
	11	UPB.12.C.03.L.011EM	Pedagogie 2	Pedagogie 2	E	2	2			5

MATHEMATICS FOR ENGINEERS I

Assimilation by students of the operating capabilities of the fundamentals, methods and techniques provided by Applied Mathematics. Students training for analysis, drawing up and utilization of the mathematical models in engineering.

Topics*: Higher-order differential equations. Variation of parameters method. Linear equations with constant coefficients. Euler's equations. Systems of differential equations. Variation of parameters formula. Systems of differential equations with constant coefficients. Stability of the systems of differential equations. Routh-Hurwitz Criterion. Lyapunov equation. Lyapunov functions. Complex functions. Analytic functions. Cauchy-Riemann conditions. Complex Integrals. Cauchy's fundamental theorem and Cauchy's integral formulas. Taylor and Laurent series. Singularities. Residues theorem and its applications. Fourier transform. Inversion formula. Sine and cosine Fourier transform. Fourier integral. Applications of Fourier transforms and integrals in engineering. Discrete Fourier transform. Fast Fourier transform.*

Prof. Valeriu PREPELITA / George IONITA

PROBABILITIES AND STATISTICS

The objective of this course is the formation of the capacities of handling the concepts of the PROBABILITY AND STATISTICS by presenting them in direct relation with other sciences.

Topics*: The notion of probability. Axiomatic definition. The classical concept of probability. Geometric probability. Conditional probability. Applications to reliability Sequence of independent trials. Limit theorem. Random variables. Distribution functions. Random vectors. Functions of random variables. Numerical characteristics of random variables. Correlation. Regressions. Characteristic functions. Classical laws. via characteristic functions. Data representation and data analysis. Estimation of parameters. Confidence intervals. Approximation theory in statistics. Best approximation. Least squares methods.*

Prof. Anda Georgiana OLTEANU

PHYSICS II

Learning the basics of Modern Physics/Quantum Physics.

Topics*: The experimental foundations of quantum physics: thermal radiation; photoelectric effect; Compton effect; atomic spectra; X-rays, Bohr's model of the hydrogen atom; correspondence principle; Einstein's theory of radiative processes; wave-particle duality; Heisenberg's uncertainty principle. Applications: the optical pyrometer; the photoelectric cell; the photomultiplier; X-rays in medicine; the electron microscope. The formalism of quantum mechanics (I): wavefunction postulate; time-dependent Schrödinger equation; probability conservation; wavefunction*

constraints; time-independent Schrödinger equation (TISE); 1-D infinitely deep potential well; 1-D finite potential well; potential potential barriers and tunnel effect; quantum harmonic oscillator; TISE in 3-D. Applications: nanotechnology, quantum wells with semiconductors; tunnel diode; scanning tunneling microscopy; vibration spectrum of a molecule. The formalism of quantum mechanics (II): state vectors; Hermitian operators; position and linear momentum operators; the link between the quantum state of a system and measurement results; Heisenberg's uncertainty principle. Applications: quantum computer; quantum cryptography. Angular momentum in quantum mechanics: orbital angular momentum (definitions of orbital angular momentum operators, properties, eigenfunctions and eigenvalues); spin angular momentum (Stern-Gerlach experiment, electron spin hypothesis) Hydrogen atom and multielectron atoms. The periodic table of elements. Condensed matter physics: crystalline structure of a solid; electron dynamics in solids; energy bands; metals, semiconductors and dielectrics.
Prof. Valericã NINULESCU / Maria-Ana POPOVICI

STRENGTH OF MATERIALS I
Strength calculus of components loaded statically and dinamically
Topics*: Cap. 1+2 Stresses, displacements, deformations Cap. 3 Traction and compression Cap. 4 Torsion of circular bars Cap. 5 States of stress on inclined planes Cap. 6 Bending of straight bars (calculus of stresses) Cap. 7 Shearing Cap. 8 Deformations of bars loaded in bending.*
Prof. Dan Mihai CONSTANTINESCU / Stefan PASTRAMA

INTRODUCTION TO MECHANICAL ENGINEERING
The course presents lectures and applications of software tools from math calculus and representation (OCTAVE. MathCAD) to drawing and design machine elements (CATIA-Mechanical Engineering with feature modelling). Based on a core of CAD activities students learn the concept of total design. The main part of activities is dedicated to learn and deal with advanced CAE/CAD/CAM concepts to create innovative products. • Understand the criteria for selecting component and mechanical system variants based on concepts, theories and methods of technical and economical analysis. • Interpretation of technological and functional problems of mechanical systems by applying basic knowledge and using new ones • Select design solutions (CAD/CAE solutions) for mechanical transmissions given the inter-relationships of design, material selection and nature of product design, manufacturing process • Explain the concepts of concurrent engineering and team work in CAD/CAE projects • Product development and lifecycle product management in mechanical engineering field.
Topics*: What is Mechanical Engineering. What a Mechanical Engineer does. Definitions: Machine, Apparatus, Mechanism, Device. A brief description (types and functions) of general purpose machine parts; (fasteners, springs, shafts, bearings, couplings, gear drives, belt, drives). Main steps of the Design Process. Materials and Manufacturing Processes. Fits and Tolerances. Sketches. 2D-Drawings – advanced features. Complex assembly drawings. Dimensioning and Tolerancing. Reports and Presentations. General rules. Basic Principles. Main modules. Profiles. 3D-transformation commands.*
Prof. Sorin CANANAU / Marilena STOICA

ELECTRICAL ENGINEERING I
This course develops the student’s abilities in applying the basic knowledge of electromagnetic field theory and circuit theory to understand, model and analyze the field and circuit problems, to understand the limits of the used models. Understanding the main phenomena of electromagnetism.
Topics: *I. Electromagnetism I.1 Introduction. Overview of the subject. The coherent construction of a scientific theory. Physical model, physical quantities and attached mathematical relationships. I.2 Electromagnetic quantities. Primary electromagnetic quantities. Derived electromagnetic quantities. I.3 Laws and theorems of electromagnetic phenomena. Electric flux law (Gauss law). Magnetic flux law. The magnetic field constitutive law. Temporary magnetization law. The electric*

field constitutive law. The law of temporary electric polarization. Electromagnetic induction law (Faraday Law). The magnetic circuit law (Ampère law). The electric charge conservation law. The constitutive law of electric conduction. The law of energy conversion associated to e. The law of energy conversion associated to electric conduction. The electrolysis law. II. Electric circuits. II.1 Introduction and overview. Limits of circuits' models. The main quantities of electrical engineering. Kirchhoff's theorems. II.2 Direct current (D.C.) circuits. Elements of direct current circuits. Branch characteristics. Fundamental theorems for direct current circuits. Kirchhoff equations method. Loop current method. Node potential method. II.3. Alternating current (A.C.) circuits. Circuit equations. Basic circuit elements. Complex form of equations for A.C. circuit. Power in A.C. circuits (active, reactive, apparent). Power factor. Matrix form of circuit equations. Power conservation. RLC series circuit. RLC parallel circuit. Combined circuits: series/parallel branches. Inductive coupling. Coupling removal.
Prof. Marilena STĂNCULESCU

MECHANICS II
Topics: *1. Dynamics of the Particle. Theorems of Dynamics. Dynamics of the Constrained Particle. 2. Dynamics of Relative Motion. 3. Dynamics of a System of Particles. 4. Theorems of Dynamics. Theorem of Linear Momentum. 5. Theorems of Dynamics. Theorem of Angular Momentum. 6. General Theorems of Dynamics. Theorem of Variation of Kinetic Energy and Work. 7. Moments of Inertia. Definitions. Moments of Inertia with Respect to Parallel Axes. 8. Moments of Inertia with Respect to Concurrent Axes. Principal Moments of Inertia 9. Theorem of Linear Momentum in Dynamics of the Rigid Body. 10. Theorem of Angular Momentum. Theorem of Variation of Kinetic Energy and Work. 11. Dynamics of the Rigid Body with Fixed Axes. 12. Dynamics of the Rigid Body with Fixed Point. 13. Gyroscope. 14. General Motion of the Rigid Body.*
Prof. Ion STROE / Victor BURACU

COLLABORATIVE WORK II
Developing the four fundamental components of communication: oral and written comprehension, written and oral communication (listening, writing, reading, speaking).
Topics**:** *CV writing. Letter of intent writing. Lexis specific to professional communication: career plan, working schedule, job descriptions/working environments description. Sitting for an interview. Oral presentations – the structura of an oral presentation. Oral presentations (Functions, expressions, structures of lexis specific to an oral presentation). Oral presentations (delivery). Mid term examination. Making oral presentations.*
Prof. Doina COMANETCHI

MICROECONOMICS
Formation and assimilation of the economic way of thinking that helps in the identification and application at microeconomic level of entrepreneurship decisions.
Topics**:** *C1 Introduction to economics, economic principles. C2 Demand, supply and market equilibrium. C3 Elasticity, demand and supply and there application. C4.Maximum/minimum prices- economics of welfare. C5 Production cost. C6 Profit and prices under competition. C7 Market structures.*
Prof. Ana-Maria NEAGU

ROMANIAN LANGUAGE (FOR FOREIGN STUDENTS) III
1) Enhancing the foreign students' ability to understand written and verbal messages in Romanian by enriching their vocabulary and advancing their grammar knowledge. 2) Developing the students' communicative competence, focusing on fluency and accuracy. Developing their ability to use grammar structures and vocabulary items in their own contexts of communication. 3) Enhancing the students' knowledge of grammar by focusing on academic writing activities and communicative activities such as conversations, presentations, descriptions, negotiations, telephone conversations.

4) Developing the students' ability to understand a series of aspects concerning the Romanian culture and civilization presented within the seminars of Romanian language.
Topics: *1. Presenting our daily activities. • The indicative. The present tense. Verbs whose infinitive ends in ,''-a", ''-e", ''-i", ''-ea", ,''-î". • Verbs with the personal pronoun in the dative. • The indefinite pronoun and adjective. • Reading, speaking, vocabulary and grammar activities. 2. Naming and presenting the objects in a classrooom, in a laboratory, in one's house. • The noun. The masculine, the feminine and the neuter gender. • The plural of nouns in the masculine, feminine, neuter gender.• Reading, speaking, vocabulary and grammar activities. 3. Describing places and objects. Describing a friend. • The adjective with two, three and four forms. • The demonstrative pronoun and the demonstrative adjective. • Reading, speaking, vocabulary and grammar activities. 4. How do we ask for information? How do we give information? • Adverb + verb.• Verb + preposition + noun.• Prepositions followed by nouns without an article. • Prepositions followed by nouns with the definite article.• The personal pronouns in Accusative and the reflexive pronouns in Accusative.• Reading, speaking, vocabulary and grammar activities. 5. An introduction to the Romanian culture and civilization. • Presenting the Romanian traditions and customs at Christmas, New Year's Eve and Easter. • Asking the students to talk about their own traditions and customs. • The indicative. The present tense. Reflexive verbs. • Reading, speaking, vocabulary and grammar activities. 6. Describing a city visited in the past. Presenting the activities done in that city in the past. • The indicative. The compound perfect tense. • The dative case. Unstressed forms. • Revision of the adjectives with two, three and four forms.• The comparative of adjectives. • Reading, speaking, vocabulary and grammar activities. 7. Individual project: • Presenting one's home town. Presenting the activities done in that city before coming to study in Romania. 8. Plans for the future. • The indicative. The future tense. • Reading, speaking, vocabulary and grammar activities.*
Prof. Elisabeta Simona CATANA

II Year, 2nd semester

			Denumire RO	An 2/Sem 4	Ver	C	S	L	P	ECTS
28	1	UPB.12.F.04.O.001EM	Tehnologia materialelor	Material Technology	E	2		1		3
29	2	UPB.12.T.04.O.002EM	Mecanica III	Mechanics III	E	1	1			2
30	3	UPB.12.T.04.O.003EM	Rezistenta materialelor II	Strenght of Materials II	E	2	1			3
31	4	UPB.12.T.04.O.004EM	Procedee de fabricatie I	Manufacturing Processes I	C	2		1		3
32	5	UPB.12.T.04.O.005EM	Organe de masini si mecanisme I	Machine Elements & Mechanisms I	E	2		1		4
33	6	UPB.12.F.04.O.006EM	Metode numerice	Numerical Methods	C	2	2			5
34	7	UPB.12.S.04.O.007EM	Instrumente software in ingineria mecanica I (design corp solid)	Software Tools for Mechanical Engineering I (solid body design)	C	1		2		3
35	8	UPB.12.S.04.O.008EM	Comunicare tehnică	Technical writting	C		2			2
36	9	UPB.12.C.04.O.009EM	Macroeconomie	Macroeconomics	C	1	1			2
DISCIPLINE OPTIONALE										
37	10	UPB.12.T.04.A.010EM	Masini si aparate electrice	Electrical engineering II (Electrical machines)	E	2	1			3
		UPB.12.T.04.A.011EM	Masurari electrice si traductoare	Electrical measurements & Transdu	E	2	1			3
DISCIPLINE FACULTATIVE										
	11		Limba si cultura romana (pentru straini) IV	Romanian Language (for foreign students) IV	V		2			2
	12		Didactica specialitatii	Didactica specialitatii	E	2	2			5

MATERIAL TECHNOLOGY

Topics**:** *1. Introduction (Definitions. Manufacturing. Production. Business. Industry. The post-industrial society. Fabric. Management. Manufacturing properties of engineering materials). 2. Classification of the primary manufacturing processes (Summary of manufacturing processes for obtaining metals, ceramics, plastics, composites). 3. Metals (Definitions and properties of metals and alloys. Metallurgy processes. Powder metallurgy. Foundry. Forging. Joining. Product design. Processes selection and design. Specific flaws). 4. Ceramics (Definitions and properties. Classification of ceramics. Obtaining processes. Product design. Processes selection and design. Specific flaws). 5. Plastics (Definitions and properties. Classification of plastics. Obtaining processes. Product design. Processes selection and design. Specific flaws). 6. Composites (Definitions and properties. Classification of composites. Obtaining processes. Product design. Processes selection and design. Specific flaws). 7. Trends (Space manufacturing).*

Prof. Ovidiu Viorel RÎNDAŞU

MECHANICS III

Topics: *1. Analytical Mechanics. Introduction. Constraints. Displacements. 2. Principles of Virtual Work. Toricelli's Principles. Principle of Virtual Powers. 3. D'Alembert Principle. 4. Lagrange Equations for Holonomic Systems. 5. Prime Integrals. 6. Lagrange Equations for Non-Holonomic Systems. Lagrange Equations for Holonomic Systems with Dependent Variables. 7. Hamilton's Equations.*

Prof. Ion STROE

STRENGTH OF MATERIALS II

The objective is to study the behavior of solid bodies under load and also to carry out strength and displacement analyses for a variety of engineering components and structures. It introduces the major techniques of experimental stress and strain measurement, calculation of the stresses and strains which occur in several mechanical structures.

Topics: *Chapter 1 Statically Indeterminate Systems. Chapter 2 Introduction to Theory of Elasticity Chapter 3 Theories of Elastic Failure. Chapter 4 Complex Stresses and Strains. Chapter 5 Struts Chapter 6 Impact Loads. Chapter 7 Fatigue. Chapter 8 Plates, Thin-Walled Cylinders, Thick Cylinders. Chapter 9 Experimental Stress Analysis.*

Prof. Aurelia RUSU-CASANDRA

MANUFACTURING PROCESSES I

A major goal of engineers is to determine the properties and characteristics of the materials for their rational use and expected performances. This module will allow achieving knowledge concerning the integration of fabrication using different materials with product design from machining to quality control.

Topics: *1. Generalities; Basic definitions for manufacturing systems; Design activities for manufacturing systems; Planning and control activities for manufacturing systems; 2. Design for fabrication and plan based on computer-assisted technique; 3. The fundamentals of cutting through traditional methods and modern methods. Cutting and cutting power using lasers and plasma guillotines;4. Processing processes used to produce round shapes. Machining, rounding and finishing processes using power laser technology and plasma guillotines;5. Thermal, chemical and electrochemical finishes; Coating methods using the thin film deposition techniques; 6. Synthesis and processing of materials on micro- and nanoscale scale; 7. Methods for characterization of pre- and post-processed micro- and nanoscale materials; 8. Dimensional metrology, metrology inspection equipment and techniques.*

Prof. Marius ENACHESCU

MACHINE ELEMENTS AND MECHANISMS I

The course is intended to provide the student with a clear and thorough understanding for both the theory and application of the fundamentals of general-purpose machine elements. Being the first in a series of three courses which can be considered the "spinal column" of mechanical engineering education this course is focused on general purpose linkages and cam mechanisms and on general purpose fasteners or elastic joints (springs).

Topics*: 1. Modern design principles. Product development. Functional analysis. 2. Planar mechanisms. General considerations. Classification. Basis of kinematics (Degree of freedom, joints (pairs), links, chains, mobility). Linkages. Analysis and synthesis of simple linkages. Practical design considerations. Cam mechanisms. Classification. Analysis of cam and flat follower. Design considerations. Kinetostatic and dynamics of linkages. Driving systems of mechanisms. 3. Contact of elastic mechanical components. Extended surface contacts (conformal contacts); contact pressure for various configurations. Concentrated (Hertzian) contacts (Counterformal contacts); stresses and deformations. 4. Threaded fasteners and power screws. General considerations (functions, design solutions, materials and technologies, standardization) Forces and moments in a threaded pair. Efficiency of power screws. Ball screws. Planetary roller screws. Threaded fasteners calculation. Power screws calculation. Design methods of threaded fasteners. Locking nuts and washers. 5. Springs. General considerations (Functions, characteristics, materials and technologies, applications). Torsion bar. Helical springs. Leaf springs. Ring springs. Elastomeric springs. Special, novel springs. 6. Permanent joints (welded, bonded, riveted).*

Prof. Traian CICONE

NUMERICAL METHODS

Learning the basic principles and fundamental methods for numerical solving of computational problems.

Topics*: 1. Introduction - Scope discipline. Link to programming and technical subjects. Steps to solving a given problem. 2. Methods for approximate solving of algebraic equations 2.1. Graphical method 2.2. The bisection method 2.3. The secant method 2.4. Newton method 3. Numerical methods for solving systems of equations 3.1. Systems of linear equations. Criteria for the existence and uniqueness of the solution of a system of linear equations. 3.2. Direct methods for solving linear algebraic equations. Gauss elimination method. 3.3. Iterative methods for solving linear algebraic systems of equations 3.4. The method of successive approximations. Gauss-Seidel method. 4. Function Approximation 4.1. Interpolation. 4.1.1. Lagrange interpolation polynomial 4.1.2. First and second order Newton interpolation polynomials 4.1.3. The method of divided*

differences. 4.1.4. Spline interpolation 4.1.5. Interpolation of function of two variables 4.2. Regression 4.2.1. The least squares method 4.2.2. Linear regression 4.2.3. Quadratic regression 4.2.4. Exponential regression 4.2.5. Bilinear regression 5. Numerical differentiation. Forward finite differences. Backward finite differences. Centered finite differences 6. Numerical integration. 6.1. Midpoint method 6.2. Trapezoidal method 6.3. Simpson's method. 6.4. Gauss quadrature 6.5. Numerical integration of improper integrals. 7. Solving differential equations and systems of differential equations 7.1. Euler's method 7.2. Predictor – corrector methods (Heun) 7.3. Taylor series method 7.4. Second order Runge-Kutta methods 7.5. Fourth order Runge-Kutta methods 7.6. Numerical integration of systems of differential equations 7.7. The finite difference method 7.8. The finite element method.
Prof. Claudia IONITA

SOFTWARE TOOLS FOR MECHANICAL ENGINEERING I (SOLID BODY DESIGN)
The course presents lectures and applications of software tools from math calculus and representation (OCTAVE. MathCAD) to drawing and design machine elements (CATIA-Mechanical Engineering with feature modelling). Based on a core of CAD activities students learn the concept of total design.The main part of activities is dedicated to learn and deal with advanced CAE/CAD/CAM concepts to create innovative products.
Topics: *C1.Concept and calculus using various software. Designing- master model. Relattion to manufacturing. Original soft; The commercial codes of software C2.Life cycle design principles, CAD / CAE design life cycle design, product development C3.Mechanical assembly. Realization of the parts and their integration as an aassembly. The concept of "master modeling". Soft to compute and graphical representation. CAD / CAE design software C4. Using OCTAVE - description, use C5.Developing the design of mechanical components using the MathCAD software C6.Product database, Interactive database utilization within a design team, information exchange and CAD files. Design, testing, manufacturing, quality. Teamwork and manufacturing preparation.*
Prof. Sorin CĂNĂNĂU

TECHNICAL WRITTING
Developing the four fundamental components of communication: oral and written comprehension, written and oral communication (listening, writing, reading, speaking) in professional communication contexts.
Topics*: Debates. Professional meetings. Academic writing – technical reports. Approaching the teaching of writing skills within the process paradigm. Collaborative and/or individual writing. Communicative methods (interactive lecturing, explanation, conversation, group discussion). Brainstorming, problem solving, audio techniques and written ones (reading, working with course book/working cards).*
Prof. Doina COMANETCHI

MACROECONOMICS
Formation and assimilation of the economic way of thinking that helps in the identification and application at macroeconomic level of entrepreneurship decisions
Topics*: C1. Measuring a nation's income. C2. The Wealth of Nation's and economic growth. C3. Macroeconomic equilibrium. AD-AS model C4. Growth. Money growth and inflation. C5. Unemployment. C6. International finance. C7. Stock market and personal finance.*
Prof. Ana-Maria NEAGU

ELECTRICAL ENGINEERING II
Acquisition of basic knowledge of electrical transformer; Acquisition of basic knowledge of induction machine; Acquisition of basic knowledge of synchronous machine; Acquisition of basic knowledge of DC machines; Acquisition of basic knowledge of electric drive systems.

Topics: *1. Review of basic knowledge of units, laws and regimes of electromagnetic field Gauss's law. Coulomb's law. Joule-Lentz's law. 2. Review of basic knowledge of Direct current (DC) electric circuits. Nodes, Branches and Loops. Direct currents devices. Law of Current. Law of Voltage. Superposition theorem. Node Voltage Method. 3. Review of basic knowledge of Electrodynamics. Magnetic field. Electromagnetic induction. Lorentz force law. Electromotive force. Ampere's law. Faraday-Lenz law. Classification of magnetic materials. Ferromagnetism. Magnetic circuits. Inductivity. Energy and forces in magnetic field. 4. Review of basic knowledge of Alternating current (AC) electric circuits. Sinusoidal steady-state regime. CompMlex representation. Complex impedance. Sinusoidal power 5. Electrical transformers. Construction. Operation principle. Circuit equations. The secondary side values referred to the primary side. Electric equivalent circuit. No load and short circuit regimes. Efficiency and power diagram. Characteristics. Three-phase transformer. Special transformers. 6. Induction machine. Three-phase induction motor. Construction. Operation principle. Efficiency and power diagram. Torque. The characteristics of the three-phase induction motor. Starting of the three-phase induction motor. Single phase induction motor. 7. Synchronous machine. Construction. Synchronous generator. Operation principle. Efficiency and power diagram. Equation and voltage diagram. Electromagnetic torque and electromagnetic power. Characteristics of the synchronous generator. 8. DC Machine. Construction. Operation principle. DC machine torque. DC generator. DC generator equations. Efficiency and power diagram. Characteristics. DC motor. DC motor equations. Efficiency and power diagram. Starting of the DC motor. Variable speed. Characteristics. 9. Drives and Electric Motor Selection. Introduction to Drive Systems. Mechanical Requirements. Electric machines heating and cooling. The power calculus of the drive motor that is working under invariable load. The power calculus of drive motor, that is working under variable load. Motor Drives Controller.*
Prof. Marilena STĂNCULESCU

ROMANIAN LANGUAGE (FOR FOREIGN STUDENTS) IV
The practical course of Romanian for foreign students focuses on the development of the four fundamental skills: listening, speaking, reading and writing.
Topics: *Telephone conversations. Writing a letter. Talking about Romania. Reading about Romania. Individual project - Presenting your country. Talking about your future career. Presenting your future career and your plans for the future. Talking about our free time.*
Prof. Elisabeta Simona CATANA

III Year, 1st semester
2020-2021

		An 3/Sem 5	Denumire Disciplina	Denumire Disciplina in limba de predare	Forma verificare	Nr ore/sapt C	S	L	P	ECTS	Tip	Cat
38	1	UPB.12.5.001.I.EM	Analiza cu element finit	Finite Element Analysis	E	2		2		4	T	O
39	2	UPB.12.5.002.I.EM	Termodinamica tehnica	Engineering Thermodynamics	E	2	1	1		5	T	O
40	3	UPB.12.5.003.I.EM	Mecanica fluidelor	Fluid Mechanics	E	2	1			4	T	O
41	4	UPB.12.5.004.I.EM	Proiectare pentru reciclare	Design for recycling	V	2			2	4	S	O
42	5	UPB.12.5.005.O.EM	Comportarea mecanica a materialc	Mechanical Behaviour of Materials	E	2	1			3	T	A
43	6	UPB.12.5.006.I.EM	Organe de masini si mecansme II	Machine Elements & Mechanisms I	E	2		1	2	5	T	O
44	7	UPB.12.5.007.I.EM	Procedee de fabricatie II	Manufacturing Processes II	C	2		1		3	T	O
45	8	UPB.12.5.008.I.EM	Moneda si sistem bancar	Money & Banking	C	1	1			2	C	O

2021-2022

		Denumire RO	An 3/Sem 5	Ver	C	S	L	P	ECTS
38	1	UPB.12.T.05.O.001EM Analiza cu element finit	Finite Element Analysis	E	2		2		4
39	2	UPB.12.T.05.O.002EM Termodinamica tehnica	Engineering Thermodynamics	E	2	1	1		5
40	3	UPB.12.T.05.O.003EM Mecanica fluidelor	Fluid Mechanics	E	2	1			4
41	4	UPB.12.T.05.O.004EM Organe de masini si mecanisme II	Machine Elements & Mechanisms I	E	2		1	2	5
42	5	UPB.12.T.05.O.005EM Procedee de fabricatie II	Manufacturing Processes II	C	2		1		3
43	6	UPB.12.S.05.O.006EM Proiectare pentru reciclare	Design for recycling	V	2			2	3
44	7	UPB.12.C.05.O.007EM Comportarea mecanica a materialelor	Mechanical Behaviour of Materials	E	2	1			4
45	8	UPB.12.C.05.O.008EM Moneda si sistem bancar	Money & Banking	C	1	1			2

FINITE ELEMENT ANALYSIS
The student should obtain knowledge of theoretical fundamentals of the finite element analysis of mechanical structures, stress, strain and displacement calculations, method approximations and computer implementation.
Topics*: Introduction. Displacement method. Direct stiffness method – trusses. Slender beams, planar frames, grids. Linear elasticity. Energy methods. Finite elements based on displacement fields. Isoparametric elements. Plate bending.*
Prof. Ştefan SOROHAN

ENGINEERING THERMODYNAMICS
Applying the concepts, principles and methods of analysis specific to Thermodynamics to engineering applications in the field of thermo-mechanical machines
Topics: *Basic Concepts of Thermodynamics. Working Fluids in Thermal Machines. First Law of Thermodynamics. Thermodynamic Processes. Second Law of Thermodynamics. Vapor and Steam Power Plants. Basic of High Speed Gas Dynamics*.
Prof. Monica COSTEA

FLUID MECHANICS
The focus of the lectures is to teach the students how the theoretical models are applied to obtain solutions with relevance for practical cases. The focus of the lectures is to obtain laminar solutions of the Navier-Stokes equation, with application in lubrication, dynamics of thin films and the study of biofluids. One main aim of the courses/seminars, in the second part of the course, is to investigate the hydrodynamics instability, in relation to laminar – turbulence transition.
Topics: *Definition of continuous media, rheological fluids properties, diffusion process. Boundary conditions, surface tension, capillarity. Forces and stresses; Cauchy stress tensor. Kinematics; velocity gradient, stretching and spin tensor, vorticity; stream lines and stream tube. General principles and their mathematical formulations: conservation of mass and momentum; Bernoulli solution. Navier-Stokes equation (general presentation). Exact and numerical solutions of Navier-Stokes equation. 2D Stokes solutions; Hele-Shaw flow; Thin films approximation (Reynolds*

equation for lubrication). Laminar and turbulent flows; hydrodynamic stability (introduction). Boundary layer theory; hydrodynamic forces against immersed bodies.
Prof. Corneliu BALAN

MACHINE ELEMENTS AND MECHANISMS II
Specific objectives: Learning and correct usage of the terminology and technical language specific to mechanical components. Learning of the design solutions and operating characteristics of the main components studied through theory and experiment. Define the specifications and methods to calculate and design (including their selection from catalogues) of the components studied. Identification of the main mechanical load acting on the studied components and calculation of the corresponding stresses and deformations. Apply of the failure theories for static and variable (fatigue) conditions. Critical analysis (expertise) of alternative design solutions for a given mechanical system.
Topics: *Introduction into mechanical design (Design steps. priciples of mechanical design. Engineering specifications. Design considerations). Basics of Tribology (Classification of friction pairs. Elastic and plastic contacts. Friction regimes and modes of wear. Fluid film generation). Shafts, axles and associated parts: (Generalities: definitions, classifications, materials and technology, modes of failure. Shaft design. Hub-on-shaft assemblies by positive means: keys, splines, pins, polygonal profiles.Hub-on-shaft assemblies by friction means: tapered shaft, taper rings, interference fit). Rolling-element bearings (Generalities: design solutions, classification symbols. Design of rolling-element bearings: modes of failure, force repartition, bearing arrangements and calculation. Bearing lubrication). Sliding bearings (General characteristics: principles of operation, classification, constructive solutions, materials for sleeves. Sliding bearings - radial and thrust - operating in boundary lubrication conditions. Fluid film – HD – bearings: principle of operation, design solutions, calculation. Lubricant supply systems. Hydrostatic bearings. Optimum bearing selection - Neale Chart). Seals (Overview. Static seals - gaskets, "O"-rings etc. Dynamic seals – lip seals, mechanical face seals, compliant seals - brush seals, finger seals. Design solutions).*
Prof. Traian CICONE

MANUFACTURING PROCESSES II
The course presents the basic notions of cutting processes, parameters involved in cutting speed and feed calculation, correlation between different types of cutting tools and processed materials in connection with the indications of some important producers and their catalogues; understanding of the CNC machine tool structures, flexible manufacturing and fabrication lines. The course presents also the fundamentals of computer aided manufacturing – CAM applied in programs such as EasyCAM, Catia.
Topics*: Introduction. Material Properties. Metal Cutting. CNC machines and systems. CNC programming.*
Prof. George CONSTANTIN

DESIGN FOR RECYCLING

Prof. Adrian VOLCEANOV

MECHANICAL BEHAVIOR OF MATERIALS
The student becomes familiar with modern strength calculation methods used in order to assess structures with defects. They learn how to use methods in order to design and verify structures subjected to different dynamic loads. The numeric calculations are performed on common structures used in mechanical engineering.
Topics: *Chapter 1. Basic equation in theory of elasticity in matrix formulation. The case of isotropic materials; Extension to anisotropic materials. Chapter 2. Basic description of main*

failure modes for materials and structures: under static and dynamic loading, under simple and combined loads, buckling and creep. Chapter 3. Structural imperfections and failure initiation in materials, at microscopic and macroscopic level. Dislocations and voids, hardening mechanisms. Theoretical limits of strength. Chapter 4.Basic considerations on fracture mechanics. Crack initiation and fracture modes; Brittle fracture; Griffith's criterion; Energy release rate and crack driving force; Linear elastic fracture mechanics; The stress intensity factor; Crack tip zone; Critical factor controlling crack propagation; Resistance curves; Ductile fracture; J-integrals. Chapter 5. Special topics on fracture mechanics. Cracking at interfaces; Cracking of layered materials. Assessment of material toughness. Toughening mechanisms. Environmental effects. Chapter 6. Fatigue of materials. Total-Life Approaches to Fatigue; High cycle and low cycle fatigue; Fatigue crack initiation and growth in brittle and ductile materials. Cumulative damage models. Fatigue under random loads. Multi-axial fatigue. Chapter 7. Time-Dependent Behaviour. Creep and stress relaxation; Different stages of creep. Mechanisms of creep. Strain rate and fracture toughness. Chapter 8. Elements of smart design. Safe life and fail safe philosophy in design of structures. Damage tolerant design; Structural optimization; Case studies.
Prof. Dragoș-Alexandru APOSTOL

MONEY AND BANKING
Specific objectives: Identify types of banks and financial systems. Applying concepts like, money, interest rates, fees, real annual interest rate, fiat money, official interest rate, reference interest rate. Interpretation of the market signals and identification of cyclically economic tendencies compared to national and European monetary policy.
Topics: *Introduction to banking system, role of money. Money supply, money demand, monetary equilibrium, monetary injection. Fiscal and monetary policy linkages: government debt and inflation risks. General notions about banks, role and functionality. Interest rate, types of interest, price of debts instruments, fluctuations in the interest rate. International finance. Short history regarding economic crisis, possible solutions.*
Prof. Ana Maria NEAGU

III Year, 2nd semester
2020-2021

		An 3/Sem 6	Denumire Disciplina	Denumire Disciplina in limba de predare	Forma verificare	Nr ore/sapt C	S	L	P	ECTS	Tip	Cat
46	1	UPB.12.6.001.I.EM	Transfer de caldura si masa	Heat & Mass Transfer	E	3	1	1		4	S	O
47	2		Dinamica masinilor	Dynamics of Machinery	E	2		2		3	S	O
48	3	UPB.12.6.003.I.EM	Transmisii mecanice	Mechanical Transmissions	E	3		1		3	T	O
49	4	UPB.12.6.004.O.EM	Masurari mecanice	Mechanical Measurements	E	2		1		3	S	A
50	5	UPB.12.6.005.I.EM	Tehnici de analiza si control aplicate in inginerie	Engineering analysis and control technics	V	2			2	3	T	A
51	6	UPB.12.6.006.I.EM	Modelare numerica in mecanica st	Computational Structural Mechanic	C	2	1	1		4	S	O
52	7	UPB.12.6.007.I.EM	Proiect de Transmisie mecanica	Mechanical Transmissions Project	V				2	2	T	O
53	8	UPB.12.6.008.I.EM	Practica industriala	Practical Workshop	C					6	T	O
54	9	UPB.12.6.009.I.EM	Administrarea afacerilor	Bussiness Administration	C	1	1			2	C	O

2021-2022

			Denumire RO	An 3/Sem 6	Ver	C	S	L	P	ECTS
46	1	UPB.12.S.06.O.001EM	Transfer de caldura si masa	Heat & Mass Transfer	E	3	1	1		4
47	2	UPB.12.S.06.O.002EM	Dinamica masinilor	Dynamics of Machinery	E	2		2		3
48	3	UPB.12.T.06.O.003EM	Transmisii mecanice	Mechanical Transmissions	E	3		1		3
49	4	UPB.12.S.06.O.004EM	Calculul structurilor mecanice	Computational Structural Mechanic	E	2	1	1		3
50	5	UPB.12.T.06.O.005EM	Proiect de Transmisie mecanica	Mechanical Transmissions Project	V				2	2
51	6	UPB.12.T.06.O.006EM	Practica industriala	Practical Workshop	C					4
52	7	UPB.12.S.06.O.007EM	Practica industriala	Practical Workshop						4
53	8	UPB.12.C.06.O.008EM	Administrarea afacerilor	Bussiness Administration	C	1	1			2
DISCIPLINE OPTIONALE										
54	9	UPB.12.S.06.A.009EM	Masurari mecanice	Mechanical Measurements	E	2		1		2
		UPB.12.S.06.A.010EM	Circuite si componente electronice	Electronic Devices & Circuits	E	2		1		2
55	10	UPB.12.S.06.A.011EM	Tehnici de analiza si control aplicate in inginerie	Engineering analysis and control technics	V	2		2		3
		UPB.12.S.06.A.012EM	Aplicatii ale mecanicii fluidelor	Applied Fluid Dynamics (Pumps,...)	V	2		2		3

HEAT AND MASS TRANSFER

This course acquaints students with the underlying principles of heat and mass transfer modes. Analytical and numerical methodologies are presented for solving steady and transient problems with one or more spatial dimensions. Related topics of contemporary interest to industry will also be considered in terms of homework problems, design problems, and worked examples.

Topics*: Course Description and Introduction to Heat Transfer. Conduction Heat Transfer. 1-D Steady Heat Conduction. Transient Conduction. Convection Heat Transfer. Forced External Convection. Forced Internal Convection. Heat Exchangers. Radiation Heat Transfer.Phase Change. Mass Transfer.*

Prof. Emilia-Cerna MLADIN

DYNAMICS OF MACHINERY

At the end of the course the students should be able to: (a) explain the major effects of altering mass, stiffness and damping of a system, (b) understand and describe the various forms of energy dissipation mechanisms in structures, (c) describe the dynamic behavior of continuous systems such as beams, plates, and the whirling rotating shafts, (d) realistically model the rotor-bearing systems for vibration analysis, and (e) diagnose specific faults based on vibration measurement data.

Topics: *Natural frequencies. Resonance. Damping. Logarithmic decrement. Natural modes of vibration. Torsional vibrations. Geared systems. Lumped parameter vibrating systems. Modal analysis of vibrating systems. Finite element analysis of vibrating systems. Vibration limits. Standards and recommendations. Precession of rotors with rigid discs. Critical speed maps. Campbell and stability diagrams. Finite element modeling of rotor-bearing systems. Vibration in machines with hydrodynamic bearings. Vibration in machines with rolling bearings. Diagnosis of rolling element bearings. Vibration measurement for machinery monitoring. Specific faults of*

machines and their detection. Monitoring machinery operation condition. Computer assisted vibrodiagnosis. Computer programs.
Prof. Stefan SOROHAN

MECHANICAL TRANSMISSIONS
The course is intended to provide the student with a clear and thorough understanding for both the theory and application of the fundamentals of mechanical transmissions. The third in a series of courses dedicated to the "anatomy" of machines, the course is focused on the components used to transmit power by rotation with constant or variable transmission ratio (gears, CVT-s, belt or chain drives, friction drives, couplings and clutches).
Topics: 1. *Fundamentals of mechanical transmissions. The need of a mechanical transmission. Overview and comparative analysis. Operating characteristics. Stable unstable operation. Continuously variable transmissions (CVT). 2. Gears. Gear kinematics. Fundamental law of gearing. Spur gears: geometry; nominal forces; strength calculation. Design method Particularities of helical gears: geometry, nominal forces, strength calculation. Design details of cylindrical gears. Bevel gears. Overview. Straight teeth orthogonal bevel gears: geometry, nominal forces, strength calculation. Worm gears. Overview, geometry, forces, strength calculation. Design solutions for gear boxes. Planetary gears. Special gears: harmonic drives, non-circular gears. 3. Belt drives. General characterization (classification, materials, belt types). Friction belts. Forces and stresses in belts. Belt sleep and creep. Efficiency. Strength calculation. Design procedure. Belt tensioning. Design solutions for sheaves and pulleys. Timing belts. 4. Friction drives. Overview. Design solutions. Fluid traction (EHD) cylindrical and conical CVT. Toroidal CVT. Belts CVT. 5. Chain drives. Overview. Roller chain: kinematics, geometry, design considerations. 6. Couplings. General considerations (definitions, classifications). Solid (fixed/non-compensating) couplings. Mobile (compensating) couplings: rigid and elastic. Clutches. Modelling of friction coupling engagement. Torque limiters. One-way couplings. Fluid Couplings Brakes.*
Prof. Traian CICONE

COMPUTATIONAL STRUCTURAL MECHANICS
The course objectives: to learn the principles of calculus for mechanical structures using high-performance finite element codes; to apply methods for calculation of lifetime of cracked structures; to calculate structures made of composite materials.
Topics: *Review of main parameters in fracture mechanics. Review of Finite element concepts: fundamental equation; triangular and quadrilateral finite elements. Finite element modeling of stress singularity at the crack tip. Computational methods for determination of the stress intensity factor. The compounding method – theoretical background, applications. Fatigue and fracture: Paris law, crack propagation rate, fatigue lifetime. Classification and properties of composites. Laminated composites: Strength of a lamina. Strain-displacement relations. Laminate stiffness and compliance coefficients. Finite element modelling of composites.*
Prof. Dragos-Alexandru APOSTOL

MACHINE TRANSMISSIONS PROJECT
This project, which is in strong relationship with the courses “Machine Elements and Mechanisms” (ME&M) and ”Mechanical Transmissions" introduces students to the design of mechanical components and provides the basis for professional practice for the design of machineries. The main goal is to provide students the ability to utilize specific design tools needed to execute a design. The tools are presented as examples of the general types of approaches that designers employ (empirical, semi-empirical and analytical methods). This activity, with a thorough individual character, gives the opportunity to solve a real technical problem, i.e. a complex mechanical transmission including a gear reducer box, a belt transmission and couplings. The final form of the project that includes a Technical Report drafts for assembly drawing and for detail drawings and a

3D solid model allows to concretize all the previous knowledge acquired during the first 3 academic years.
Topics: *Power and speed calculation. Estimation of transmission efficiency. Selection of the electric motor. Optimization of the transmission ratio and calculation of torque and speed of each transmission stage. Selection of the motor mount from catalogues. Design and optimization of the V-belt drive. Design of the transmission. Selection of the gearbox and the elastic coupling from vendors catalogues. 3D-model of the transmission. Design of an one stage gear set (helical, bevel or worm). Gear sizing. Geometry of the gears. Forces in the gear-set. Strength calculation of the gears. Design of the other components of the gearbox. Shafts sizing. Bearing reactions and diagrams of moments. Bearings selection and calculation. Seals selections. Selection and calculation of shaft associated parts. Gearbox lubrication. 3D-model/3-views assembly drawing of the gearbox. 3D-model. Detail drawings for both shafts and the gear. Technical Report.*
Prof. Georgiana PĂDURARU

BUSINESS ADMINISTRATION
The main objective of this course is to introduce the student to the entrepreneurial process from idea recognition to implementation of a new business plan.
Topics: *C1. Marketing introduction. The marketing environment C2.Consumers behavior and target market C3.Product decisions C4.Distribution decisions C5.Promotion decisions C6.Price decisions C7.Social media marketing.*
Prof. Ana-Maria NEAGU

MECHANICAL MEASUREMENTS
The objective of the course is to provide students with the knowledge and working methods necessary to initiate an experimental research program, design a measurement chain or computerized data acquisition system and measure the main types of physical quantities (forces, pressures, temperatures , speeds, etc.)
Topics: *1. Introduction to measurements 2. Measuring standards. Calibration 3. Measurement characteristics 4. Measuring systems 5. Analog and digital sizes 6. Data transmission 7. Parametric transducers 8. Generators transducers 9. Wheatstone Bridge 10. Forces and moments measurement 11. Pressure measurement 12. Position and speed measurement 13. Vibration measurement 14. Temperature measurement*
Prof. Andrei SZUDER

APPLIED FLUID DYNAMICS
Objectives: definition and classification of concepts, theories and methods that are used in the design of processes and equipments related to mechanical engineering.
Topics: *Fluid mechanics. Non-Newtonian fluid mechanics. Pumps. Turbines.*
Prof. Emil-Alexandru BRUJAN

PRACTICAL WORKSHOP
It is intended only for Romanian students. A 12 weeks period of internship will be spent in an public/private company during the summer period (June-September).

IV Year, 1st semester
2020-2021

	An 4/Sem 7		Denumire Disciplina	Denumire Disciplina in limba de predare	Forma verificare	Nr ore/sapt C	S	L	P	ECTS	Tip	Cat
55	1	UPB.12.7.001.O.EM	Instrumente software in ingineria mecanica II	Software Tools for Mechanical Engineering II (thermal design)	C	2		2		4	S	O
56	2	UPB.12.7.003.I.EM	Tribologie	Tribology	E	2		2		5	T	O
57	3	UPB.12.7.004.I.EM	Procedee de fabricatie avansate si asigurarea calitatii	Advanced Manufacturing Processes and Quality Assurance	C	2		1		3	T	A
58	4	UPB.12.7.005.I.EM	Dezvoltarea de produse inovante	Design of Innovative Products	V	1			2	3	S	O
59	5	UPB.12.7.007.I.EM	Electronica	Electronics	E	2		1		4	T	A
60	6	UPB.12.7.002.I.EM	Masini termice I (Motoare cu ardere	Heat Engines I (Internal Combustion Engines)	E	2	1	1	1	6	S	O
61	7	UPB.12.7.008.I.EM	Bazele managementului	Fundamentals of management	C	1	1			2	T	O
58	4		Aplicatiile nanotehnologiei in ingineria mecanica	Nanotechnology applications in mechanical engineering	V	1			2	3	S	O

2021-2022

			Denumire RO	An 4/Sem 7	Ver	C	S	L	P	ECTS
56	1	UPB.12.S.07.O.001EM	Instrumente software in ingineria mecanica II	Software Tools for Mechanical Engineering II (thermal design)	C	2		2		4
57	2	UPB.12.T.07.O.002EM	Tribologie	Tribology	E	2		2		5
58	3	UPB.12.S.07.O.003EM	Dezvoltarea de produse inovatoare	Design of Innovative Products	V	1			2	3
59	4	UPB.12.S.07.O.004EM	Aplicatiile nanotehnologiei in ingineria mecanica	Nanotechnology applications in mechanical engineering	E	1			2	3
60	5	UPB.12.S.07.O.005EM	Masini termice I (Motoare cu ardere interna)	Heat Engines I (Internal Combustion Engines)	E	2		1	2	6
61	6	UPB.12.T.07.O.006EM	Bazele managementului	Fundamentals of management	C	1	1			2
DISCIPLINE OPTIONALE										
62	7	UPB.12.T.07.A.007EM	Electronica	Electronics	E	2		1		4
		UPB.12.T.07.A.008EM	Teoria controlului	Control Theory	E	2		1		4
63	8	UPB.12.T.07.A.009EM	Procedee de fabricatie avansate si asigurarea calitatii	Advanced Manufacturing Processes and Quality Assurance	E	2		1		3
		UPB.12.T.07.A.010EM	Prelucrarea imaginilor	Image Processing	E	2		1		3

SOFTWARE TOOLS FOR MECHANICAL ENGINEERING II (THERMAL DESIGN)

Objectives: Principles description of individual and system operation of thermal equipment; their design and test sizing methods. Application of principles and methods for the construction, design and execution of mechanical systems and equipment. Ensuring the ability for production and designer engineers to reasonably understand the momentum an heat transfer processes in equipment and systems. Provide the necessary tools to simulate the operation of energy and substance change equipment with the environment.

Topics:

TRIBOLOGY

Cross-disciplinary course intended to provide the student with a clear and thorough understanding of friction and wear phenomena caused by the relative motion between interacting elements, basic principles of lubrication, and tribological design solutions of elements and systems.

Topics*: Introduction. Subject definition. Historical background. Economic consideration. Lubrification issues. Friction and wear issues. Contact of mechanical components. Classification and characterization of friction pairs. Contact area. Physical and geometrical characterization of metallic surfaces. Roughness. Elastic contacts. Hertz model for stress and strain calculation in linear and elliptic contacts. Lubricanți. Classification. Mineral oils. Additives. Sinthetic lubricants. Properties of liquid lubricants. Viscosity and its dependence on temperature and pressure. Newtonian and non-Newtonian liquids. Greases. Hydrodynamic (HD) Lubrication. Isothermal*

Reynolds eq. for 1D and 2D configurations. Parallel gap. Step (Rayleigh) slider. Plane-inclined slider (convergent gap). Aplications to HD thurst bearings, seals, viscous pumps etc. Heat balance. Numerical solution for Reynolds eq. Hydrodynamic journal bearings. The mechanism. Geometryof the gap. Narrow journal bearing model. Numerical solutions (2D) to calculate finite length HD journal bearings. Squeeze film effects. Circular and rectangular configurations. Hydrostatic (HS) lubrication. Overview. Thrust bearings in constant flow system (load, flow rate, stiffness, power loss). Multi-recess HS systems. Recess optimization. Application of HS lubrication to aligned mechanical face seals. Elastohydrodynamic (EHD) lubrication. Macro-EHD efects for conformal pairs. EHD lubrication for non-conformal pairs. Mathematical model. Numerical solutions. Aplications to rolling bearings, gears, cams and EHD friction drives. Dry Friction. Laws and theories (simple and extended adhesion theory; ploughing effect) for sliding friction. Methods for friction coefficient measurement. Friction regimes. Striebeck curve. Methods to predict friction regimes. Boundary lubrication. Mixed lubrication. Wear. Definition. Indicators. Wear variation in time. Main mechanisms as wear (adhesive, abrasive, surface fatigue-pitting-, fretting). Methods of calculation. Solutions to reduce wear.
Prof. Traian CICONE

DESIGN OF INNOVATIVE PRODUCTS
Objective: Developing skills in developing a strategy to create a competitive advantage by innovating, to ensure development and even survival in an aggressive competitive environment; knowing the need for systematic exercise of innovative activity.
Topics: *1. Innovation: definitions and typologies 1.1. The context and importance of innovation. 1.2. Innovation: definition. 1.3. Typologies of innovation. 1.4. Classification of innovations. 1.5. Innovation management. 1.6. The causes of innovation failure and success factors. 1.7. The matrix model of innovation management. 1.8. Techniques of creativity. 1.9 Sources of Innovation. 2. Enterprise Strategy and Innovation 2.1. Defensive strategy; offensive strategy. 2.2. Strategy. Decision levels. 2.3. Position targeted on the market. 3. Strategic marketing and its environment 3.1. Marketing: concept, evolution. 3.2. Strategic marketing and operational marketing. 3.3. Analysis of the need and definition of the reference market. Functional analysis of need 3.4. Conceiving a customer-oriented marketing strategy. 3.5. Market segmentation, target marketing. 3.4. Strategic marketing in the enterprise and its environment; analyzing attractiveness in terms of quantity (dynamic) and dynamic (product life cycle). Elaboration of the marketing strategy 4. SWOT analysis 5. Operational marketing. 5.1. The marketing mix. 5.2. The product. 5.3. Price. 5.4. Placement. 5.5. Promotion. 6. Functional technical analysis 7. Production 7.1. Production and manufacture of products. 7.2. Organization of production (spatial, temporal, logistic). 7.3. Production Management. 7.4. Production costs. Executive summary*
Prof. Camelia STANCIU

NANOTECHNOLOGY APPLICATIONS IN MECHANICAL ENGINEERING
The course forms competences, skills and gives students the knowledge necessary to use the methods and techniques of analysis and control of materials used in advanced mechanical engineering. Also, through its content and approach, the course is designed to develop creativity and interest in deep investigating the field, including research activities.
Topics: *1. What is nanotechnology? Motivation for the study of nanotechnology. 2. Investigation and handling of materials at nanometer scale. 3. Micro- and nano-manufacturing/fabrication. 4. Nanoscale mechanical properties of solids and thin film surfaces. 5. Nano-devices. 6. Nano-sensors for biology and medicine. 7. Nano-molecular machines and ethics of nano-materials use. 8. Nano-tribology - Friction and wear at the atomic scale 9. Social implications of nanoscience and nanotechnology. 10. Recapitulation and fixation of acquired notions. Reflections for the future.*
Prof. Marius ENACHESCU

HEAT ENGINES I (Internal Combustion Engines)

The course objective is to provide the corresponding concepts on knowledge concerning structure, operating, design and practice of the internal combustion engines. In this sense, there are discussed fundamental bases for engine design, development and manufacturing. In the same time are emphasized the main parameters which characterize performance, efficiency, and emissions which are produced by spark ignition and diesel engines. There is discussed in details the influence of different parameters on engine's characteristics, the reliability and manufacturing and service costs. The engine's operating processes are analyzed from point of view of thermodynamics, combustion development, fluid flow, heat and mass transfer and effects of fuel's chemical and physical properties. Methods and instrumentation used for theoretical and experimental investigations to performing engine research, development and optimization are described too.
Topics*: 1 Introduction 2 Gas exchange processes 3 Combustion in Spark – Ignition Engines 4 Combustion in Compression – Ignition Engines 5 Heat transfer 6 Engine mechanism kinematics and friction.*
Prof. Radu CHIRIAC

FUNDAMENTALS OF MANAGEMENT
The course objective is understanding of the role and the importance of management for the future engineering activities.
Topics: *Management – art or science? Managers. Definition and importance of management. Evolution of management thinking. Management function. Role of managers in the contemporary society. Foreseeing in management. Elements of the managerial foreseeing process. Tools of the managerial foreseeing process. Decision-making process. Business planning. Assess the business ideas. Business planning. Organizing the activities. Elements of an organizational structure. Development of an organizational structure. Job design. Leading the people. Process of human resource management. Groups. Managers' traits and managerial behavior. Inter personal and organizational communication. Motivation and performance. Coordination and controlling. Mechanism of activities' coordination. Coordination methods. Result control.*
Prof. Radu STANCIU

ELECTRONICS
The general objective of the subject is to familiarize students with the field of electronics engineering for mechanical engineering. The course presents a broad thematic area, with emphasis on basic electronic devices and circuits. The laboratory of the "Electronics" subject, through its pragmatic side, being strongly application-oriented, highlights the importance of aspects such as design, evaluation, testing and virtual manufacturing of electronic products, the main target being the development of high quality real electronic products right from the first production process.
Topics: *1. Introduction to electronics 1.1 Basics of Design and Manufacturing in the Electronics Industry 1.2 Modern technologies in the electronics industry. 2. Passive electronic components and circuits 2.1 Resistors 2.2 Capacitors 2.3 Inductors and transformers 2.4 RL, RC, RLC circuits 3. Printed Circuits (PCB) 3.1 Introduction to PCB 3.2 Manufacturing technologies 3.3 Providing communication between the designer and the manufacturer 4. Discrete active electronic components 4.1 Properties of semiconductors and of p-n junctions (intrinsic and extrinsic semiconductors of p and n types, diffusion and drift current) 4.2 Junction diode, characteristics, graphical analysis, diode and rectifier circuits, Zener diode and regulation circuits, LED diode and display 4.3 Bipolar transistors (structure of pnp and npn transistors, current flow mechanism, Ebers-Moll model, EC, CC and BC connections, input, output, transfer, static, operation regions), field effect transistors, MOS field effect transistors 4.4 Thyristor, diac, triac, optoelectronic devices 5. Analog electronic circuits 5.1 Amplifiers (single and multiple stages, audio amplifiers, amplifier design) 5.2 Negative and positive feed-back 5.3 Analog components and integrated circuits, operational amplifiers (description, characteristics, equivalent circuits, buffer, inverse amplifier, noninvers amplifier, algebraic summer, comparator) 6. Digital electronic devices and circuits 6.1 Introduction to Digital Concepts, Systems and Numeric Codes, Logical Gates, Boolean Algebra,*

Implementation of Logic Equations 6.2 Memory elements (clock signals, "preset" and "clear", RS latch, D latch, D type bistable circuit, JK type bistable circuit) 6.3 Shift registers, counters, coders, decoders, multiplexors, demultiplexors, comparators 6.4 Advanced digital components (microcontrollers and microprocessors) and advanced digital circuits.
Prof. Norocel CODREANU

CONTROL THEORY
Objectives: to know the main basic components symbols and operation principle, basic rules of connecting, sizing, commissioning and fault detection for the fluid power systems.
Topics: *Structure and operation of fluid control systems; control systems performance; common examples of control systems; practical analysis and design methods for control systems. Mathematical modeling of control systems by transfer functions. Modeling control systems in state-space. Transformation of mathematical models with MATLAB. Mathematical modeling of mechanical, electrical, fluid and thermal control systems. Transient and steady-state response analyses of first, second, and higher order systems. Routh's stability criterion; effect of integral and derivative control on system performance. Control systems analysis and design by the root-locus method. Control system analysis and design by the frequency-response method; Nyquist stability criterion. PID controllers; ZieglerNichols rules for tuning PID controlers; automatic PID tuning using SIMULINK. Controllability and observability; robust control systems. Analysis and synthesis of control systems by Control Toolbox and Identification Toolbox. Control systems optimization by simulation with Hardware-in-the-Loop.*
Prof. Nicolae VASILIU

ADVANCED MANUFACTURING PROCESSES AND QUALITY ASSURANCE
Objective: knowledge acquiring on design, implementation and continuous improvement of quality management systems in industrial organizations and supplier chains – commitment for quality, QMS documentation design, quality management related standards for organizations' performance improvement and sustainable development.
Topics*: General elements and concepts in quality field: concept evolution, quality characteristics, quality control / assurance / management concepts, motivation and commitment for quality, client requirements versus organizational performance, national and international standards and conformity / quality related legislation. Quality management system: concepts, practicality versus bureaucracy, management / staff motivation for QMS, QMS design, quality system documents, requirements and features of the ISO 9001:2015 standard. Quality certification: conformity certification, product and quality management system certification, European Conformity label CE, certification bodies, certification procedures, personel certification, supplier conformity declaration, laboratory accreditation in accordance to ISO 17025, impact of conformity certification on consumer (consumer protection). Monitoring & measurement: measurement uncertainty, processes monitoring, non-conforming product, measurement device monitoring, monitoring and measurement of consumer satisfaction, complaints handling ISO 10001, 2, 3, 4. Continuous improvement: self-assessment (ISO 9004), corrective / preventive actions, internal audit of QMS (ISO 19011), audit role in organizations and link to management analysis. Quality control: control methods classification, statistical techniques, correlation quality assurance / quality control, SPC ISO 10017. Economic aspects related to quality: costs of non-quality, client versus company perspective, ISO 10014, quality added value.*
Prof. Irina SEVERIN

IV Year, 2nd semester
2020-2021

	An 4/Sem8		Denumire Disciplina	Denumire Disciplina in limba de predare	Forma verificare	Nr ore/sapt C	S	L	P	ECTS	Tip	Cat
62	1	UPB.12.8.004.I.EM	Masini termice II (Turbine & Gen. de abur)	Heat Engines II (Turbines & Steam Generators)	C	2		2		4	S	O
63	2	UPB.12.8.001.I.EM	Instalatii frigorifice si de conditionare a aerului	Refrigeration and Air Conditioning	C	2	1	2		5	S	O
64	3	UPB.12.8.003.I.EM	Ingineria mediului	Environmental Engineering	V	2	1			3	S	O
65	4	UPB.12.8.002.I.EM	Proiect de licenta	Diploma Project	V				8	10	S	O
66	5	UPB.12.8.005.O.EM	Management industrial	Industrial Management	V	1	1			2	T	A
67	6		Compresoare si ventilatoare	Compressors and Fans	V	2			1	3	S	O
68	7		Actionari hidraulice si pneumatice	Fluid Power Systems	V	2		1		3	T	O

2021-2022

			Denumire RO	An 4/Sem8	Ver	C	S	L	P	ECTS
64	1	UPB.12.S.08.O.001EM	Masini termice II (Turbine & Gen. de abur)	Heat Engines II (Turbines & Steam Generators)	C	2		2		4
65	2	UPB.12.S.08.O.002EM	Instalatii frigorifice si de conditionare a aerului	Refrigeration and Air Conditioning	C	2	1	2		5
66	3	UPB.12.S.08.O.003EM	Ingineria mediului	Environmental Engineering	V	2	1			3
67	4	UPB.12.S.08.O.004EM	Elaborarea proiectului de diploma	Diploma Project	V				8	4
68	5	UPB.12.S.08.O.005EM	Practica pentru elaborarea proiectului de diploma (60 ore)	Diploma Project Internship						6
69	6	UPB.12.S.08.O.006EM	Compresoare si ventilatoare	Compressors and Fans	V	2			1	3
70	7	UPB.12.T.08.O.007EM	Actionari hidraulice si pneumatice	Fluid Power Systems	V	2		1		3
DISCIPLINE OPTIONALE										
71	8	UPB.12.T.08.A.008EM	Management industrial	Industrial Management	V	1	1			2
		UPB.12.T.08.A.009EM	Robotica si Realitate virtuala	Robotics & Virtual Reality	C	1		1		2

HEAT ENGINES II (Turbines & Steam Generators)
Objectives: 1. Identification and description of basic concepts, theories and methods used in the analysis of technological processes of conception, execution and exploitation of steam generators and turbines. 2. Description of components and principles for the design and construction of steam generators and turbine. 3. Description of component parts and principles of individual and system operation of steam generators and turbines 4. Applying the principles and methods for the design and construction of steam generators and turbines. 5. Optimal construction and operation of steam generators and turbines based on technical, economic and ecologic criteria.
Topics: *Steam boilers. Fossil Fuels and alternative/renewable fuels. Combustion and material balance. Boilers types. Thermal efficiency and heat losses. Pollutant emissions and environment protection. Vapor and combined cycle power plants analysis. Fundamental laws applied to turbines Study. Turbine stage theory and design. Analysis and design of main turbine components. Turbine control system.*
Prof. Elena POP

REFRIGERATION AND AIR CONDITIONNING
The objectives of the course are to describe the operating principles at the system and individual level for refrigeration and air conditioning and the design and testing methods, to apply the principles and methods for the design and construction of refrigeration and air conditioning equipment, the optimum design and operation of refrigeration and air conditioning system based on technico-economic criteria.
Topics: *1. Refrigeration systems. Basic concepts. The throttling effect for real gases (the Joule-Thomson effect) 2. Classification of the refrigeration systems 3. Refrigeration systems with mechanical compression of vapors (MCV) 3.1 One stage MCV 3.2 Conventional regimes for MCV*

3.3 Two-stage MCV 3.4 Cascade MCV 4. Absorption refrigeration systems (ARS) 4.1 Diagrams for calculating ARS. Enthalpy – Composition diagram (h - ξ) for the Ammonia-Water solution. lnp – 1/T diagram. Representing of basic processes in the h - ξ diagram. 4.2 Thermal calculus of the one-stage ARS. 5. Ejection refrigeration cycles 6. Air conditioning systems. Psyhrometrics - basic concepts. Absolute humidity. Relative humidity. Humidity ratio. The Dew point. Density of the moist air and the mixture constant. Enthalpy of the moist air. The H-x diagram for the moist air. Moist air Conditioning Processe. Dry cooling and heating of the moist air. Mixing of moist air currents. Humidification with water or vapors. Drying.
Prof. Alexandru DOBROVICESCU

ENVIRONMENTAL ENGINEERING
The course focuses on the students' acquaintance with technical problems concerning the environment pollution due to dangerous flue gas emission; necessary investments estimation to reduce the quantity of solid and gaseous pollutant matters.
Topics: *Introduction. Generalities. Effects towards human health and environment. The most frequently noxious flue gas emissions. Power plants as pollutant sources. Phonic pollution. Control of solid matter pollution from fixed sources. Solid maters pollution upon the environment. Special equipment for dust removal. Control of NOx emissions. Formation mechanisms, reducing methods, most frequently used equipment. Control of SOx emissions. Formation mechanisms, reducing methods, most frequently used equipment. Carbon monoxide emission. Other pollutants: nuclear plants, di- oxine emissions, and residual water. Main monitoring systems. Waste sustainable deposits. Treatments methods and equipment. European programmes and norms for sustainable development.*
Prof. Tudor PRISECARU

COMPRESSORS AND FANS
The course aims to present the processes, characteristics and construction elements of the compressors and fans. The purpose of the course is to understand the principles of operation and sizing of various types of compressors used in engineering. Students are required to design a sizing project for these cars working in teams.
Topics: *1.Introduction 1.1 Fundamental notions; 1.2 Classification of compressors; 1.3 Choosing the compressor type 2.Thermodynamic bases of gas compression processes 2.1 The behavior of real fluid; 2.2 Theoretical and actual compression processes. 3. Positive displacement compressors 3.1 Classification 3.2 Components of the piston compressor 3.3 Thermodynamic compressor diagrams 3.4 Multi-stage compressors 3.5 Computation scheme of a multi-stage compressor 3.6 Piston compressor flow control 4. Rotodynamic compressors 4.1 Elements of gas dynamics 4.2 Theorem of Euler 4.3 Rotalpy 5. Centrifugal compressors 5.1 Components of the centrifugal compressor; 5.2 Thermodynamic analysis of the compression process; compression ratio; the mechanical work required for compressing; isentropic efficiency 5.3 Mono-dimensional gas flow through the compressor; triangles velocity; load and flow coefficients. 5.4 Two-dimensional inviscid flow elements. Distribution of the relative velocity and pressure in the rotor channel; 5.5 Losses in centrifugal compressors 5.6 Dimensional analysis. Maps of centrifugal compressors 5.7 Multistage centrifugal compressors 6 Axial compressors 6.1Components of axial compress 6.2 Thermodynamic analysis of compression process; distribution of mechanical work on compressor stages. 6.3Monodimensional inviscid flow through the compressor stage; velocity triangles; number of blade for the stage 6.4 Profiling lows of the blades 6.5 Stage losses 6.6 Dimensional analysis; map of axial compressors. 7 Fans 7.1 Fan definition 7.2 Axial fans 7.3 Radial fans 7.4 Techniques for controlling fans 7.5 Maps of fans.*
Prof. Dorin STANCIU

FLUID POWER SYSTEMS

General objective: to know the main basic components symbols and operation principle, basic rules of connecting, sizing, commissioning and fault detection for the fluid power systems.

Topics*: Structure of fluid control systems. Hydraulic fluids properties and selection. Fluid flow fundamentals. Hydraulic pumps and motors. Hydraulic control valves. Hydraulic power elements. Electro hydraulic servo valves. Electro hydraulic servomechanisms. Hydro mechanical servomechanisms. Nonlinearities in control systems. Simulation of the basic control systems behavior. Hydraulic power supplies. Pneumatic drives.*

Prof. Nicolae VASILIU

INDUSTRIAL MANAGEMENT

The objectives of this course are related to offering information that will lead to understanding and knowledge of several industrial management concepts, principles and methods. They include research & development, operations management, forecasting, scheduling, quality assurance, human resources management, finance & accounting management, and commercial management. Emphasis will be placed on the application of these concepts to actual business situations.

Topics: *Industrial management and its importance: setting the context. Industrial management: evolution and stages. Functions of industrial units. Systems theory. Conception and realization of an industrial unit. Operations management. Management of human resource. Management of financial and accounting activities.*

Prof. Daniela Cristina MOMETE

DIPLOMA PROJECT

The project is developed under the guidance of a supervisor. The supervisor is chosen by the student among the professors teaching at this division.

For ERASMUS students it is advisable to avoid choosing this subject since they should specify in the learning agreement the subject of the thesis and the coordinating professor (difficult to be set before arrival and also difficult to be set in the first weeks of school without knowing the professors and subjects).