“Dunarea de Jos” University of Galati

Faculty of Engineering

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
MECHANICAL ENGINEERING - BA						
Mechanical Engineering	**BA**	**Mechanical Engineering**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	5
					Physics Elements of physical mechanics. Fluid statics and dynamics. Oscillations and elastic waves. Elements of molecular physics. Elements of thermodynamics. Elements of quantum mechanics, atomic and nuclear physics.	5
					Chemistry Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Colloidal systems. Redox reactions. Electrolysis. Hydrogen. Metals. Periodic system groups.	5
					Descriptive Geometry Projection systems. Representation of point, line and plan. Polyhedrons. Cylinder and cone. Sphere. Intersections of geometric bodies.	5
					Materials Science and Engineering Types of materials. Atomic architecture. Diffusion. Solidification of metallic materials. Alloy systems. Phase balance diagrams. Fe-C alloy system. Phase transformations in solid state. Heat treatments. Non-ferrous alloys. Ceramic materials. Plastic materials. Composite materials.	5
					Sports Front exercises and workouts. Notions of running school. Repeat the main processes in football (boys) and volleyball (girls). Educate the dynamic force at the level of the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops. Effort readjustment. Sports Games.	1

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**1**	**1**	**English** Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses. Research and Development. Specialized vocabulary and discourse situations. Grammar in focus: Past tenses (past simple, past continuous, past perfect). Information technology. Specialized vocabulary and discourse situations. Grammar in focus: Future forms. Logistics. Specialized vocabulary and discourse situations. Grammar in focus: Conditionals. Quality. Specialized vocabulary and discourse situations. Grammar in focus: Verb phrases. Health and Safety. Specialized vocabulary and discourse situations. Grammar in focus: Verb phrases.	2
					Communication Communication, principles, units and characteristics of communication, the effects of communication, the intelligibility of the message; levels of human communication. The emitting-receiver relationship in managerial and organizational communication. Language Functions. Effective communication principles. Characteristic units of communication. Nonverbal communication. Oral communication. Prepare and support an oral presentation. Types of interviews. Communication networks. Communication in conflict management. Communication and listening. Techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Case Studies. Structure of technical and scientific works.	2
				2	**Linear Algebra, Analytic and Differential Geometry** Matrix operations. Determinants and their properties. Systems of linear equations. Vector spaces. Subspaces. Linear dependence and independence. Bases and Dimension. Coordinates. Change of basis. Linear transformations and Matrices. Eigenvalues and eigenvectors. Diagonalization of a matrix. Inner products and orthogonality. Gram–Schmidt orthonormalization process. Coordinates. Cartesian coordinate-system. Polar coordinates. Cylindrical and Spherical Coordinates. Products of Vectors. Equations of lines and planes. Equations of sphere. Quadric Surfaces. Local theory of Curves. Parametrized Surfaces. The Gauss Map. Curvatures.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**1**	**2**	**Drawings and Infographics I** Arrangement of projections. Views, sections, breaks. Dimensioning of technical drawings. Representation of threads and flanges. Indication of surface condition, marking of dimensional deviations and geometric tolerances. The assembly drawing. Non-demountable joints. Removable assemblies. Mechanical Power Transmitters. Sealing elements.	5
					Computer Programming and Programming Languages Basics of computing. Components of a Computer Systems. The functional scheme of the structure of the computer. Types of computer memory. Introduction to Computers Programming. Forms of information. Data structures. Algorithms and components. Object orientation. Programming techniques. Computer Language Translation. Cloud Computing. Future of programming.	4
					Materials Technology The Structure of Crystalline Solids. Mechanical Properties of Materials. Physical properties of materials. Processing of Metal Alloys. Glass processing. Processing of ceramics. Cermet's. Processing of rubber.	4
					Mechanics I Statics. Fundamental concepts, systems of forces, moment of a force about a point, moment of a force about a given axis, reduction of a force, reduction of a system of forces, particular cases. Centers of gravity of a system of particles and a rigid body. Centers of gravity of some usual homogeneous bodies. Statics of free particles and particles with constraints. Equilibrium of rigid bodies and systems of rigid bodies. Trusses. Statics of the cables. Statics of the simple machines. Kinematics of particles: motion of particles in about various coordinate systems, particular motion of particles. Relative motion of particles.	5
					Electrotechnics Introduction to the basics of electrotechnics. Electricity. Production, transport, distribution. Quality of electricity. Analysis of circuits and electrical networks. Electromagnetism. Effects of electric current. Constructive, functional and behavioral study of machines power.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**1**	**2**	**Sports** Front and work team exercises. The jumping school exercises. Training the skills and motor skills specific to some sports.	1
					English Engineering. Automotive. Specialized vocabulary and discourse situations. Grammar in focus: Active vs. Passive. Relative clauses. Causation. Metallurgy. Specialized vocabulary and discourse situations. Grammar in focus: Obligation and requirements. Welding. Specialized vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability.	2
			2	**1**	**Numerical Methods** Algorithms & calculus errors. Numerical methods for solving algebraic equations. Numerical methods for solving systems of equations. Approximation of real functions. Numerical methods for calculating derivatives & integrals. Numerical methods for solving differential equations.	5
					Drawings and Infographics II AutoCAD - Overview. Basics for Drawing. Entering text into graphic files. Commands for multiplying objects. Dimensioning. Polylines. Editing commands. Advanced drawing commands. 3D drawing commands: nonprimitive. 3D drawing commands: primitive. 3D editing commands. Preparing technical product documentation.	5
					Mechanics II Kinematics of a rigid body. Kinematics of the systems of rigid bodies. Dynamics. Fundamental concepts. Moments of inertia of a body. Kinetic characteristics of a body: momentum, angular momentum, kinetic energy. Fundamental theorems in dynamics of a rigid body and system of particles. Dynamics of a rigid body with fixed axis, dynamics of a rigid body in plane-parallel motion, rigid body dynamics in general motion. Dynamics of a particle. Relative motion dynamics of a particle. Collision and percussions. Elements of analytical mechanics. D'Alembert's principle. Principle of virtual work. Lagrange Equations.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**2**	**1**	**Materials Strength I** Introduction: Definitions, structural concepts (beams), approaches. Shearing forces and bending moments. Behavior of materials. Traction/Compression of beams. Cross section properties of beams.	5
					Mechanisms I Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain. Mechanisms. Analysis of the configuration and kinematics of the mechanisms. Vector connection equations for configuration, velocities and accelerations fields. Spatial mechanisms. Force analysis of mechanisms. Dynamics of mechanisms.	4
					Machine-tools and cutting processing Elementary notions about generating surfaces on machine tools. Elementary notions of the construction and geometry of cutting tools. Thermal phenomena in cutting processes. Cutting forces. Wear and durability of cutting tools. The parameters of the cutting regime. Turning processing. Processing by milling. Bore processing. Processing by planning. Processing by broaching. Processing by grinding.	3
					Sports Front and work team exercises. The throwing school exercises. Training the skills and motor skills specific to some sports.	1
					English Electrical. Specialized vocabulary and discourse situations. Grammar in focus: Scale of likelihood. Electronics. Specialized vocabulary and discourse situations. Grammar in focus: Subordinate clauses of result and purpose. Energy. Specialized vocabulary and discourse situations. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Civil Engineering. Specialized vocabulary and discourse situations. Grammar in focus: Comparison of adjectives. Mining. Specialized vocabulary and discourse situations. Grammar in focus: Prepositions of time.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**2**	**2**	**Materials Strength II** Compound stresses. Stability of elastic beams (buckling of beams). Energy methods in the calculation of elastic deformations of beam structures. Static undetermined systems of beams. Beam systems under dynamic loads.	3
					Mechanisms II Balancing mechanisms and machines. Synthesis of Lower Coupler Mechanisms. Gear Mechanisms. Cam – follower.	4
					Applied Informatics Overview of the software application. 3D modeling of parts. 3D modeling of sheet metal parts. 3D modeling of assemblies. 3D modeling of welded assemblies. 3D design of mechanical structures from profiles. Specific procedures for 3D modeling of plastic parts. Assisted design of mechanical transmissions.	2
					Fluid Mechanics Fluid statics. Basic equations of fluid mechanics. Dimensional analysis and similarity theory. Boundary layer theory. The flow through the pipes.	3
					Thermo-Technics I General thermodynamics. Status sizes. Mechanical work, heat, entropy, enthalpy. Simple transformations of perfect gases, Carnot cycle. Principles I and II of Thermodynamics. Reversible processes for thermodynamic systems. Irreversible processes for thermodynamic systems. Nozzles. The principle of operation of the turbines. Piston compressors. Perfect gas mixtures. Ideal cycles of internal combustion engines.	4
					Machine Parts I Principles of calculation of mechanical engineering. The mechanical characteristics of the materials used in the construction of machines. Shape and dimensional accuracy of machine parts. Calculation at simple and compound stresses. Calculation on variable loads. Reliability of machine parts. Elements of tribology. Permanent joints. Removable assemblies. Assemblies between the hub and the shaft. Assemblies on cone. Elastic assemblies.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**2**	**2**	**Tolerances and Dimensional Control** Introduction. Dimensional accuracy. Micro-geometric accuracy. Accuracy of geometric shape. Precision of orientation and reciprocal position. Chains of size. Methods and means of measurement and control. Tolerances, fits and control of smooth tapered, bearings and key assemblies. Tolerances, fits and control of threaded assemblies. Tolerances, fits and control of gears and spur gears.	3
					Sports Front and work team exercises. The throwing school exercises. Training the skills and motor skills specific to some sports.	1
					English Electrical. Electronics. Specialized vocabulary and discourse situations. Grammar in focus: Scale of likelihood. Subordinate clauses of result and purpose. Energy. Specialized vocabulary and discourse situations. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Civil Engineering. Specialized vocabulary and discourse situations. Grammar in focus: Comparison of adjectives. Mining. Specialized vocabulary and discourse situations. Grammar in focus: Prepositions of time.	2
					Practice Activities in the Scientific Field General notions about metal cutting. Casting. Hot plastic deformation sectors. Thermal and thermo-chemical treatments. Galvanic coatings. Welding.	4
			3	**1**	**Machine Parts II** Gear drives. Belt drives. Chain drive. Friction wheel drives. Axles and shafts. Rolling bearings. Sliding bearings. The elements of the crank shaft mechanism. Couplings.	6
					Hydraulic and Pneumatic Drives Structure of a hydrostatic system. Organology of hydrostatic systems. Hydraulic pumps. Hydraulic motors. Distribution equipment. Pressure adjustment equipment. Flow adjustment equipment. Hydraulic diagrams. Structure of pneumatic schemes. Pressure valves. Directional Control Valves. Pneumatic motors. Pneumatic diagrams.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**3**	**1**	**Tribology** Introduction to Tribology. Materials for tribology. Elements of contact mechanics (Hertz contact theory; The contact area; Plasticization of asperities; Adhesive contact). Friction (The coefficient of friction; Tribometers; Laws and theories of friction). Wear (Different form of wear; Wear maps; Interface tribology third body concept; The PV product). Lubrication (Oils; Greases; Anti-friction materials).	2
					Thermo-Technics II Thermodynamics of thermal agents. Thermodynamics of fuel combustion. Thermodynamics of thermal machine cycles.	5
					Elasticity Generalities regarding Elasticity Theory. Stress Theory. Strain Theory. Relations between stress and strain specific. The mechanical work and the potential energy of deformation. Particular cases of the stress state. Plane problems of elasticity theory.	5
					Mechanical Vibrations Mechanical Vibration - General considerations. The vibrations of structures with one degree of freedom. The vibrations of structures with more than one degree of freedom. The vibrations of continuous structures. The approximate methods in the study of vibrations. The vibration measurement.	4
					Special Problems of Materials Strength Calculation of helical spring resistance; stiffness of the helical spring. Beams of equal resistance to bending; calculation of resistance of leaf spring. Overview of the finite element method. Thin walled rotating vessels. Tubes with thick walls; tube milling; discs in rotation motion. Equations of thin plane plates. Plate in plane stresses state. Flat plates with small transversal deformations.	4
				2	**Applied Electronics** Electronic devices of circuit. Amplifiers and oscillators. Uncontrolled low power rectifiers. Electronic stabilizers. Controlled low power rectifiers. Combinational and sequential logic circuits. Applications of combinational and sequential logic circuits.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**3**	**2**	**Plasticity** Introductory elements in Plasticity Theory. One-dimensional elastoplastic stress. Elastoplastic stress of bars. Elastoplastic stress of plates. Tri-dimensional plasticity.	3
					Construction and Design of Structures Introduction in constructions. Lightweight construction - steel construction. Steel Structure - constructive systems for the future.	3
					Finite Element Method Generalities on Finite Element Analysis. The displacement method applied at bars systems. Finite Element Method. Mechanical applications using finite element method.	4
					The Static, Stability and Dynamics of Structures General aspects of the calculation of structures strength. Static determined structures made up of straight bars. Truss. Static indeterminate structures made up of straight bars - strain method. Indeterminate static structures made up of straight bars - The displacement method. Stability of bars and bar systems.	4
					Practice Activities in a Specific Scientific Field Modeling of complex structures and substructures with the finite element method using specialized programs. Evaluation of the strain state by the method of resistive electrical tensometry.	4
					Optimization in Mechanical Engineering Optimization algorithms for unrestricted problems. Transformation of optimization problems. Problems with linear constraints. Problems with nonlinear constraints. Multicriteria optimization. Optimization of structures. Reanalysis methods. Methods for solving problems with many variables. Methods for optimizing the reliability of structures.	3
					Lifting and Conveying Machines General theory and specific machine elements of lifting and transporting installations. Lifting equipment specific to various fields of activity. Auxiliary equipment. Operation of transport equipment.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**3**	**2**	**Biomechanics** Introduction to Biomechanics. Basic aspects of anatomy and physiology. Presentation of programs for transforming the assembly of CT sections into 3D surfaces that delimit tissues according to their densities. Biomechanics of the osteo-articular system. Biomechanics of the muscular system. Anthropometry.	3
			4	**1**	**Contact Mechanics** Normal contact of elastic bodies as a problem of spatial elasticity. The contact theory of two elastic bodies - the Hertz theory. Strain state in the general case of the elliptical contact surface. Numerical developments in contact analysis using the finite element method. Consider the friction between the bodies in contact. Adherent contact. Contact algorithms. Elastoplastic contact problems. Bodies in contact from materials with nonlinear behavior.	5
					Assisted Analysis and Design of Mechanical Systems Basics of parametric design with Autodesk Inventor. Generation of frame structures (Frame generator). Design Accelerator - design and calculation of shafts, gears, keys, bearings, springs. Finite element analysis in Autodesk Inventor. Static analysis of parts. Parametric analysis. Exploded presentation of the assemblies. Animating the presentation of an assembly.	4
					Dynamics of Mechanical Structures Single Degree of Freedom Systems. Free Vibrations. Response to Harmonic Excitation. Transfer Functions. Forced vibrations periodic excitation and short excitation. Seismic Excitation. Multi Degree of Freedom Systems. Damping. Vibration Problems in Structures.	4
					Finite Element Method Review of finite element method. Assembling the system of finite-element equations. Linear elastic calculus. Nonlinear geometric calculus. Nonlinear physical calculation. Dynamic calculus. 2D and 3D bar systems: computer implementation. 2D and 3D plate systems: computer implementation. Implementing on the computer three-dimensional finite elements.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**4**	**1**	**Modeling and Simulation of Mechanical Systems Dynamics I** General theorems in dynamics of mechanical systems. Particular movements of mechanical systems. Application of differential principles in the study of the dynamics of mechanical systems. Clashes and percussions. Gyroscope and gyroscopic effect. The vibrations of the systems with a finite and infinite number of degrees of freedom. Parametric and non-linear vibrations, vibrating machines. Modeling of torsional vibrations of mechanical systems for transmitting rotational motion.	5
					General Economy The economy and economic science. The contemporary market economy. The economic flow. The economic utility and behavior. Consumer. The production factors. The production costs. The demand. The offer. Market types and price training mechanisms. The remuneration of production factors. Macro economy.	3
					Composite Structures Overview of composite materials. Levels of analysis, topological coding, determination of engineering quantities, general relations between stresses and strains. General notions of fracture mechanics and theories regarding the boundary states of composite materials. The elastic behavior of the orthotropic plate with unidirectional continuous fibers. General theory of laminates. Methods of analysis of composite materials.	5
				2	**Modeling and Simulation of Mechanical Systems Dynamics II** Integral principles and their use in the dynamics of material systems. Elements of continuous environment mechanics. Modeling, simulation in the dynamics of nonlinear systems. Modeling the kinematics and dynamics of 2D mechanical systems. Introductory notions of modeling, simulation in mechanics of robots, 3D mechanical systems.	6
					Collapse of Mechanical Structures Buckling of compressed bars. Ultimate strength of compressed bars. The flat plate buckling. Buckling of unidirectional stiffened plateau. Buckling of floors reinforced in two orthogonal directions.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**BA**	**Mechanical Engineering**	**4**	**2**	**Management** Theoretical fundamentals of company management. The company – economical aspects. Organizing the company. Production capacity. Fundamental concepts of production management in time and space. Serving processes.	2
					Completion of Graduation Paper	4
					Practical training for the graduation paper	2
					Experimental Modeling in Mechanical Engineering Basic concepts regarding experimental methods. Methods of measuring pressure. Measurement of displacements and positions. Flow measurement methods. Methods of measuring the temperature. Methods for measuring motion and vibration. Measurement of forces. Methods for measuring thermal and nuclear radiation. Methods for measuring pollution.	4
					Numerical Modeling for Fluids Mechanics Fundamentals of numerical modeling of fluid. Numerical methods in fluid dynamics (CFD - Computational Fluid Dynamics). Theory of fluid with free surface. Numerical models for fluids used in the technique.	4
					Welded Structures Types of jointing and clamping according to Eurocode 3. Welded joints. Base metal. Elements of calculation. Stress distribution in welded joints. The origin of residual stresses in welded structures. Metallic columns, beams and truss.	3
MACHINE BUILDING TECHNOLOGY - BA						
Industrial Engineering	**BA**	**Machine Building Technology**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	5
					Physics Elements of classical mechanics. Oscillations and waves. Notions of thermodynamics. Fundamentals of electromagnetism. Fundamentals of optics. The origins of quantum physics. Elements of atomic physics. Elements of solid body physics.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**1**	**1**	**Descriptive Geometry** Representation of lines and particular plans. Representation of polyhedra. Representation of rotating bodies. Intersections of geometric bodies.	5
					Materials Science and Engineering Types of materials. Atomic architecture. Diffusion. Solidification of metallic materials. Alloy systems. Phase balance diagrams. Fe-C alloy system. Phase transformations in solid state. Heat treatments. Non-ferrous alloys. Ceramic materials. Plastic materials. Composite materials.	5
					Chemistry Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Colloidal systems. Redox reactions. Electrolysis. Hydrogen. Metals. Periodic system groups.	5
					Sports Enhancing elements of the Running School and the Jumping School and coordination elements. Speed development through motion games. Football game. Volleyball game.	1
					English Production. Present Tenses. Research and Development. Past Tenses. Future Forms. Information Technology. Conditionals. Verb phrases. Logistics. Active versus Passive.	2
					Communication Structure of the communication process. Non-verbal communication. Communication networks. Communication in the management of conflicting states. Communication and listening. Final planning, organization and preparation of the message. Structure of the technical-scientific works: reports, works for the completion of studies, works and scientific articles, projects. Human-human interaction mediated by web and audio-video technologies.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**1**	**2**	**Linear Algebra, Analytic and Differential Geometry** Vector spaces. Linear applications. Real Euclidean vector spaces. Free vectors. Line and plan in space. Conics on reduced equations. Quadrics on reduced equations. Curves in space. Surfaces.	5
					Materials Technology The Structure of Crystalline Solids. Mechanical Properties of Materials. Physical properties of materials. Processing of Metal Alloys. Glass processing. Processing of ceramics. Cermet's. Processing of rubber.	4
					Computer Programming and Programming Languages Basics of computing. Evolution of computer systems. Components of a Computer Systems. The functional scheme of the structure of the computer. Types of computer memory. Introduction to Computers Programming. Forms of information. Data structures. Algorithms and components. Object orientation. Programming techniques. Computer Language Translation. Cloud Computing. Future of programming.	4
					Mechanics I Statics. Fundamental concepts, systems of forces, moment of a force about a point, moment of a force about a given axis, reduction of a force, reduction of a system of forces, particular cases. Centers of gravity of a system of particles and a rigid body. Centers of gravity of some usual homogeneous bodies. Statics of free particles and particles with constraints. Equilibrium of rigid bodies and systems of rigid bodies. Trusses. Statics of the cables. Statics of the simple machines. Kinematics of particles: motion of particles in about various coordinate systems, particular motion of particles. Relative motion of particles.	5
					Electrotechnics Introduction to the basics of electrotechnics. Electricity. Production, transport, distribution. Quality of electricity. Analysis of circuits and electrical networks. Electromagnetism. Effects of electric current. Constructive, functional and behavioral study of machines power.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**1**	**2**	**Drawings and Infographics I** Arrangement of projections. Views, sections, breaks. Dimensioning of technical drawings. Representation of threads and flanges. Indication of surface condition, marking of dimensional deviations and geometric tolerances. The assembly drawing. Non-demountable joints. Removable assemblies. Mechanical Power Transmitters. Sealing elements.	4
					Sports Front and work team exercises. The jumping school exercises. Training the skills and motor skills specific to some sports.	1
					English Engineering. Automotive. Metallurgy. Welding. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Active vs. Passive. Relative clauses. Causation. Obligation and requirements. Cause and effect. Ability and inability.	2
			2	**1**	**Drawings and Infographics II** AutoCAD - Overview. Basics for Drawing. Entering text into graphic files. Commands for multiplying objects. Dimensioning. Polylines. Editing commands. Advanced drawing commands. 3D drawing commands: nonprimitive and primitive. 3D editing commands. Preparing technical product documentation.	4
					Numerical Methods Algorithms & calculus errors. Numerical methods for solving algebraic equations. Numerical methods for solving systems of equations. Approximation of real functions. Numerical methods for calculating derivatives & integrals. Numerical methods for solving differential equations.	5
					Mechanics II Kinematics of a rigid body. Kinematics of the systems of rigid bodies. Dynamics. Moments of inertia of a body. Kinetic characteristics of a body. Fundamental theorems in dynamics of a rigid body and system of particles. Dynamics of a rigid body with fixed axis, dynamics of a rigid body in plane-parallel motion, rigid body	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
					dynamics in general motion. Dynamics of a particle. Relative motion dynamics of a particle. Collision and percussions. Elements of analytical mechanics.	
Industrial Engineering	**BA**	**Machine Building Technology**	**2**	**1**	**Thermo-Technics** Thermodynamic system. Thermodynamic balance. Status sizes. Process sizes. The postulates of thermodynamics. Temperature and pressure. The first principle of thermodynamics. Internal energy. Mechanical work. Mechanical movement work. Mechanical work. The heat. Enthalpy. The perfect gas. Simple laws. Specific heaters. Perfect gas mixtures. Simple state transformations. The second principle of thermodynamics. The entropy of perfect gases. Vapor. Wet air. Combustion of solid, liquid and gaseous fuels.	4
					Mechanisms I Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain. Mechanisms. Analysis of the configuration and kinematics of the mechanisms. Vector connection equations for configuration, velocities and accelerations fields. Spatial mechanisms. Force analysis of mechanisms. Dynamics of mechanisms.	5
					Materials Strength I Introduction: Definitions, structural concepts (beams), approaches. Shearing forces and bending moments. Behavior of materials. Traction/Compression of beams. Cross section properties of beams.	5
					Sports Front and work team exercises. The throwing school exercises. Training the skills and motor skills specific to some sports.	1
					English Electrical. Electronics. Energy. Specialized vocabulary and discourse situations. Grammar in focus: Scale of likelihood. Subordinate clauses of result and purpose. Countable and uncountable nouns. Adjectives and adverbs. Civil Engineering. Specialized vocabulary and discourse situations. Grammar in focus: Comparison of adjectives. Mining. Specialized vocabulary and discourse situations. Grammar in focus: Prepositions of time.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**2**	**2**	**Tolerances and Dimensional Control** Introduction. Dimensional accuracy. Micro-geometric accuracy. Accuracy of geometric shape. Precision of orientation and reciprocal position. Chains of size. Methods and means of measurement and control. Tolerances, fits and control of smooth tapered, bearings and key assemblies. Tolerances, fits and control of threaded assemblies. Tolerances, fits and control of gears and spur gears.	3
					Essentials of Surface Generation Elements of kinematic theory of surface winding. Generation of surfaces by winding. Generation of surfaces by winding by the rolling method. Crossing surfaces - interference of surfaces. Generation of helical surfaces. Tool profiling with materialized generators for generating helical surfaces.	3
					Applied Informatics Overview of the software application. 3D modeling of parts. 3D modeling of sheet metal parts. 3D modeling of assemblies. 3D modeling of welded assemblies. 3D design of mechanical structures from profiles. Specific procedures for 3D modeling of plastic parts. Assisted design of mechanical transmissions.	3
					Fluid Mechanics Fluid statics. Basic equations of fluid mechanics. Dimensional analysis and similarity theory. Boundary layer theory. The flow through the pipes.	3
					Machine Parts I Principles of calculation of mechanical engineering. The mechanical characteristics of the materials used in the construction of machines. Shape and dimensional accuracy of machine parts. Calculation at simple and compound stresses. Calculation on variable loads. Reliability of machine parts. Elements of tribology. Permanent joints. Removable assemblies. Assemblies between the hub and the shaft. Assemblies on cone. Elastic assemblies.	4
					Mechanisms II Balancing mechanisms and machines. Synthesis of Lower Coupler Mechanisms. Gear Mechanisms. Cam – follower.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**2**	**2**	**Materials Strength II** Compound stresses. Stability of elastic beams (buckling of beams). Energy methods in the calculation of elastic deformations of beam structures. Static undetermined systems of beams. Beam systems under dynamic loads.	4
					Sports Resumption of the main technical-tactical structures in football - boys and volleyball - girls. Development of the speed of reaction to auditory and visual stimuli. Improving the technique of speed running. Educating the segmental dynamic force at the level of the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops, differentiated, depending on the individual potential. Fixing and consolidating the main technical elements and procedures specific to sports games. Development of the elements of coordinative capacity - rhythm, precision, static and dynamic balance, spatial-temporal orientation, combination of movements, kinesthetic discrimination, ambidextry, agility. Educate the mixed and anaerobic lactacid resistance by the method of variable, progressive and interval training.	1
					English Materials Technology. Material Types. Material Properties. Forming, working, and heat-treating metal. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Prepositions of place. Writing in focus: Description. Manufacturing and Assembly. 3D Component features. Interconnection. Grammar in focus: Quantifiers. Writing in focus: Definition and exemplification.	1
					Practice Activities in the Scientific Field Cold processing of metals. Measurement and control equipment. Turning. Milling. Planing and mortising. Grinding. Hot processing of metals. Casting. Hot plastic deformation sectors. Thermal and thermo-chemical treatments. Galvanic coatings. Welding.	4
			3	**1**	**Machine Parts II** Gear drives. Belt drives. Chain drive. Friction wheel drives. Axles and shafts. Rolling bearings. Sliding bearings. The elements of the crank shaft mechanism. Couplings.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**3**	**1**	**Hydraulic and Pneumatic Drives** Structure of a hydrostatic system. Organology of hydrostatic systems. Hydraulic pumps. Hydraulic motors. Distribution equipment. Pressure adjustment equipment. Flow adjustment equipment. Hydraulic diagrams. Structure of pneumatic schemes. Pressure valves. Directional Control Valves. Pneumatic motors. Pneumatic diagrams.	4
					Cutting-Tools Design I The structure of the cutting tools. Materials for cutting tools. The calculation and construction of lathe tools. The calculation and construction of tools for machining bores. Calculation and construction of broach.	4
					Machine Manufacturing I Basics of manufacturing processes in the construction of machines. Types of production. Design of technological processes. Production processes, technological processes. Processing accuracy. Optimization of technological processes. The quality of the processed surfaces. Determination of processing additions and inter-operational dimensions. Technological criteria for the determination of cutting regimes. Technical standardization. Basic concepts regarding the workability of metallic materials.	3
					Machine-Tools I Fundamentals of machine-tools. The main kinematic chain. The kinematic chain of feed. Complex generating kinematic chains. Auxiliary kinematic chains. Special purpose mechanisms. Machine parts specific to machine tools.	3
					Welding Processes Welding as a thermochemical process. Classification of welding processes. Heat sources used for welding. Thermal field on welding. Changes in chemical composition during welding. Volume changes on welding. Structural changes to welding. Cracks, pores, inclusions. Technological particularities when welding different materials.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**3**	**1**	**Finite Element Method** The basic concepts of the finite element analysis method. Finite element types. Boundary conditions and loads. Material modeling. Modeling and meshing. Finite element analysis. Numerical methods in mechanical and technological processes.	4
					Heat Treatments Classification and characterization of thermal and thermo-chemical treatments. The theory of solid-state transformations in metals and alloys. Characterization of the metallic materials that are thermally and thermo-chemically treated. Specific heating-cooling processes and their thermal regimes for thermal and thermo-chemical treatments. Technology of thermally and thermo-chemical treatments. Quality control of the products treated thermally and thermo-chemically.	3
				2	**Cutting-Tools Design II** Calculation and construction of mills. Calculation and construction of tools for threading. Tools for toothing cylindrical and worm gears. Tools for toothing bevel gears. Calculation and construction of combined tools.	4
					Machine Manufacturing II Analysis of the main processing procedures. Analysis of the processing of special surfaces. Modern methods of processing based on Numerical control machine tools. Modern manufacturing systems.	4
					Machine-Tools II Lathe machines. Milling machines. Shaping, slotting and broaching machines. Drilling machines. Grinding machines. Reaming machines. Machines for processing gear teeth. Machines for grinding gear teeth.	4
					Cold Plastic Deformation Processes I Basics of cold plastic deformation processes. Plastic deformation of polycrystalline materials. The main laws of plastic deformation. The state of deformations of the body. Plasticity conditions. Deformation behavior of metals and alloys. Theoretical and experimental methods used in the analysis of cold plastic deformation processes. Characterization of cold plastic deformation processes and specific machines.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**3**	**2**	**Essentials of Devices Design I** Structure of cutting systems. Principles of device design. Principles of orientation of semi-finished products. Orientation on flat surfaces. Orientation on outer and inner cylindrical surfaces. Orientation on outer and inner conical surfaces.	3
					Fusion Welding Technologies Welding processes and procedures. Arc welding. Calculation algorithm for electric arc welding technology. Welding behavior of materials. Remaining stresses and strains. Preheating.	3
					Essentials of Experimental Research Experimental methods, measurements and devices of measuring physical quantities and acquiring experimental data. Statistical processing of experimental results. Classic and modern methods for planning experiments.	4
					Practice Activities in a Specific Scientific Field Measurement and control equipment. Turning. Milling. Planing and mortising. Grinding. Hot processing of metals. Casting. Hot plastic deformation sectors. Thermal and thermo-chemical treatments. Galvanic coatings. Welding.	4
			4	**1**	**Cold Plastic Deformation Processes II** Operations and punches for cutting. Operations and punches for bending. Operations and punches for embossing. Operations and punches for trimming. Operations and punches for volumetric deformation. Elements of technology design and technological equipment for processing by cold plastic deformation. Non-conventional cold pressing technologies. CAD / CAM techniques for designing cold pressing technologies and equipment.	4
					Fusion Welding Technologies II Electric arc welding with coated electrodes. WIG welding. MIG-MAG welding. Welding with tubular wire. Submerged arc welding. Electroslag welding. Gas welding.	4
					Pressure Welding Technologies Non-electric welding procedures. Butt welding through resistance. Butt welding by sparks. Spot welding.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**4**	**1**	**Essentials of Devices Design II** The system of loads and moments that demand the semi-finished products in the technological process. Calculation of locking mechanisms with keys and with levers. Calculation of locking mechanisms with thread. Calculation of locking mechanisms with cams. Calculation of locking mechanisms with elastic elements. Indexing mechanisms. Locking mechanisms. Device body design.	5
					Processing Technologies of Polymeric Materials Thermoplastic and thermoreactive materials. The principle of mixing. The principle of calendering. The principle of extrusion. The basis of the plastic injection process. Technological aspects of vulcanization in molds. Notions regarding the recycling of polymeric materials.	5
					Computer-Aided Technology Design Methods and principles in computer aided manufacturing. Basic elements in the methodology of computer assisted manufacturing of parts using machine tools with numerical control. Methodology of designing the process of processing parts on machine tools with numerical control.	3
					Numerical Control Systems and Equipment I Numerical control systems. Control systems implemented in wired logic. Control systems with automatic control systems with flexible structure. Programmable PLCs.	3
					Automation of Technological Processes Automatic manufacturing system. The technological subsystem of automated manufacturing. Storage and transport subsystem. Command subsystem. Automatic control used in the automation of technological processes. Programmable logic controllers. Synthesis of controllers using modeling with Petri nets.	3
				2	**Management** Theoretical foundations of company management. Enterprise - economic agent. Company organization. Production capacity. Basic concepts of production design in time and space. Serving processes.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**BA**	**Machine Building Technology**	**4**	**2**	**Unconventional Processing Technologies** Processing by electric erosion. The effects of pulsed electric discharge. Technological characteristics when processing by electric erosion. Generation of surfaces by electrical erosion. Errors of processing in the erosive process. Principles of design of electro erosive technology. Industrial applications of electric erosion processing.	4
					Completion of Graduation Paper	4
					Practical Training for the Graduation Paper	1
					Numerical Control Systems and Equipment II Structure. Variables. Modes of program execution. Programming languages. Sequential processing.	3
					3D Modeling General notions regarding computer aided design (CAD) and computer aided manufacturing (CAM). Aspects regarding computer-aided design with CATIA. Sketcher module. Part Design module. Generative Shape Design module. Assembly Design module. Mock-up Kinematics module. Machining module.	4
					Rapid Prototyping Technologies The stages of rapid prototyping techniques. Stereolithography. Selective Laser Sintering. Fused Deposition Modeling. Selective Laser Melting. Laminated Object Manufacturing. Digital Light Processing. Three-Dimensional Printing. PolyJet Printing. Jetted Photopolymer. MultiJet Printing. Binder Jetting. Solid Ground Curing. Direct Ceramic Jet Printing.	3
					Processing Technologies on Numerical Control Machine-Tools Elements of CNC technology. The SINUMERIK programming system. Main movement functions. Technological cycles of drilling. Technological cycles of milling. The structure of a processing program. Subprograms.	3
					Actuators, Transducers, Sensors Characteristics and performances of transducers. Interfacing of peripheral systems. Interfacing of sensors and data communications. Interfacing of transducers. Actuators.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
AUTOMOTIVE VEHICLES - BA						
Automotive Engineering	**BA**	**Automotive Vehicles**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	5
					Physics Elements of physical mechanics. Fluid statics and dynamics. Oscillations and elastic waves. Elements of molecular physics. Elements of thermodynamics. Elements of quantum mechanics, atomic and nuclear physics.	5
					Chemistry Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Redox reactions. Electrolysis. Hydrogen. Metals. Periodic system groups.	5
					Descriptive Geometry Projection systems. Representation of point, line and plan. Polyhedrons. Cylinder and cone. Sphere. Intersections of geometric bodies.	5
					Materials Science and Engineering Types of materials. Atomic architecture. Diffusion. Solidification of metallic materials. Alloy systems. Phase balance diagrams. Fe-C alloy system. Phase transformations in solid state. Heat treatments. Non-ferrous alloys. Ceramic materials. Plastic materials. Composite materials.	5
					Sports Front exercises and workouts. Notions of running school. Repeat the main processes in football (boys) and volleyball (girls). Educate the dynamic force at the level of the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops. Effort readjustment. Sports Games.	1
					English Production. Research and Development. Information technology. Logistics. Quality. Health and Safety. Grammar in focus: Present tenses. Past tenses. Future forms. Conditionals. Verb phrases.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**1**	**1**	**Communication** Principles, units and characteristics of communication. The emitting-receiver relationship in managerial and organizational communication. Language Functions. Effective communication principles. Characteristic units of communication. Nonverbal communication. Oral communication. Prepare and support an oral presentation. Types of interviews. Communication networks. Communication in conflict management. Communication and listening. Techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Case Studies. Structure of technical and scientific works.	2
				2	**Linear Algebra, Analytic and Differential Geometry** Matrix operations. Determinants and their properties. Systems of linear equations. Vector spaces. Subspaces. Linear dependence and independence. Bases and Dimension. Coordinates. Change of basis. Linear transformations and Matrices. Diagonalization of a matrix. Coordinates. Products of Vectors. Equations of lines and planes. Equations of sphere. Quadric Surfaces. Local theory of Curves. Parameterized Surfaces. The Gauss Map. Curvatures.	4
					Drawings and Infographics I Arrangement of projections. Views, sections, breaks. Dimensioning of technical drawings. Representation of threads and flanges. Indication of surface condition, marking of dimensional deviations and geometric tolerances. The assembly drawing. Non-demountable joints. Removable assemblies. Mechanical Power Transmitters. Sealing elements.	4
					Computer Programming and Programming Languages Basics of computing. Evolution of computer systems. Components of a Computer Systems. The functional scheme of the structure of the computer. Types of computer memory. Introduction to Computers Programming. Forms of information. Data structures. Algorithms and components. Object orientation. Programming techniques. Computer Language Translation. Cloud Computing. Future of programming.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**1**	**2**	**Materials Technology** The Structure of Crystalline Solids. Mechanical Properties of Materials. Physical properties of materials. Processing of Metal Alloys. Glass processing. Processing of ceramics. Cermets. Processing of rubber.	5
					Mechanics I Statics. Fundamental concepts, systems of forces, moment of a force about a point, moment of a force about a given axis, reduction of a force, reduction of a system of forces, particular cases. Centers of gravity of a system of particles and a rigid body. Centers of gravity of some usual homogeneous bodies. Statics of free particles and particles with constraints. Equilibrium of rigid bodies and systems of rigid bodies. Trusses. Statics of the cables. Statics of the simple machines. Kinematics of particles: motion of particles in about various coordinate systems, particular motion of particles. Relative motion of particles.	5
					Electrotechnics and Electric Machines Introduction to the basics of electrotechnics. Electricity. Production, transport, distribution. Quality of electricity. Analysis of circuits and electrical networks. Electromagnetism. Effects of electric current. Constructive, functional and behavioral study of machines power.	5
					Sports Front and work team exercises. The jumping school exercises. Training the skills and motor skills specific to some sports.	1
					English Engineering. Specialized vocabulary and discourse situations. Grammar in focus: Active vs. Passive. Relative clauses. Automotive. Specialized vocabulary and discourse situations. Grammar in focus: Causation. Metallurgy. Specialized vocabulary and discourse situations. Grammar in focus: Obligation and requirements. Welding. Specialized vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**2**	**1**	**Numerical Methods** Algorithms & calculus errors. Numerical methods for solving algebraic equations. Numerical methods for solving systems of equations. Approximation of real functions. Numerical methods for calculating derivatives & integrals. Numerical methods for solving differential equations.	3
					Drawings and Infographics II AutoCAD - Overview. Basics for Drawing. Entering text into graphic files. Commands for multiplying objects. Dimensioning. Polylines. Editing commands. Advanced drawing commands. 3D drawing commands: nonprimitive. 3D drawing commands: primitive. 3D editing commands. Preparing technical product documentation.	4
					Essentials of Automotive Engineering Engines for motor vehicles. Mechanical clutches used in motor vehicles. Mechanical gearboxes used in vehicles. Longitudinal transmissions. Front deck. Rear axle. Steering systems. Braking systems of vehicles. Suspension of vehicles. Car bodies, underframes and rolling systems of vehicles.	4
					Mechanics II Kinematics of a rigid body. Kinematics of the systems of rigid bodies. Dynamics. Fundamental concepts. Moments of inertia of a body. Kinetic characteristics of a body. Fundamental theorems in dynamics of a rigid body and system of particles. Dynamics of a rigid body with fixed axis, dynamics of a rigid body in plane-parallel motion, rigid body dynamics in general motion. Dynamics of a particle. Relative motion dynamics of a particle. Collision and percussions. Elements of analytical mechanics. D'Alembert's principle. Principle of virtual work. Lagrange Equations.	4
					Finite Element Method Matrix algebra fundamentals. Strong and weak formulations. Choice of approximating functions for the FE method. Choice of weight functions - weighted residual method. Guidelines for element meshes and global nodal numbering. Stresses and strains. Linear elasticity. Approximating functions for the FE method. FE formulation of beams. FE formulation of plates. Numerical integration.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**2**	**1**	**Materials Strength I** Introduction: Definitions, structural concepts (beams), approaches. Shearing forces and bending moments. Behavior of materials. Traction/Compression of beams. Cross section properties of beams.	4
					Mechanisms I Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain. Mechanisms. Analysis of the configuration and kinematics of the mechanisms. Vector connection equations for configuration, velocities and accelerations fields. Spatial mechanisms. Force analysis of mechanisms. Dynamics of mechanisms.	4
					Sports Front and work team exercises. The throwing school exercises. Training the skills and motor skills specific to some sports.	1
					English Electrical. Specialized vocabulary and discourse situations. Grammar in focus: Scale of likelihood. Electronics. Specialized vocabulary and discourse situations. Grammar in focus: Subordinate clauses of result and purpose. Energy. Specialized vocabulary and discourse situations. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Civil Engineering. Specialized vocabulary and discourse situations. Grammar in focus: Comparison of adjectives. Mining. Specialized vocabulary and discourse situations. Grammar in focus: Prepositions of time.	2
				2	**Materials Strength II** Compound stresses. Stability of elastic beams (buckling of beams). Energy methods in the calculation of elastic deformations of beam structures. Static undetermined systems of beams. Beam systems under dynamic loads.	3
					Mechanisms II Balancing mechanisms and machines. Synthesis of Lower Coupler Mechanisms. Gear Mechanisms. Cam – follower.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**2**	**2**	**Tolerances and Dimensional Control** Introduction. Dimensional accuracy. Micro-geometric accuracy. Accuracy of geometric shape. Precision of orientation and reciprocal position. Chains of size. Methods and means of measurement and control. Tolerances, fits and control of smooth tapered, bearings, and key assemblies. Tolerances, fits and control of threaded assemblies. Tolerances, fits and control of gears and spur gears.	3
					Applied Informatics Overview of the software application. 3D modeling of parts. 3D modeling of sheet metal parts. 3D modeling of assemblies. 3D modeling of welded assemblies. 3D design of mechanical structures from profiles. Specific procedures for 3D modeling of plastic parts. Assisted design of mechanical transmissions.	3
					Fluid Mechanics Fluid statics. Basic equations of fluid mechanics. Dimensional analysis and similarity theory. Boundary layer theory. The flow through the pipes.	3
					Thermo-Technics I General thermodynamics. Status sizes. Mechanical work, heat, entropy, enthalpy. Simple transformations of perfect gases, Carnot cycle. Principles I and II of Thermodynamics. Reversible and irreversible processes for thermodynamic systems. Nozzles. The principle of operation of the turbines. Piston compressors. Perfect gas mixtures. Ideal cycles of internal combustion engines.	4
					Machine Parts and Tribology I General elements underlying the design of machine parts. Transmissions through belts and chains. Friction wheel drives. Spur Gears. Axles and shafts straight. Sliding and rolling bearings. Clutches. Removable assemblies. Non-removable assemblies by welding.	4
					Sports Consolidation of the main processes of football - boys and volleyball – girls. Settling in attack and defense game systems. Bilateral games. Development of the elements of coordinative capacity. Educate the general force on the upper, lower limbs, abdomen and trunk.	1

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**2**	**2**	**English** Materials Technology. Material Types. Material Properties. Forming, working, and heat-treating metal. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Prepositions of place. Writing in focus: Description. Manufacturing and Assembly. 3D Component features. Interconnection. Grammar in focus: Quantifiers. Writing in focus: Definition and exemplification.	2
					Practice Activities in the Scientific Field Checking the technical state of the engines using the specific stands and devices existing in the service unit. Organization of workshops for the diagnosis and repair of vehicles.	4
			3	**1**	**Machine Parts and Tribology II** Mechanical transmissions by gear. Transmissions through belts. Friction wheel drives. Chain transmissions. Axles and shafts. Rolling bearings. Clutches. Tribosystem. Types of wear. Friction regimes.	6
					Hydraulic and Pneumatic Drives Structure of a hydrostatic system. Organology of hydrostatic systems. Hydraulic pumps. Hydraulic motors. Distribution equipment. Pressure adjustment equipment. Flow adjustment equipment. Hydraulic diagrams. Structure of pneumatic schemes. Pressure valves. Directional Control Valves. Pneumatic motors. Pneumatic diagrams.	4
					Thermo-Technics II Thermodynamics of thermal agents. Thermodynamics of fuel combustion. Thermodynamics of thermal machine cycles.	4
					Mechanical Vibrations The vibrations of the elastic linear systems with a degree of freedom. Vibrations of elastic linear systems with finite number of degrees of freedom. Vibrations of continuous systems. Approximate methods in vibration study. Vibration measurement.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**3**	**1**	**Fuels, Lubricants and Special Materials for the Vehicle** Chemical composition and structure of fuels and lubricants. Physical-chemical and operating characteristics of fuels. Alternative fuels. Physical-chemical and operating characteristics of lubricants. Hydraulic fluids for telescopic shock absorbers. Brake Fluids. Coolants for engines. Friction gaskets.	4
					Vehicle System Dynamics I General organization and main parameters of vehicles. The process of self-propelling and running of vehicles. Resistances to motion of vehicles. The reactions of the treadmill on the wheels of vehicles. The reactions of the roadway on the wheels of vehicles.	4
					Internal Combustion Engine I The operation, the actual operating schemes and the operating regimes of the internal combustion engines with piston. Ideal thermodynamic processes in internal combustion engines. Fluids used in the operation of internal combustion engines. Processes of gas change in internal combustion engines. Characteristic parameters of internal combustion engines. Supercharging of internal combustion engines. Static operating characteristics of internal combustion engines.	5
				2	**Vehicle System Dynamics II** Vehicle performance. Calculation of traction of vehicles. Stability of vehicles. Vehicle maneuverability. Fuel consumption of the vehicle.	6
					Internal Combustion Engine II Elements of kinematics and dynamics of the crank-piston mechanism. Piston group: piston, bolt, piston ring. Connecting rod. Crankshaft. Gas distribution system. The fixed parts of the engine mechanism. The installations of internal combustion engine.	5
					Construction and Calculation of Motor Vehicles I The main parameters of the vehicles. Operating conditions and establishing the calculation regimes for the parts of vehicles. The strength calculation of vehicle parts. Determination of operating resistance. Motion transmission systems. Clutch. Gearboxes. Front deck.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**3**	**2**	**Applied Electronics** Electronic devices of circuit. Amplifiers and oscillators. Uncontrolled and low power rectifiers. Electronic stabilizers. Controlled low power rectifiers. Combinational and sequential logic circuits. Applications of combinational and sequential logic circuits.	4
					Fundamentals of Automation Systems Mathematical modeling of signals. Temporal analysis of the automatic adjustment system in functional representation. The stability of the automatic adjustment system. Analysis of the stationary regime of the automatic adjustment system. Analysis of the dynamic regime of the automatic adjustment system. Design of automatic adjustment systems.	3
					Traffic and Traffic Safety Traffic and road traffic. Component factors of the road traffic system. Traffic engineering. Basic characteristics of road traffic. Geometrical characteristics of the roads. Road traffic capacity. Traffic of vehicles in crossroads.	3
					Practice Activities in a Specific Scientific Field Practical operations for checking, adjusting and repairing the transmission elements, of the elements of the braking system, of the elements of the steering system, of the elements of the electrical installation and of air conditioning, of the suspension elements of the vehicles, of the car body elements. Organization of workshops for the diagnosis, repair and maintenance of road vehicles.	4
			4	**1**	**Construction and Calculation of Motor Vehicles II** Construction and calculation of: the steering mechanisms, braking systems, suspension systems, car bodies.	6
					Manufacture and Repairing of Motor Vehicles The production process, the technological process, the method and the processes for the manufacture and repair of vehicles. Technologies for manufacturing the main car parts. Wear of auto parts. Methods to determine the wear of parts and to reworking them. Technologies for repair of vehicle parts and component parts. Car body painting. Final control of vehicles.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**4**	**1**	**Electrical and Electronic Equipment for Motor Vehicle** Distribution and interconnection elements. Switching and protection elements. Electricity supply system. Starting system. Ignition systems. The injection system. Active and passive control electronic systems for safety. Lighting and signaling system, internal and external. Embedded monitoring and control systems.	3
					Motor Vehicle Diagnosis General diagnosis of engine and powertrain. In-depth engine diagnostics. General and in-depth diagnosis of transmission. Diagnosis of the front axle and the rear axle. Diagnosis of steering system. Diagnosis of suspension. Diagnosis of the braking system. Diagnosis of lighting and optical signaling installations. Diagnosis of comfort and safety equipment.	4
					Braking, Steering and Suspension Systems	4
					Construction and Calculation of Motor Vehicle Auxiliary Installations Ventilation, heating and air conditioning systems. Diagnosing and repairing automotive air conditioning systems. Passive protection system with airbag and seat belt.	4
					Computer Aided Design Introduction to CATIA assisted design. Generating sketches. Solids generation - Part Design module. Generation of surfaces. Drawing generation - Drafting module. Assembly drawing - Assembly Design module. Generative Sheetmetal Design module. Finite element analysis - Generative Structural Analysis module.	4
				2	**Practical Training for the Graduation Paper**	2
					Completion of Graduation Paper	4
					Motor Vehicles Mechatronics Mechatronic systems from modern cars. Structure of mechatronic systems specific to the automotive field. Smart sensors. Intelligent control systems. Analysis, modeling and simulation of the operation of mechatronic subsystems in automobiles. Presentation of the specific software Simulink, AMESIM, dSpace, Carsim, Fluidsim, Modelica. Mechatronics of comfort and anti-theft systems. Intelligent navigation systems (autonomous vehicles).	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**4**	**2**	**Controlling Pollution Generated by Internal Combustion Engines** Regulations regarding pollution due to vehicles. Pollutants produced by road vehicles. Origin of pollutants from exhaust gases. Technologies for reducing polluting emissions. Methods and equipment for measuring the concentration of pollutants in the exhaust gases of road vehicles.	3
					Unconventional propulsion systems Vehicles with electric and hybrid propulsion, the solution for reducing pollution and fuel consumption. General objectives and design specifications for electric and hybrid vehicles. Accumulators used on electric and hybrid vehicles. Command and control of hybrid electric vehicles. Electric motors used for the propulsion of electric and hybrid electric vehicles.	4
					Reliability and Terotechnology of Motor Vehicles Defects of the component parts of the vehicles. Elements of probability theory and statistics with application in reliability problems. Reliability indicators and distribution laws. Reliability of systems. Reliability of vehicles in operation. FMEA method and FTA method - applications to the transmission system. Terotechnology applied to car technical systems.	4
					Car Bodies and Load-Bearing Structures for Motor Vehicle General considerations on the construction of car bodies and of load-bearing structure. Design of the car body shape and the load-bearing structure. Materials used in car body construction. Technologies for the manufacture of car body components. Technologies for the assembly of car bodies. Painting technologies in the automotive industry. Car body sealing and soundproofing. Active and passive safety.	4
					Organization of Motor Services Organization of motor services. Organizational framework. Regulation of service activity. Conditions for ensuring compliance. Rules of procedure for the assessment of the technical capacity and the authorization of the economic operators. Services activities. Supply of spare parts, materials and lubricants. Technical representation of a brand. Revisions. Guarantees.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Automotive Engineering	**BA**	**Automotive Vehicles**	**4**	**2**	**Management** Managerial strategies applied within the vehicle manufacturing company. Production capacity of industrial companies. Constructive and technological preparation of industrial production. Material and organizational preparation of industrial production. Stochastic phenomena and the management process. Quality management of industrial production. Strategic management of industrial production.	3
INDUSTRIAL ECONOMIC ENGINEERING - BA						
Engineering and Management	**BA**	**Industrial Economic Engineering**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	5
					Physics Classical mechanics. Elements of restricted relativity theory. Thermodynamics, Molecular Physics and Heat. Electricity and Magnetism. Optics. Introduction to Quantum Physics.	5
					Chemistry Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Colloidal systems. Redox reactions. Electrolysis. Hydrogen. Metals.	5
					Descriptive Geometry Projection systems. Representation of point, line and plan. Polyhedrons. Cylinder and cone. Sphere. Intersections of geometric bodies.	5
					Materials Science and Engineering Types of materials. Physical and mechanical properties of materials. Chemical stability of materials. Corrosion resistance. Interatomic connections. Crystalline and amorphous structure. Structure of real crystals. Solidification of metallic materials. The diffusion. Alloy systems. Phase balance diagrams. Fe-C alloy system. Steels. Cast iron. Heat treatments. Plastic deformation. Non-ferrous alloys. Polymers. Ceramic, sintered and composite materials. Advanced materials.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**1**	**1**	**Sports** Enhancing elements of the Running School and the Jumping School and coordination elements. Speed development through motion games. Football game. Volleyball game.	1
					English Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect). Research and Development. Specialized vocabulary and discourse situations. Grammar in focus: Past tenses. Information technology. Specialized vocabulary and discourse situations. Grammar in focus: Future forms. Logistics. Specialized vocabulary and discourse situations. Grammar in focus: Conditionals.	2
					Communication Getting Started in professional communication techniques. Communication techniques. Oral communication. Preparation and support of a presentation / speech / scientific papers. Types of interviews. Employment interview. Written communication. The experimental study. How to make a presentation on areas of professional competence.	2
				2	**Linear Algebra, Analytic and Differential Geometry** Vector spaces. Linear applications. Real Euclidean vector spaces. Free vectors. Line and plan in space. Conics on reduced equations. Quadrics on reduced equations. Curves in space. Surfaces.	5
					Materials Technology Production and technological processes. Materials used in the construction of machines and ships. Properties and testing of materials. Elements of general metallurgy: cast iron metallurgy, steel metallurgy, metallurgy of the main non-ferrous metals. Processing of metallic materials by casting. Processing of metallic materials by plastic deformation. Welding processing of metallic materials. Processing of coated metal materials. Processing of metal materials by sintering. Unconventional processes of erosion processing. Special non-metallic materials. Shape memory materials. Nanostructured materials.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**1**	**2**	**Computer Programming and Programming Languages** Introduction to C Language in the Qt environment. Presentation of the Turbo C programming environment. Variables. Constants. Structures. Conditioning instructions. Repetitive structure for. Panels. The repetitive instruction while. Matrices. Files. Strings of characters. Functions. Pointers. Classes in C ++.	4
					Mechanics Introduction to vector operations, principles and axioms of mechanics. Moment theory. Static moments and center of gravity. Equilibrium of the rigid to ideal connections. Methods and theorems in the static of the material systems. Friction in technique. Wire statics. Technical applications of statics. Kinematics of the point.	5
					Electrotechnics Basics of electrotechnics. Electricity. Production, transport, distribution. Quality of electricity. Analysis of circuits and electrical networks. Electromagnetism. Effects of electric current. Constructive, functional and behavioral study of machines power.	5
					Drawings and Infographics Arrangement of projections. Views, sections, breaks. Dimensioning of technical drawings. Representation of threads and flanges. Indication of surface condition, marking of dimensional deviations and geometric tolerances. The assembly drawing. Non-demountable joints. Removable assemblies. Mechanical Power Transmitters. Sealing elements.	4
					Sports Enhancing elements of the Running School and the Jumping School and coordination elements. Speed development through motion games. Football game. Volleyball game.	1
					English Quality Control. Obligation and Requirements. Health and Safety. Ability and Inability. Relative Clauses. Engineering. Countable and uncountable nouns. Adjectives and adverbs. Prepositions and conjunctions. Medicine.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**2**	**1**	**Computer Aided Graphics** AutoCAD - Overview. Basic elements for drawing. Entering text into graphic files. Notions of quotation. Polylines. Editing commands. Advanced drawing commands. 3D drawing commands: nonprimitive. 3D drawing commands: primitive. 3D editing commands. Preparing technical product documentation.	4
					Materials Strength Overview. Shearing forces and bending moments. Behavior of materials. Traction/Compression of beams. Cross section properties of beams. Bending of beams. Torsion of beams having circular or annular section; torsion of rectangular cross-section bars. Methodology of dimensioning and verifying beams.	5
					Numerical Methods Algorithms and computational errors. Approximation of functions by interpolation. Solving systems of linear equations. Solving systems of nonlinear equations. Numerical derivation. Numerical integration. Numerical solution of ordinary equations. Numerical solution of higher order differential equations. Numerical solution of differential equations with partial derivatives.	4
					Thermo-Technics and Thermal Equipment General thermodynamics. Status sizes. Mechanical work, heat, entropy, enthalpy. Simple transformations of perfect gases. Principles I and II of Thermodynamics. Reversible and irreversible processes for thermodynamic systems. Reversible and irreversible processes of stabilized flow systems. Nozzles. Homogeneous and non-unitary thermodynamic system. Perfect gas mixtures. Cycles of machines and thermal installations with perfect gas as a working fluid. Heat exchangers.	5
					Processing by cutting Basics about generating surfaces on machine-tools. Basics of the construction and geometry of cutting tools. Thermal phenomena in cutting processes. Cutting forces. Wear and durability of cutting tools. Wear and durability of cutting tools. The parameters of the cutting regime. Turning processing. Processing by milling. Bore processing. Processing by planning. Processing by broaching. Processing by grinding.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**2**	**1**	**Operational Research** Linear programming. The mathematical model of linear programming problems. Solving linear programming problems. Graph theory. Basic concepts. Calculation procedures in graphs. Optimal flow in transport networks. The critical path method. Transportation problems.	4
					Sports Resumption of the main technical-tactical structures in football - boys and volleyball - girls, completed in year 1. Settling in attack and defense game systems. 3x3, 4x4 games on small field, in conditions of moderate or increased difficulty. Bilateral games in compliance with the regulation. Development of the speed of reaction to auditory and visual stimuli. Improving the technique of speed running. Development of the speed of travel through accelerations on variable distances 20-60m. Educating the segmental dynamic force at the level of the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops, differentiated, depending on the individual potential. Fixing and consolidating the main technical elements and procedures specific to sports games. The application of the combinations of specific procedures under adverse conditions, within the bilateral game, with respect to the tasks in positions. Development of the elements of coordinative capacity - rhythm, precision, static and dynamic balance, spatial-temporal orientation, combination of movements, kinesthetic discrimination, ambidextrousness, agility. Educate the mixed and anaerobic lactacid resistance by the method of variable, progressive and interval training.	1
					English Design. Drawings. Design Development. Design Solutions. Grammar in focus: Scale of likelihood. Measurement. Locating and setting out. Dimensional Accuracy. Grammar in focus: Subordinate clauses of result and purpose. Measurement. Numbers and Calculations. Measurable parameters. Grammar in focus: Comparison of adjectives.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**2**	**2**	**Accounting** Patrimonial structures of assets. Patrimonial structures of liabilities. Incomings and outgoings structures. Accounting method. Valuation of assets in accounting. Balance sheet. Analysis and operation of accounts. Inventory of patrimony. Trial balance. Synthesis and accounting reporting.	3
					Fluid Mechanics and Hydraulic Equipment Fluid statics. Basic equations of fluid mechanics. Dimensional analysis and similarity theory. Boundary layer theory. The flow through the pipes.	3
					Fundamentals of Economy Factual economics and theoretical economics. Contemporary market economy. Economic flow. Economic utility and consumer behavior. Production factors. Production costs. Demand. Supply. Types of markets and price formation mechanisms. Remuneration of production factors. Macroeconomics.	3
					Quality Management Concept of quality. Quality costs. Quality features. The role of quality in increasing the technical level. The spiral of quality. Traditional management. International quality standards. Evaluation of the quality system. Audit. ISO 9000 and ISO 9001 certification. Statistical tools of quality. New management tools.	3
					Prices and Costs Calculus Cost calculation. Delimitation of expenditure by carriers and sectors. Procedures for the allocation of indirect costs, for the separation of expenses, for separating production costs into variables and fixed, for calculating the cost per unit of product, for calculating the costs of interdependent manufacturing production. Budgeting of accounts. Accounting of internal management operations.	3
					Tolerances and Dimensional Control Introduction. Dimensional accuracy. Micro-geometric accuracy. Accuracy of geometric shape. Precision of orientation and reciprocal position. Chains of size. Methods and means of measurement and control. Tolerances, fits and control of smooth tapered, bearings and key assemblies. Tolerances, fits and control of threaded assemblies. Tolerances, fits and control of gears and spur gears.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**2**	**2**	**Mechanisms and Machine Parts I** Structure and configuration of plane mechanisms. Kinematic element. Kinematic couple. Kinematic chain. Mechanisms. Analysis of the configuration and kinematics of the mechanisms. Analysis of forces at mechanisms. Dynamics of mechanisms. Balancing mechanisms and machines. Synthesis of mechanisms with lower couplings. Gear mechanisms. Cam mechanisms.	5
					Sports Resumption of the main technical-tactical structures in football - boys and volleyball - girls. Development of the speed of reaction to auditory and visual stimuli. Improving the technique of speed running. Educating the segmental dynamic force at the level of the upper, lower limbs, abdomen and trunk. Fixing and consolidating the main technical elements and procedures specific to sports games. Development of the elements of coordinative capacity. Educate the mixed and anaerobic lactacid resistance by the method of variable, progressive and interval training.	1
					English Materials Technology. Material Types. Material Properties. Forming, working, and heat-treating metal. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Prepositions of place. Writing in focus: Description. Manufacturing and Assembly. 3D Component features. Interconnection. Grammar in focus: Quantifiers. Writing in focus: Definition and exemplification.	2
					Practice Activities in the Scientific Field Knowledge of the sectors of the company and the organizational chart of the company. Study of machining processes on different types of machine tools. Study of relevant examples of related technical-economic documentation as well as the learning of the methodology for its preparation. Study of the implementation mode and the specific procedures for quality control.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**3**	**1**	**Mechanisms and Machine Parts II** General problems of machine construction. Non-removable assemblies. Removable assemblies. Elastic assemblies. Mechanical transmissions by gear. Transmissions through belts. Friction wheel drives. Chain transmissions. Axles and shafts. Rolling bearings. Clutches.	5
					Hydraulic and Pneumatic Drives Structure of a hydrostatic system. Organology of hydrostatic systems. Hydraulic pumps. Hydraulic motors. Distribution equipment. Pressure adjustment equipment. Flow adjustment equipment. Hydraulic diagrams. Structure of pneumatic schemes. Pressure valves. Directional Control Valves. Pneumatic motors. Pneumatic diagrams.	4
					Tools and Devices I The structure of the cutting tools. Materials for cutting tools. The calculation and construction of lathe tools. The calculation and construction of tools for machining bores. Calculation and construction of broach. Calculation and construction of mills.	5
					Accounting Structural and comparative analysis of economic means, sources and processes. Factorial analysis of turnover. Intermediate management balance account. Self-financing capacity. Financing table. Cash flow statement. Accounting of financial results and funds. Profitability analysis. Bankruptcy risk analysis.	5
					Product Manufacturing Technology I Basics of manufacturing processes in the machine construction. Production types. Design of technological processes. Production processes, technological processes. Processing accuracy. Optimization of technological processes. The quality of the processed surfaces. Determination of processing additions and inter-operational dimensions. Technological criteria for determining cutting regimes. Technical standardization. Basic concepts regarding the workability of metallic materials.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**3**	**1**	**Integrated CAE Systems** Global vision on PLM (Product Lifecycle Management) and virtual enterprise. Integration of the development stages and the management of the technical documentation about the product. Integration of product data into the virtual enterprise. Structures of products in the virtual enterprise. The flow of technical documentation about the product in the virtual enterprise. Revision management in the virtual enterprise. Manufacturing process management. Management of product specifications and regulations. Management of the entire product development process.	3
					Project Management Types of programs and projects. Project management in organizational context. Identification of projects and establishing their objectives. Time management. Project cost management. Project quality management. Project team management. Communication management. Risk management in projects. Management of material resources and of procurement for projects.	4
				2	**Tools and Devices II** Calculation and construction of tools for threading. Tools for toothing cylindrical and worm gears. Tools for toothing bevel gears. Calculation and construction of combined tools.	4
					Marketing Marketing research design. The marketing information system. Methods and techniques for collecting and analyzing information in marketing research. Measurement and scaling of phenomena in marketing research. Methods and techniques for obtaining information. Analysis of marketing information. The survey.	3
					Product Manufacturing Technology II Analysis of the main processing procedures. Analysis of the processing of special surfaces. Modern methods of processing based on the numerical control of machine tools. Modern manufacturing systems.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**3**	**2**	**Engineering of Assembly Processes** Types of production processes. The architecture of the production systems. Assembly processes through different modes of energy activation. Thermal sources used to make non-removable assemblies. The algorithm for designing an assembly technology by thermal energy activation. Welding procedure specifications (WPS) for shipbuilding industry. Welding procedure specifications (WPS) for pipelines production.	3
					Fundamentals of Data Processing Processing of statistical data specific to engineering. Error assessment. Notions of probability theory. Distribution laws. Statistical hypotheses. Verification of statistical assumptions. Variation analysis. Experiment planning. Signal-to-noise analysis. Determination of optimal parameters. The study of the influence of parameters and interactions.	3
					Manufacturing Equipment Main kinematic chains. Feeding kinematic chains. Kinematic chains for continuous speed control. Systems for individual and centralized control. Notions regarding the electrical control of machine tools. Notions regarding the numerical control of machine tools. Lathe machines. Milling machines. Drilling machines. Planing machines. Grinding machines.	3
					Fundamentals of Computer Aided Technological Design Methods and principles in computer aided manufacturing. Basic elements in the methodology of computer assisted manufacturing of parts using machine tools with numerical control. Methodology of designing the process of processing parts on machine tools with numerical control.	3
					Practice Activities in a Specific Scientific Field Programming, adjusting and operating different types of mechanical processing equipment. The practical implementation of the concepts of accounting learned in the profile courses.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**4**	**1**	**Entrepreneurship** The concept of the project. The entrepreneurial process. Developing successful business ideas. Entrepreneurial activity. Designing the business plan. Social entrepreneurship. Entrepreneurship and innovation.	3
					Plastics Processing Technologies Thermoplastic and thermoreactive materials. The principle of mixing. The principle of calendering. The principle of extrusion. The basis of the plastic injection process. Technological aspects of vulcanization in molds.	5
					Integrated Production Systems Elements of CNC technology. The SINUMERIK programming system. Main functions of movement. Linear and circular interpolation. Technological cycles of drilling. Technological cycles of milling. The structure of a processing program.	3
					Deformation Systems and Technologies Operations and punches for cutting, for bending, for embossing, for trimming and for volumetric deformation. Elements of technology design and technological equipment for processing by cold plastic deformation. Non-conventional cold pressing technologies. CAD / CAM techniques for designing cold pressing technologies and equipment.	5
					Logistics Management The importance of logistics. Storage. Supply. Introduction to industrial logistics. Planning the commercial logistics of the company. Upstream production logistics. Logistics upstream of production. Logistics in distribution. Information system of the logistic activity. Logistics and marketing. Logistics services.	3
					The Simulated Enterprise The structure, organization and functioning of a simulated enterprise. Presentation and analysis of a simulation model for the accounting and financial management module of an enterprise. Presentation and analysis of a simulation model for the human resources and payroll module of an enterprise. Presentation and analysis of a simulation model for the inventory, logistics and production module of an enterprise. Integrated Enterprise Resource Planning - ERP platforms.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**4**	**1**	**Production Management** Fundamentals of company management. Enterprise - economic agent. The decision-making system. The information system. Structural and procedural organization of the company. Production capacity.	3
					Value Engineering Introduction to value analysis. The logical and chronological process of carrying out the value analysis. Methods for investigating or producing ideas. Methods of evaluation. Case studies. Creativity - an important element in the value analysis approach.	3
					Labor Legislation Labor law: notion, object, sources, principles. Individual labor law. Individual labor contract. Collective labor law. Collective labor agreement.	3
				2	**Production Management** Basic concepts of production design in time and space. Servicing processes. Organization and planning of maintenance and repair of machinery. Organization of insurance activity with tools, devices and verifiers. Organizing the internal transport activity. Production costs of an industrial production enterprise. Modern production management systems.	4
					E-commerce Fundamentals in e-commerce. Techniques used to organize and operate e-commerce platforms. Solutions for simulation development dedicated to e-commerce applications. Applications for e-commerce - B2C and B2B. Integrated e-commerce platforms. Cloud applications for e-commerce.	3
					Management of SMEs Definition, characteristics, typology of the entrepreneur. The real and perceived entrepreneurial environment. Management functions within SMEs. Strategic behavior models applicable to SMEs. Human resources / talent management. Organizational culture in SMEs. Social entrepreneurship. Competitiveness and innovation in the SME sector. Developing anticipatory capacity in the context of the complexity of the environment.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Engineering and Management	**BA**	**Industrial Economic Engineering**	**4**	**2**	**Informatics Systems in Management**	4
					Completion of Graduation Paper	4
					Practical Training for the Graduation Paper	1
					Environmental Management Institutional framework specific to environmental protection and nature conservation. Legislative framework in the field of the environment. The scope of the environmental management system. Requirements of the environmental management system. The elements of the environmental management system. Assessment of environmental performance. Environmental audit. Product life cycle assessment. Environmental labels and declarations.	4
					Competition Law or **Business Law**	3
					Economic Analysis Theoretical and methodological bases of the economic-financial analysis. Diagnostic analysis of the production and marketing activity. Analysis of human resources management. Analysis of material resource management. Cost analysis. Profitability analysis. Analysis of the financial position based on the balance sheet.	4
ENGINEERING AND ENVIRONMENT PROTECTION IN INDUSTRY - BA						
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**3**	**1**	**Environmental Management** Factors that stimulated the emergence of ecological management. The purpose, objectives and functions of ecological management. Ecological management tools. Environmental management systems. ISO 14000 series of standards. Implementation of an Environmental Management System (EMS) according to ISO14001. EMAS - Eco-Management and Audit Scheme of the European Union. Implementation and registration of EMAS. Toxic and hazardous waste management. Ecological risk management - the concept of risk - ecological risks, the concept of risk management, standards.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**3**	**1**	**Risk and Industrial Security** The lighting. The noise. The vibrations. Thermal environment. Chemical agents. Carcinogens and mutagens. Biological agents. Industrial ventilation. Technical equipment. Workplace arrangement. Organizing work spaces. Fires and explosions. Electrosecurity. Work task. Circulation, horizontal and vertical risks. Collective and individual protection. Organization of first aid.	5
					Technologies and Equipment for Water Treatment and Purification Equipment and installations for wastewater treatment. Equipment and installations for phase separation. Methods and equipment for biological treatment.	5
					Air Purification Technologies and Equipment Sources of pollution and the effects of the main atmospheric pollutants on the environment and on human health. The genesis of pollutant emissions resulting from the combustion process in a thermo-energy system. Calculation of the components of the combustion process. Installations for combustion of gaseous, liquid, solid fuels. Energy balance of an energy installation. Dispersion of pollutant emissions into the atmosphere.	5
					Rehabilitation of Industrial Sites Environmental protection in the concept of sustainable development. Pollution. The influence of the activity of the polluting industrial units on the bordering areas. Influence of steel and non-ferrous metals units on the surrounding areas. The influence of the extractive industry units on the surrounding areas. Influence of chemical industry units on the surrounding areas. Influence of the units of the building materials industry on the surrounding areas. Influence of units in the thermo-energy industry on the surrounding areas. Influence of industrial activity on environmental factors in the surrounding areas. The air pollution, water pollution, soil pollution, biosphere pollution. The correlation between the objectives of environmental protection, economic theory and practice. The correlation between economic development and environmental protection, public health, education and culture. Environmental legislation.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**3**	**2**	**Transfer Processes (Mass and Thermal)** Introduction. Sizes characteristic of heat transfer. Elementary modes of heat transfer. Thermal conduction. Thermal convection. The total heat transfer taking into account the conduction and convection. The total heat transfer taking into account convection and radiation. Heat exchangers. Mass transfer.	4
					Risk assessment and disaster management The stages of the risk assessment process - setting the context, identifying the hazards, probability (frequency) and severity of the consequences, dimensioning the risk, analyzing the risk. Elements of disaster management. Hydrological disaster management. Planning for emergencies. Disaster risk prevention and management. Risk assessment methods.	4
					Physics of the Atmosphere The composition and structure of the atmosphere. Static and thermodynamic of the atmosphere. Humidity. Fog and clouds. Atmospheric stability and pollution. Dynamics of the atmosphere. Atmospheric circulation. The radiative budget of the Earth. Physics of atmospheric aerosol. Climate variability. Elements of hydrology.	3
					Radiation Sources and Protection Techniques Classification of ionizing radiation and radiation sources. Notions of nuclear physics. Fuels and nuclear materials. Structural conception of nuclear energy reactors. Thermal diagrams of nuclear power plants. Security of nuclear power plants. Notions of dosimetry.	4
					Technologies from Acquisition, Monitoring and Diagnosis of Environmental Quality General principles of measurement. Methods of measurement. Measurement errors. Performances of the measuring installations. Electrical measurement of non-electric quantities. Fluid pressure measurement. Fluid temperature measurement. Methods of measurement applied to fluid flow. Measurement of air humidity. Methods for monitoring and controlling air composition. Control of pollutants at the generating source. Gas analyzers. Dispersion of pollutants. Monitoring the pollution of the marine environment. Monitoring of soil quality.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**3**	**2**	**Technologies and Equipment for Water Treatment and Purification** Advanced treatment methods. Physical processes of advanced treatment. Physico-chemical processes. Biological processes. Sludge treatment.	4
					Air Purification Technologies and Equipment Impact of industrial and energy processes on atmospheric air. Technologies and methods for controlling atmospheric pollutant emissions from stationary sources. Formation and control of solid particulate emissions. Mechanical, electrostatic, hydraulic, in porous layer, dust removing systems. Formation and control of NO_x and SO_2 emissions. Solutions for the treatment of volatile organic compounds. Economic analysis of technologies for reducing atmospheric pollution.	4
					Practice Activities in a Specific Scientific Field Documentation and realization of practical works in the specialized laboratories - Galati Regional Environmental Agency. The analysis of the environmental factors specific to the city and the industrial areas bordering Galati in the specialized laboratories of the Regional Environmental Agency. Galati Water Plant. Recycling of urban waste from Galati. The ecological landfill of Galati municipality.	4
					Specific Machinery and Equipment in Environmental Industry General calculation of a mechanical machinery. Mechanical equipment and installations for the continuous transport of waste. Dynamic calculation of a transport - processing equipment for waste. Types of feeders for waste processing plants. Shredders for waste. Elements regarding automatic waste sorting facilities. Reliability of machines and installations for the transport and processing of waste.	4
					Toxic and Hazardous Waste National strategy for managing toxic and hazardous waste. Classification and characterization of hazardous waste (European Waste Catalog / Waste list, including hazardous waste). Labeling and packaging of dangerous chemical substances and preparations. Storing, incineration and final disposal of toxic and hazardous waste. Transport of toxic and hazardous waste and products. Technologies and techniques for treating and recovering toxic and hazardous waste. Radioactive pollution and radiation protection.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**4**	**1**	**Environmental Impact Assessment** Legislative and institutional framework. Screening stage of the project. Stage scoping. Impact analysis stage. Measures to reduce the impact on the environment. The stage of management and monitoring of the impact. Environmental audit. Elaboration of the impact report. The step of examining the quality of the impact study. Public consultation and involvement. Decision making based on impact study. Implementation and supervision.	5
					Environmental Legislation General framework of European environmental legislation. European legislation on water quality, atmosphere, soil and European legislation on habitats, ecosystems and wild birds. Evolution of environmental policies at international and community level. Transformations at European Union level of environmental policies. European environmental policies. Sustainable development. The principles of the right to a healthy and balanced environment in Romania. The concept of environmental law and regulatory acts in the field of environmental protection. Romanian environmental legislation regarding the protection of water and the marine environment. Romanian environmental legislation regarding soil, subsoil, natural resources, conservation of biodiversity and protected areas. Protection of the atmosphere in domestic law.	3
					Alternative Energy Sources The potential of renewable energy resources. Solar energy. Biomass. Wind energy. Hydraulic energy. Geothermal energy.	5
					Waste Recovery Technologies Technologies for processing and recovering on ferrous waste. Technologies for processing and recovering on copper and copper-based alloys waste. Technologies for processing and recovering on aluminum and aluminum-based alloys waste. Recovery of metallurgical slags. Technologies for the recovery of powders and sludge from the metallurgical industry. Recovering on useful elements from waste by pyro metallurgical and hydrometallurgical procedures.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**4**	**1**	**Biotechnologies in Environmental Protection and Engineering** General notions regarding the role of biotechnology in environmental protection and practical applications; economic impact and quality of life. Description of the main groups of microorganisms with implications in biotechnologies for environmental protection. Study of physico-chemical and biological factors that influence the development and metabolic behavior of microorganisms. Conditions and systems of cultivation of microorganisms in biotechnologies with applications in environmental protection. Biochemical processes with implications in the bio-valorification of waste and bio-treatment. Waste composting. Bio-treatment of waste water. Bio sorption of metals and bioremediation of polluted media with recalcitrant xenobiotic compounds.	4
					Nanomaterials and Nanotechnologies Introduction to nanotechnology and nanomaterials. Classes of nanotechnologies. 0D nanostructured materials (nanoparticles and quantum dots). 1D nanostructured materials (nanowires, nanotubes and nanobags). 2D nanostructured materials (nanosheets, thin films). 3D nanostructured materials. Carbon-based nanomaterials (nanotubes, fullerene, graphene). Nanomaterials and devices for electronics, computers and communications. Nanomaterials with biological and medical applications. Toxicity of nanomaterials. Nanomaterials for renewable energy. Nanomaterials with applications in environmental protection.	4
					Clean Technologies Defining and classifying clean technologies. Clean technologies for energy production. Clean technologies for obtaining materials. Clean manufacturing technologies for products.	4
				2	**Waste Recovery Technologies** Integrated waste management. Solid waste. The polluting potential of solid municipal waste. Storage, collection and transport of solid municipal waste. Technologies of basic processing. Thermo-chemical treatment of waste. Biological treatment of waste. Controlled storage of waste.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**4**	**2**	**Automation of Technological and Biotechnological Processes** Automatic adjustment systems. The main components of the automatic adjustment systems. The operating conditions of the automatic systems and their characteristics. Automatic measurement of the main technological variables: temperature, fluid flow, pressure, depression, humidity of air and gas, chemical composition, angular position, rotational speed. Extreme adjustment of the parameters of the specific installations.	3
					Economy and Environmental Accounting Theoretical-methodological bases of the environmental economy. Involving environmental factors in the activity of modern enterprises. Natural resources and environmental accounting. Pollution risk assessment and management. Analysis of projects with influence on the environment and impact assessment. Methods and models of economic evaluation of natural resources. Economic assessment of soil resources and mineral resources. Complex economic assessment of aquatic resources. Economic value of forest resources and biodiversity. Economic evaluation of the protection of the atmosphere. National specifications.	3
					Technologies and Equipment for Soils Depollution Pedology and pedogeography. Evolution of knowledge about soil. Development of pedology and pedogeography in Romania. Global soil composition. Soil composition and properties. Soil pollution. Pollutant emissions from soil. Natural sorbents used in soil depollution. Study of the process of absorption of petroleum hydrocarbons. Study of the aerobic biodegradation process of petroleum hydrocarbons. Measures to stimulate the biodegradation process. Use of polymers for conditioning and/or remediation of contaminated or polluted soils.	3
					Energy Management Human society and energy. Management of fossil energy sources. Management of solar energy conversion systems into electricity with cells and photovoltaic panels. Solar energy. Conversion into thermal energy (heat). Systems of heat conversion into mechanical work and then into electrical energy with Stirling	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
					Engines. Wind energy - VAWT and HAWT systems. Conversion management to increase overall efficiency. Management of the conversion of solar energy into hydrogen. Solar energy conversion management in HOH. Biomass and biogas management. Combustion cells (PEMFC). Management of CHP (cogeneration), CCHP (trigeneration) and polygeneration systems.	
Environment Engineering	**BA**	**Engineering and Environment Protection in Industry**	**4**	**2**	**Completion of Graduation Paper**	4
					Practical Training for the Graduation Paper	4
					Topography The object and importance of topography. Terrestrial measurements. Topographic elements of the terrain. Methods of projection of the topographic points. Remote sensing elements used in topography. Coordinate systems used in topography. Cartographic projections used in topography. The content elements of the topographic map. Marking and signaling in the field of the points of the support network. Measuring distances. Plans and maps, general notions, classifications, conventional signs, scales, drafting methods. Total topographic taking. Design of taking. Topo-geodesic activity at the phases of prefeasibility, feasibility, project execution.	3
					Sustainable Development Evolution of the concept of sustainable development. The challenges of sustainable development. Sustainable development from Stockholm to Copenhagen. Sustainable development from theory to practice. Sustainable development in the context of the European Union. Regional development policy and sustainable development. Measures to improve sustainable development strategies. Current sustainable development practices. Sustainable livelihoods in rural and urban areas. Use of market mechanisms to stimulate sustainable development. Problems and challenges in sustainable development. Measuring sustainability.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
HYDROTECHNICAL IMPROVEMENTS AND ENVIRONMENTAL PROTECTION - BA						
Environmental Engineering	**BA**	**Hydrotechnical Improvements and Environmental Protection**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	4
					Physics Classic mechanics. Thermodynamics, Molecular Physics and Heat. Electricity and Magnetism. Optics. Introduction to Quantum Physics.	5
					Descriptive Geometry Projection systems. Representation of point, line and plan. Polyhedrons. Cylinder and cone. Sphere. Intersections of geometric bodies.	5
					Mechanics I Moment theory. Static moments and center of gravity. Static mechanical systems. Kinematics. The dynamics of the material point. The kinematics and dynamics of the relative motion of the point.	5
					Materials Science and Engineering Types of materials. Atomic architecture. Diffusion. Fe-C alloy system. Phase transformations in solid state. Heat treatments. Non-ferrous alloys. Ceramic materials. Plastic materials. Composite materials.	3
					Chemistry Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Colloidal systems. Redox reactions. Electrolysis. Hydrogen. Metals.	5
					Sports Resumption of the main technical-tactical structures in football (boys) and volleyball (girls). Games on small field, in conditions of moderate or increased difficulty. Bilateral games in compliance with the regulation. Development of the speed of reaction to auditory and visual stimuli. Improving the technique of speed running. Educating the segmental dynamic force at the level of the upper, lower limbs, abdomen and trunk.	1

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**BA**	**Hydrotechnical Improvements and Environmental Protection**	**1**	**1**	**English** Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses. Research and Development. Specialized vocabulary and discourse situations. Grammar in focus: Past tenses. Information technology. Specialized vocabulary and discourse situations. Grammar in focus: Future forms. Logistics. Specialized vocabulary and discourse situations. Grammar in focus: Conditionals. Quality. Specialized vocabulary and discourse situations. Grammar in focus: Verb phrases. Health and Safety. Specialized vocabulary and discourse situations. Grammar in focus: Verb phrases.	2
				2	**Topography** General Elements of Topography. General Elements of Cartography. Marking and signaling of topographic points. Tools used in Topography. Planimetric determinations. Elements specific to measurements using GPS technology. Elements related to the drawing on the ground of the designed elements.	5
					Linear Algebra, Analytic and Differential Geometry Vector spaces. Linear applications. Real Euclidean vector spaces. Free vectors. Line and plan in space. Conics on reduced equations. Quadrics on reduced equations. Curves in space. Surfaces.	5
					Ecology Biosphere. Biotope - the abiotic environment of the living creatures. Ecology of populations. The causes of the emergence and aggravation of ecological imbalances. The ecosystem as a formation in space and time. The main ecosystems in Romania. Biome. The biocenotic order in the ecosystem. Trophic chains. Ecosystem successions.	4
					Applied Informatics Hardware architecture of computers. Operating systems. Installation. Operations. Internet. Intranet. The MS Word text editor. Calculation in the form of tables in MS Excel. MS PowerPoint presentations. Database Management with MS Access. Editing advertising content with MS Publisher. Cyber security.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**BA**	**Hydrotechnical Improvements and Environmental Protection**	**1**	**2**	**Hydrology and Hydrogeology** Introduction to hydrology study. The water circuit in nature. General properties of water. Notions of hydrogeology. The hydrographic basin. Danube. Elements of flowing waters hydrometry. Limnology.	5
					Meteorology and Climatology Temperature gradient, temperature variability. Baric formations. Static and thermodynamic of the atmosphere. Humidity. Fog and clouds. Rain. Dynamics of the atmosphere. The wind. Radiative budget. Atmospheric circulation. Types of climate. Climate elements of Romania.	4
					Sports Fixing and consolidating the main technical elements and procedures specific to sports games. The application of the combinations of specific procedures under adverse conditions, within the bilateral game, with respect to the tasks in positions. Development of the elements of coordinative capacity - rhythm, precision, static and dynamic balance, spatial-temporal orientation, combination of movements, agility. Educate the mixed and anaerobic lactacid resistance by the method of variable, progressive and interval training.	1
					English Engineering. Automotive. Metallurgy. Welding. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Active vs. Passive. Relative clauses. Causation. Obligation and requirements. Cause and effect. Ability and inability.	2
			2	**1**	**Thermodynamics** Thermodynamic system. Thermodynamic balance. Status sizes. Process sizes. The postulates of thermodynamics. Temperature and pressure. The first principle of thermodynamics. Internal energy. Mechanical work. Mechanical movement work. Mechanical work. The heat. Enthalpy. The perfect gas. Simple laws. Specific heaters. Perfect gas mixtures. Simple state transformations. The second principle of thermodynamics. The entropy of perfect gases. Vapor. Wet air. Combustion of solid, liquid and gaseous fuels.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**BA**	**Hydrotechnical Improvements and Environmental Protection**	**2**	**1**	**Computer Aided Graphics** AutoCAD - Overview. Basic elements for drawing. Entering text in graphic files. Organizing drawings. Drawing graphic entities without width. Drawing entities with width. Modification of entities. Editing commands. Information commands. Dimensioning commands in AutoCAD.	4
					Geology The structure of the Earth's globe. The chemical and mineralogical composition of the globe. Notions of petrology. Elements of cartography and structural geology. Elements of global tectonics.	4
					Numerical Methods Errors in numerical methods. Systems of linear equations (direct methods, iterative methods). Numerical interpolation. Numerical quadrature.	5
					Materials Strength I Elements of materials strength. Cross sections. Axial load. Bending load. Methodology of dimensioning and verifying beams. Torsion of beams having circular section. The stability of the elastic equilibrium (buckling).	4
					Fluid Mechanics Fluid statics. Basic equations of fluid mechanics. Dimensional analysis and similarity theory. Boundary layer theory. The flow through the pipes.	5
					Sports Consolidation of the main processes in football - boys and volleyball - girls, known from previous cycles. Settling in attack and defense game systems. Bilateral games. Development of the elements of coordinative capacity. Educate the general force on the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops.	1
					English Design. Drawings. Design Development. Design Solutions. Grammar in focus: Scale of likelihood. Measurement. Locating and setting out. Dimensional Accuracy. Numbers and Calculations. Measurable parameters. Grammar in focus: Subordinate clauses of result and purpose. Comparison of adjectives.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**BA**	**Hydrotechnical Improvements and Environmental Protection**	**2**	**2**	**Computer Aided Graphics** Graphic construction of the cylinder. Graphic construction of prisms. Composition of solid bodies. Creating parts views. Three-dimensional editing commands. Representing parts section.	4
					Environment Chemistry The object of environmental chemistry. The atmosphere as an environmental factor. Chemistry of the aquatic environment (hydrosphere). Soil chemistry. Chemical interactions at the soil-water-atmosphere interface.	4
					Materials Strength II Compound stresses. Stability of elastic beams (buckling of beams). Energy methods in the calculation of elastic deformations of beam structures. Static undeterminated systems of beams. Beam systems under dynamic loads.	4
					Hydraulics Hydrodynamics. The permanent and non-permanent movement of the currents with free surface. Uniform movement in channels. Gradually varied non-uniform movement. Quickly varied non-uniform movement. Downflows. Energy dissipators. Water storage. Hydro technical constructions. Groundwater movement.	3
					Risk Management and Disaster Management The concept of risk. Stages of the risk assessment process. Elements of disaster management. Hydrological disaster management. Planning for emergencies. Disaster risk prevention and management. Risk assessment methods.	4
					Elements of Electrochemistry and Corrosion Corrosion processes. Chemical and electrochemical corrosion. Thermodynamics of metal corrosion in aqueous solutions. Kinetics of electrochemical corrosion. Factors that influence the rate of electrochemical corrosion. Corrosion investigation methods. Methods of corrosion protection of metallic materials. Methods for treating the corrosive environment. Corrosion inhibitors. Methods of coating the metal surfaces with anti-corrosion layers.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**BA**	**Hydrotechnical Improvements and Environmental Protection**	**2**	**2**	**Sports** Consolidation of the main processes in football - boys and volleyball - girls, known from previous cycles. Settling in attack and defense game systems. Bilateral games. Development of the elements of coordinative capacity. Educate the general force on the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops.	1
					English Materials Technology. Material Types. Material Properties. Forming, working, and heat-treating metal. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Prepositions of place. Writing in focus: Description. Manufacturing and Assembly. 3D Component features. Interconnection. Grammar in focus: Quantifiers. Writing in focus: Definition and exemplification.	2
					Practical training Documentation and carrying out of practical work in the specialized laboratories - Galati Regional Environmental Agency, Wastewater treatment plant - company APA CANAL SA Galati, Ecological waste dump Tirighina - Ecosal Public Service Galati, Barbosi Sorting and Composting Station - Galati Ecosal Public Service, Department of environmental protection - ArcelorMittal Galati, SETCAR S.A. Braila, Environmental laboratories - Faculty of Engineering.	4
MEDICAL ENGINEERING - BA						
Applied Engineering Science	**BA**	**Medical Engineering**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	5
					Chemistry I Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Colloidal systems. Redox reactions. Electrolysis. Hydrogen. Metals. Periodic system groups.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**1**	**1**	**Materials Science** Types of materials. Atomic architecture. Diffusion. Fe-C alloy system. Phase transformations in solid state. Heat treatments. Non-ferrous alloys. Ceramic materials. Plastic materials. Composite materials.	5
					Physics Elements of classical mechanics. Oscillations and waves. Notions of thermodynamics. Fundamentals of electromagnetism. Fundamentals of optics. The origins of quantum physics. Elements of atomic physics. Elements of solid body physics.	4
					Computer Aided Graphics AutoCAD - Overview. Basic elements for drawing. Entering text into graphic files. Commands for multiplying objects. Notions of quotation. Polylines. Editing commands. Advanced drawing commands. 3D drawing commands: nonprimitive. 3D drawing commands: primitive. 3D editing commands. Preparing technical product documentation.	4
					English I Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect). Research and Development. Specialized vocabulary and discourse situations. Grammar in focus: Past tenses. Information technology. Specialized vocabulary and discourse situations. Grammar in focus: Future forms. Logistics. Specialized vocabulary and discourse situations. Grammar in focus: Conditionals.	2
					Sports I The main processes in football - boys and volleyball - girls. Settling in attack and defense game systems. Bilateral games. Development of the speed of reaction to auditory and visual stimuli. Repeat the start from the feet and from the start from the beginning, the development of the speed of movement through accelerations on variable distances 20 - 60 m. Educate the dynamic force at the level of the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**1**	**1**	**Professional Communication Techniques** Communication techniques. Oral communication. Preparation and exposure of a presentation / speech / scientific papers. Types of interviews. Written communication. The experimental study. How to make a presentation on areas of professional competence. Data collection and interpretation, free discussion. Formulation of the research report. The scientific report.	3
				2	**Linear Algebra, Analytic and Differential Geometry** Vector spaces. Linear applications. Real Euclidean vector spaces. Free vectors. Line and plan in space. Conics on reduced equations. Quadrics on reduced equations. Curves in space. Surfaces.	5
					Chemistry II Classification of organic compounds. Composition of organic compounds. Properties of chemical bonds in organic compounds. Alkanes, cycloalkanes. Alkenes, dienes and polyenes. Alkines. Halogenated compounds, alcohols. Phenols, ethers. Sulfur compounds, nitrogen compounds. Carbonyl Compounds, Carboxylic Acids. Functional derivatives of carboxylic acids. Fatty acids, glycerides. Food dyes, medicines, pesticides. Macromolecular compounds.	5
					Biophysics General notions about the structure of the atom. Chemical bonds. The gas phase - diffusion, osmosis. Liquid phase - surface tension, flow, osmosis. Solutions and colloids. Water in biological systems. Electromagnetism. Field interaction with cells. Ionizing radiation. Dosimetry and radiation protection elements. Polymer matrix composite materials - medical applications. The periodic system of elements and life.	4
					Computer Programming and Programming Languages Introduction to C Language in the Qt environment. Using widgets in Qt. Presentation of the Turbo C programming environment. Variables. Constants. Structures. Conditioning instructions. Repetitive structure for. Panels. The repetitive instruction while. Matrices. Files. Strings of characters. Functions. Pointers. Classes in C ++.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**1**	**2**	**Medicine Elements for Engineering** Terms and anatomical planes. Terminology of body segment movements. Medical terminology. Epithelial tissues. The conjunctive tissue. Muscle tissue. Nervous tissue. Physiology of the cardiovascular system. Physiology of the respiratory system. Physiology of the nervous system. Physiology - the excretory system. Physiology of the muscular system. The physiology of the digestive system. Cell, DNA, atoms.	4
					Concepts of Mechanical Engineering Moment theory. Stability of the rigid subject to ideal connections, types of connections. Methods and theorems in material systems statistics. Friction in technique. Wire statics. Technical applications of statics. Kinematics of the point.	4
					English II Quality Control. Obligation and Requirements. Health and Safety. Ability and Inability. Relative Clauses. Engineering. Countable and uncountable nouns. Adjectives and adverbs. Prepositions and conjunctions. Medicine.	2
					Sports II Consolidation of the main elements and technical procedures specific to sports games. Repeat in adverse conditions, in bilateral play. Development of the elements of coordinative capacity - rhythm, precision, static and dynamic balance, combination of movements, kinesthetic discrimination, agility. Educate aerobic and mixed resistance by the method of uniform and variable efforts.	2
			2	**1**	**Numerical Methods** Errors in numerical methods. Systems of linear equations (direct methods, iterative methods). Numerical interpolation. Numerical quadrature.	4
					Biomaterials Basic theoretical elements in obtaining, processing and characterizing biomaterials. General properties of biomaterials. Metallic materials used as biomaterials. Polymeric biomaterials. Ceramic biomaterials. Composite biomaterials. Smart biomaterials and tissue engineering techniques. Optimal design and advanced surface processing to improve implant bio-integration.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**2**	**1**	**Biomechanics** Fundamentals of structure of the atom. Chemical bonds. The gas phase - diffusion, osmosis. Liquid phase - surface tension, flow, osmosis. Solutions and colloids. Water in biological systems. Electromagnetism. Field interaction with cells. Ionizing radiation. Dosimetry and radiation protection elements. Polymer matrix composite materials - medical applications. Nano-dimensional compounds - obtaining and applications. The periodic system of elements and life.	5
					Materials Strength Elements of materials strength. Cross sections. Axial load. Bending load. Methodology of dimensioning and verifying beams. Torsion of beams having circular section. The stability of the elastic equilibrium (buckling).	5
					English III Design. Drawings. Design Development. Design Solutions. Grammar in focus: Scale of likelihood. Measurement. Locating and setting out. Dimensional Accuracy. Grammar in focus: Subordinate clauses of result and purpose. Measurement. Numbers and Calculations. Measurable parameters. Grammar in focus: Comparison of adjectives.	2
					Sports III Consolidation of the main processes of football - boys and volleyball - girls, known from previous cycles. Settling in attack and defense game systems. Bilateral games. Development of the elements of coordinative capacity. Educate the general force on the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops.	2
					Measurements and Instrumentation Sensors and transducers. Static performance of measurement systems. Dynamic performance. Mechanical, optical and magnetic measurement amplifiers. Electronic amplifiers. Measurement of the mass and mechanical quantities. Measurement of thermal values. Measurement of electrical and magnetic quantities. Pressure measurement. Measurement of hydraulic and pneumatic quantities. Measurement of optical quantities.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**2**	**2**	**Renewable sources** Introduction. Solar energy. Biomass. Wind energy. Hydraulic energy. Geothermal energy.	4
					Electrotechnics Introduction to the basics of electrotechnics. Electricity. Production, transport, distribution. Quality of electricity. Analysis of circuits and electrical networks. Electromagnetism. Effects of electric current. Constructive, functional and behavioral study of machines power.	3
					Basics of Technical Thermodynamics Thermodynamic system. Thermodynamic balance. Status sizes. Process sizes. The postulates of thermodynamics. Temperature and pressure. The first principle of thermodynamics. Internal energy. Mechanical work. Mechanical movement work. Mechanical work. The heat. Enthalpy. The perfect gas. Simple laws. Specific heaters. Perfect gas mixtures. Simple state transformations. The second principle of thermodynamics. The entropy of perfect gases. Vapor. Wet air. Combustion of solid, liquid and gaseous fuels.	3
					Specific Processes for Biomaterials Casting Definition and classification of metal biomaterials. Brief history of the evolution of the use of metals in medicine. Classification of metallic materials used in medicine. Properties of metallic biomaterials. Technologies for obtaining metallic biomaterials. Stainless steel. Titanium and titanium alloys. Cobalt and its alloys. Noble metals and alloys. Metallic materials used in dental implantology. Metallic materials used for dental prostheses.	4
					Electronics Electronic devices of circuit. Amplifiers and oscillators. Uncontrolled low power rectifiers. Electronic stabilizers. Controlled low power rectifiers. Combinational and sequential logic circuits. Applications of combinational and sequential logic circuits.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**2**	**2**	**Applied Informatics** Databases - General concepts. Microsoft Access - Overview. Creating databases in Microsoft Access. Creating and working with tables in Microsoft Access. SQL language. MySQL language. Macro commands. Communication between Microsoft Office applications. Module. Web databases in Microsoft Access. Web databases in MySQL and PHP.	3
					Phase Structure and Structural Imaging of Biocompatible Materials Techniques and equipment for the imaging study of biocompatible materials. Techniques and equipment for electron diffraction study of biocompatible materials. Imaging of phases and structural constituents of metallic biomaterials with iron base. Imaging of phases and structural constituents of metallic biomaterials with cobalt base. Imaging of phases and structural components of titanium-based metallic biomaterials. Imaging of phases and structural constituents of metallic biomaterials with zirconium and precious metals. Imaging of phases and structural constituents of cast alloys for dentistry. The imaging of the phases and of the structural constituents of the metallic biomaterials with the shape memory. Notions of structural imaging of biocompatible ceramic materials. Notions of structural imaging of polymeric biocompatible materials.	3
					English IV Materials Technology. Material Types. Material Properties. Forming, working, and heat-treating metal. Manufacturing and Assembly. 3D Component features. Interconnection. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Prepositions of place. Quantifiers. Writing in focus: Description. Definition and exemplification.	2
					Sports IV Consolidation of the main processes of football - boys and volleyball - girls, known from previous cycles. Settling in attack and defense game systems. Bilateral games. Development of the elements of coordinative ability. Educate the general force at the level of the upper, lower limbs, abdomen and trunk by the method of working in the circuit and by working on workshops.	2

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Applied Engineering Science	**BA**	**Medical Engineering**	**2**	**2**	**Practical training** Knowledge of the operating principles and main components of laboratory equipment. Design, construction, maintenance and reliability of medical devices and systems of insurance, investigation, recovery and intervention. Management of medical engineering systems and action skills in a social context for the promotion and exploitation of biomedical systems. Monitoring the functioning of computerized systems for monitoring patients during surgical or intensive care operations. Modern methods of investigation. Design and development of strategies for decision making based on expert systems and artificial intelligence, such as computer systems to assist people with severe pathologies.	4
					Crystallography and Mineralogy Introduction to the field of crystallography. Morphological geometric crystallography. Symmetry of crystals. Methods of graphical representation of crystals. Crystallographic systems. Structural geometric crystallography. The study of the crystallographic structure. Physical crystallography. Systematics of crystalline structures.	3
MATERIALS SCIENCE - BA						
Materials Engineering	**BA**	**Materials Science**	**4**	**1**	**Modeling and Simulation in Materials Science** Purpose and importance of mathematical modeling in industrial processes. Classification of mathematical models. Parameters of industrial processes. Methodology of analytical mathematical modeling. Functional characterization of systems. Function and transfer matrix. Experimental mathematical modeling (identification).	4
					Sintered Materials and Products Obtaining powders: mechanical, physico-mechanical, chemical, physico-chemical methods. Sizing of powders. Sizing methods. Installations, working parameters. Properties of powders: physical properties, chemical properties, technological properties. Preparation of powder mixtures: addition components, dosage of blends, homogenization of blends. Formation of products obtained of powders: cold pressing in steel molds, hot pressing, isostatic, step by step.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Materials Science**	**4**	**1**	**Composite Materials** Introduction. Definition and classification of composite materials. Areas of use of composites. Comparisons between the properties of the classical materials and the properties of the composite materials. The constituent phases of composite materials. Matrixes. Reinforcements.	4
					Corrosion of Surfaces Mechanisms of surface degradation. Measures to reduce wear. Modeling the tribological behavior of materials. Increasing the sustainability of the products through specific technologies of surface engineering. Modeling the processes of surface modification. Notions regarding corrosion and corrosion protection of metallic materials. Modeling of corrosion processes of alloys. Methods of protection of metals and alloys against corrosion.	4
					Surface Engineering Surface characterization. The microstructure of the surface layer. Geometrical deviations of the surface. Roughness parameters. Methods of visualizing the surface. Methods for determining micro-hardness and nano-identification. Friction of surfaces. Surface friction mechanisms. Lubrication. Wear of surfaces. Wear types. Surface engineering technologies. Choosing the material for wear resistance. Surface engineering technologies. Superficial tempering. Superficial melting. Thermochemical treatments. Coatings. Welding deposits. Flame and plasma spray. Physical and chemical methods of vapor phase deposition.	3
					Biomaterials Biomaterials and materials engineering system. Biocompatibility. Specific properties of biocompatible materials. Metallic biomaterials: austenitic, ferritic, martensitic stainless steels. Alloying elements. Metallic biomaterials: cobalt-based alloys, nickel-based alloys. Titanium and titanium alloys. Noble alloys, other metals for medical purposes. Biomaterials with shape memory, magnetic memory and gum alloys. improvement of surface properties of metallic biomaterials. Ceramic biomaterials. Polymer materials with biocompatibility characteristics. Biocompatible composite materials. Applications of biomaterials.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Materials Science**	**4**	**1**	**Semiconductor Materials** Statistic of charge carriers in semiconductors. Transport phenomena in semiconductors. Contact phenomena and semiconductor devices. The optical properties of semiconductors. Applications in optoelectronics. Non-crystalline semiconductors.	4
					Polymer Materials Types of polymeric materials. Properties. Processes for obtaining polymers. Structure of polymers. Characteristic monomers. Molecular chains. Isomers. Form of molecular chains. Crystallinity of polymers. Polymers with simple structure. Thermoplastic, elastomeric polymers and thermosetting polymers. Copolymers. Mechanical behavior of polymers. Models of mechanical behavior specific to different classes of polymers. Mechanisms of deformation and increase of polymer resistance. Predictive models of mechanical strength increase specific to different classes of polymers. Processes for forming polymer products. Compression formation. Transfer formation. Piston injection molding. Extrusion molding with screw. Blow formation. Modeling processes for forming polymeric materials. Polymer processing equipment.	4
				2	**Modeling and Simulation in Materials Science** Use of the MATLAB software package in modeling. The mathematical model of optimization problems. Optimizations on open sets. Optimizations with equality restrictions. Elements of convex analysis. Optimal conditions. Numerical methods for solving unrestricted optimization problems.	3
					Sintered Materials and Products Laminating, powder extrusion, sintering. Molding by casting; by injection; by free pouring into molds, by vibration. Electromagnetic field formation. Choosing the formation process. Sintering of powder products. Solid phase sintering of monocomponent, polycomponent systems. Sintering in the liquid phase presence. Processing of sintered products. Cutting, calibration, thermal and thermochemical treatments, infiltration. Characterization of sintered products.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Materials Science**	**4**	**2**	**Composite Materials** Metal matrix composites. Composites with polymeric matrix. Composites with ceramic matrix. Fibers used for hardening composites. Matrix-reinforcement load transfer. Mechanical properties of fiber-reinforced composite materials.	3
					Nanomaterials and Nanotechnologies Nanomaterials and nanotechnologies. Nanostructured materials. Analysis and control tools. Functional nanodevices. Nanostructured materials. Nanomaterials: nanocrystalline materials; fullerenes; nanotubes; nanofibers, and nanowires; semiconductor quantum particles; organic hybrid architectures; functional nanostructures. Dispersions and coatings. Materials with large surface area. Massive nanostructured materials. Manufacturing techniques. Physical methods. Gaseous phase synthesis. Methods of wet chemistry. Modeling processes for obtaining nanomaterials. Design of technologies for the manufacture of nanomaterials. Applications of nanostructured materials. Optical. Magnetic. Thermal. Mechanical. Energy. Biomedical. Environmental protection.	4
					Practical Training for the Graduation Paper	4
					Completion of Graduation Paper	4
					Ceramic Materials Definition and classification of ceramic materials. Structure of ceramic materials. Phase balances in oxide ceramic systems. Traditional ceramic materials. Advanced ceramic materials. Ceramic materials with applications in the electric / electronic field. Ceramic materials with applications in the mechanical field. Super refractory ceramic materials. Nanostructured ceramic materials.	3
					Semiconductor Materials Measuring the resistivity of semiconductor materials. Study of semiconductor crystal surface defects. Determination of the sign of the semiconductor charge carriers. Obtaining single crystals from solutions. Variation of the electrical conductivity of the semiconductor with temperature and determination of the bandwidth forbidden. Electrical characteristics of the p-n junctions. Study of the Hall effect.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Materials Science**	**4**	**2**	**Metallic Materials** Characterization and properties of metallic materials. Casting metallurgy, steel metallurgy, and metallurgy of the main non-ferrous metals Cu, Al. Processing and molding technologies of metallic materials. Processing of metallic materials by plastic deformation. Special processes for plastic deformation. Welding processing of metallic materials, specific technologies. Processing of plated metal materials. Processing of metallic materials by aggregation of powders.	3
APPLIED INFORMATICS IN MATERIALS ENGINEERING - BA						
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**1**	**1**	**Mathematical Analysis** Strings and series of real numbers. Differential calculus. Integral calculus. Differential equations.	5
					Physics Classical mechanics. Elements of restricted relativity theory. Thermodynamics, Molecular Physics and Heat. Electricity and Magnetism. Optics. Introduction to Quantum Physics.	5
					Chemistry Classification of chemicals. Aggregation states of matter. State transformations. The fundamental laws of chemistry. Elements of the structure of atoms. Atomic models. The periodic system of the elements. Chemical bonds. Dispersed systems. Colloidal systems. Redox reactions. Electrolysis. Hydrogen. Metals.	5
					Descriptive Geometry Projection systems. Representation of point, line and plan. Polyhedrons. Cylinder and cone. Sphere. Intersections of geometric bodies.	5
					Materials Science and Engineering Physical properties of materials. Mechanical properties of materials. Chemical stability of materials. Corrosion resistance. Interatomic Solidification of metallic materials. The diffusion. Alloy systems. Phase balance diagrams. Fe-C alloy system. Steels. Cast iron. Heat treatments. Plastic deformation. Non-ferrous alloys. Polymers. Ceramic materials, sintered materials, composite materials with polymeric, metallic, ceramic matrix. Advanced materials.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**1**	**1**	**Sports** Repeat the main football procedures - boys - used in attack: driving the ball with the inside and outside of the foot, kicking the ball with the inside of the foot and with the kick on and off, the kick at the door, moving the ball with the right foot, throwing balls from the edge of the field, taking the foot from the move, etc. and defense: the opponent's possession of the ball from the front and from the side. Tactical actions in attack. Tactical actions in defense. Repeat the main procedures of volleyball - girls. Procedures used in the attack. Procedures used in defense. Settling in attack and defense game systems, organizing the 3 hits, combinations with passes between nearby areas. Bilateral games with reduced numbers: 3x3, 4x4. Structures and technical-tactical combinations in the form of „suveica", working in groups, in pairs or individually in order to consolidate the basic technical elements.	1
					English Production. Present Tenses. Research and Development. Past Tenses. Future Forms. Information Technology. Conditionals. Quality. Verb phrases. Health and Safety.	2
					Communication Communication techniques. Oral communication. Preparation and exposure of a presentation / speech / scientific papers. Types of interviews. Written communication. The experimental study. How to make a presentation on areas of professional competence. Data collection and interpretation, free discussion. Formulation of the research report. The scientific report.	2
				2	**Linear Algebra, Analytic and Differential Geometry** Vector spaces. Linear applications. Real Euclidean vector spaces. Free vectors. Line and plan in space. Conics on reduced equations. Quadrics on reduced equations. Curves in space. Surfaces.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**1**	**2**	**Physical Chemistry** The object of physical chemistry. Chemical Kinetics. Electrochemistry and corrosion. Galvanic cells. Chemical Thermodynamics. Thermodynamics of chemical processes.	5
					Electrotechnics Basics of electrotechnics. Electricity. Production, transport, distribution. Quality of electricity. Analysis of circuits and electrical networks. Electromagnetism. Effects of electric current. Constructive, functional and behavioral study of machines power.	3
					Drawings and Infographics Arrangement of projections. Views, sections, breaks. Dimensioning of technical drawings. Representation of threads and flanges. Indication of surface condition, marking of dimensional deviations and geometric tolerances. The assembly drawing. Non-demountable joints. Removable assemblies. Mechanical Power Transmitters. Sealing elements.	5
					Computer Programming and Programming Languages I Introduction to C Language in the Qt environment. Using widgets in Qt. Presentation of the Turbo C programming environment. Variables. Constants. Structures. Conditioning instructions. Repetitive structure for. Panels. The repetitive instruction while. Matrices. Files. Strings of characters. Functions. Pointers. Classes in C ++.	5
					Sports Resumption and consolidation of assimilated structures during the previous semester. Applying the procedures taught in variable and difficult conditions, working with the opponent and changing the current tasks. Full bilateral games in full compliance with all notions of regulation. Improving the level of specific physical training by developing combinations of aptitudes that support physical exertion. Development of reaction speed, agility, precision, dynamic balance, flexibility, spatial-temporal orientation, explosive force, dynamic segmental force, speed of movement in coordination and resistance, power in resistance regime.	1

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**1**	**2**	**English** Engineering. Specialized vocabulary and discourse situations. Grammar in focus: Active vs. Passive. Relative clauses. Automotive. Specialized vocabulary and discourse situations. Grammar in focus: Causation. Chemical. Specialized vocabulary and discourse situations. Grammar in focus: Obligation and requirements. Pharmaceutical. Specialized vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability.	2
					Materials Technology Production and technological processes. Efficiency analysis. Materials used in the construction of machines and ships. Properties and testing of materials. Elements of general metallurgy: cast iron metallurgy, steel metallurgy, metallurgy of the main non-ferrous metals. Processing of metallic materials by casting. Processing of metallic materials by plastic deformation. Welding processing of metallic materials. Processing of coated metal materials. Processing of metal materials by sintering. Unconventional processes of erosion processing. Special non-metallic materials. Shape memory materials. Nanostructured materials.	5
			2	**1**	**Manufacturing Engineering** Machinery and mechanical installations for transport. Continuous casting installations - lamination. The equipment of the heating installations of the semi-finished products. Machinery and equipment for processing. Technological equipment specific to forging, molding, extrusion plants. Technological equipment specific to heat treatment plants. Reliability and maintenance of metallurgical machinery.	5
					Materials Strength Overview. Shearing forces and bending moments. Behavior of materials. Traction/Compression of beams. Cross section properties of beams. Bending of beams. Torsion of beams having circular or annular section; torsion of rectangular cross-section bars. Methodology of dimensioning and verifying beams.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**2**	**1**	**Numerical Methods** Algorithms and computational errors. Approximation of functions by interpolation. Numerical solution of algebraic and transcendental equations. Solving systems of linear equations. Solving systems of nonlinear equations. Numerical derivation. Numerical integration. Numerical solution of ordinary equations. Numerical solution of higher order differential equations. Numerical solution of differential equations with partial derivatives.	4
					Thermo-technics Thermodynamic system. Thermodynamic balance. Status sizes. Process sizes. The postulates of thermodynamics. Temperature and pressure. The first principle of thermodynamics. Internal energy. Mechanical work. Mechanical movement work. Mechanical work. The heat. Enthalpy. Perfect gas mixtures. Simple state transformations. The second principle of thermodynamics. The entropy of perfect gases. Vapor. Wet air. Combustion of solid, liquid and gaseous fuels.	4
					Technical Analysis and Characterization of Materials Structure of materials. Sampling. Types of samples. Rules for the collection of samples. Conservation and transport of samples. X-ray diffraction structural analysis. Experimental methods for studying surfaces and interfaces. Mass spectrometry. Analysis and characterization of materials through FTIR. Structural characterization of materials by Raman spectroscopy and X-ray photoelectrons. Optical microscopy in material analysis. Electron microscopy. Atomic force microscopy. Transmission electron microscopy. Thermal characterization of materials by TGA and DSC.	4
					Computer Programming and Programming Languages II Introduction to C# Language in the Visual Studio environment. Data types in C# language. Repetitive blocks in C# language. NameSpace. Arrays. Programmatic interfaces in .Net. Using delegates. Events in C#. IO operations in .Net. Collections in .Net. String operations. Encryption using Hash. Execution of executable packages for MS Windows X, Android.	6

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**2**		**English** Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses. Research and Development. Specialized vocabulary and discourse situations. Grammar in focus: Past tenses. Information technology. Specialized vocabulary and discourse situations. Grammar in focus: Future forms. Logistics. Specialized vocabulary and discourse situations. Grammar in focus: Conditionals. Quality. Health and Safety. Specialized vocabulary and discourse situations. Grammar in focus: Verb phrases.	2
				1	**Sports** Repeat the main football procedures - boys - used in attack: driving the ball with the inside and outside of the foot, kicking the ball with the inside of the foot and with the kick on and off, the kick at the door, moving the ball with the right foot, throwing balls from the edge of the field, taking the foot from the move, etc. and defense: the opponent's possession of the ball from the front and from the side. Tactical actions in attack: demarcation, overcoming, penetration. Tactical actions in defense: marking, tying, blocking the ball, etc. Repeat the main procedures of volleyball - girls, known from previous cycles. Procedures used in the attack: trips to specific positions, two-handed pass from the top, pass over the head, lower front service and top front service. Procedures used in defense: specific positions and movements, two-handed takeover of the service and attack, blocking the net, etc. Settling in attack and defense game systems, organizing the 3 hits, combinations with passes between nearby areas. Bilateral games with reduced numbers: 3x3, 4x4. Structures and technical-tactical combinations in the form of suveica, working in groups, in pairs or individually in order to consolidate the basic technical elements.	1
				2	**Physical Metallurgy I** Introduction to materials science. Structure and organization of materials. Real structure of crystals. Physical-chemical constitution of metallic materials. Crystallization of metals. Diffusion. Phase equilibrium diagrams. The behavior of materials under mechanical stress.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**2**	**2**	**Electronics and Automation** The signal as material support of the information. Functions of electronic circuits. Primary processing of signals. Patterns of signal in time and frequency. Transducers and systems for remote measurement of electrical and non-electric quantities (tele-measures). Negative reaction in electronic circuits. Structure of a mono-variable automatic system.	3
					Environmental Protection in Industry The implications of pollutants on environmental factors. Fundamentals of gaso-dynamics and gas circulation. Equipment and installations for capturing dust from industrial gases.	3
					Fluid Mechanics Fluid statics. Basic equations of fluid mechanics. Dimensional analysis and similarity theory. Boundary layer theory. The flow through the pipes.	3
					Properties of Materials Structure and properties of materials. Elements of crystalline structure. Electronic theories of materials. Electrical properties of materials. Thermal properties of materials. Magnetic properties of materials. Methods of analysis and control. Non-destructive control of materials.	3
					Machine Parts and Mechanisms General elements underlying the design of machine parts. Transmissions through belts and chains. Friction wheel drives. Spur Gears. Axles and shafts straight. Sliding bearings. Rolling bearings. Clutches. Removable assemblies. Non-removable assemblies by welding.	4
					Theory of Plasticity and Fracture of Material Elements of the theory of plasticity. Deformation behavior of metallic materials. Thermal regime of deformation. Fundamentals in fracture of materials.	3
					Practice Activities in the Scientific Field The agglomeration sectors. The furnace sectors. The rolling mill sectors. Steelworks and technological flow at continuous casting.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**2**	**2**	**English** Engineering. Automotive. Chemical. Pharmaceutical. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Active vs. Passive. Relative clauses. Causation. Obligation and requirements. Cause and effect. Ability and inability.	2
					Sports Applying the procedures taught in variable and difficult conditions, working with the opponent and changing the current tasks. Full bilateral games in full compliance with all notions of regulation. Improving the level of specific physical training by developing combinations of aptitudes that support physical exertion. Development of reaction speed, agility, precision, dynamic balance, flexibility, spatial-temporal orientation, explosive force, dynamic segmental force, speed of movement in coordination and resistance, power in resistance regime.	1
			3	**1**	**Technological Processes for the Elaboration and Casting of Alloys** Characterization of steels for the production of castings. Theoretical basis of oxidation processes. The supply of the metal bath with oxygen and the oxidation process. Deoxidation. Desulfurization. Gas behavior. Raw materials and additions. Processes for the elaboration of steels in electric arc furnaces with basic and acid lining, in electric furnaces with induction. Particularities of steel casting in parts.	5
					Finite Element and Finite Differences Introduction. Definitions. Field of applications. Finite difference schemes. Approach with finite differences of partial derivatives. Approximation with finite differences of equations with partial parabolic derivatives. The diffusion equation. Finite differences applied to equations with partial parabolic derivatives. Wave propagation equation. Finite differences applied to equations with partial elliptic derivatives. The Laplace equation. The Poisson equation. Heat transfer in steady state and in non-steady state. Accuracy and stability of the solutions obtained by finite difference approximation of partial derivative equations. Finite differences in non-rectangular coordinates: cylindrical. spherical. Integration using finite differences.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**3**	**1**	**Virtual Instrumentation** Development of interfaces for instrumentation in RaspberyPi. Development of programs using virtual instruments (VI) in LabVIEW. Data types: vectors, clusters in LabVIEW. Controls specific to the user interface in LabView. Acquisition of signals in LabView. Development of virtual instrumentation in FactoryIO. Simulation of acquisition and automation in FactoryIO.	4
					Physical Metallurgy II Properties of materials. Structure of materials. Physical and chemical constitution of metallic materials. Crystallization of metals (Thermodynamic conditions of crystallization. Mechanisms and kinetics of crystallization. Phenomena related to solidification. Diffusion). Balance diagrams (Binary equilibrium diagrams. Balance in alloy systems. Phase law. Cooling curves under equilibrium conditions and in practical conditions. Correlation of the equilibrium diagram - physical-mechanical and technological properties. Ternary equilibrium diagrams). Plastic deformation (Mechanism of plastic deformation of monocrystals and polycrystalline metallic materials. Cold-straining and anisotropy. Recrystallization. Cold and hot plastic deformation. Fracture of metallic materials. Creep).	5
					Applied Informatics Databases with information on the physical properties of the materials. X-ray structural analysis of polycrystalline materials. Image acquisition and processing. The ImageJ programs. Basic filters. NTHSC programs and HALCON programs for manual and automatic processing and measurement.	5
					Management Introduction to management. Design of the production structure and design of industrial companies. Managerial strategies applied within the industrial enterprise. Production capacity of industrial companies. Constructive and technological preparation of industrial production. Material and organizational preparation of industrial production. Stochastic phenomena and the management process. Quality management of industrial production. Strategic management of industrial production.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**3**	**1**	**Materials Processing Technologies with Special Applications** Press forming of liquid metal. Press forming on horizontal forging machines. Radial forging. Press forming by electro-delivering under pressure. Deformation by explosion. Severe plastic deformation. Lamination of bent profiles. Rolling of multiple layers. Rolling of metal powders.	4
				2	**Fundamentals of Computer-Aided Design** Algorithms. Programming languages. Data, operators, expressions in C. Decision structure. Repetitive structures. Pictures. Vector sorting algorithms. Modularize the applications by using the functions. User defined data types. Working with files. Pointers. Classes. Use of Visual C programming environment. MFC library. Use of the QT programming environment for the C language. Use of the MATLAB environment. Programming the interfaces in MATLAB. Fundamental mathematical operations. Control structures in MATLAB. Numerical analysis with MATLAB. Charts. Artificial intelligence elements in MATLAB.	4
					Modeling and Simulation in Materials Engineering I The purpose and importance of mathematical modeling in industrial processes. Classification of types of mathematical models. Parameters of industrial processes. Methodology of analytical mathematical modeling. Functional characterization of systems. Function and transfer matrix. Experimental mathematical modeling (identification).	4
					Technological Processes for Plastic Deformation of Materials Deformation behavior of metallic materials. Thermal regime of deformation. Rolling of materials. Lamination technological schemes. The raw material and its preparation for rolling. Pulling and wire drawing. The peculiarities of pulling and wire drawing. Extrusion. Tensions and deformations in the extrusion process. Free forging. Free forging operations. Delivering under pressure. Stretching. Drilling. Press forming. Basic technological equipment for press forming. Press forming technology lines. Elements regarding the preparation of molds for press forming. The technological form of the press forming parts. Conditions of execution and exploitation of molds.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**3**	**2**	**Technologies for Materials Processing and Sintered Products** Obtaining powders. Properties of powders. Physical properties. Chemical properties. Technological properties. Preparation of powder mixtures. Addition components. Dosage of mixtures. Homogenization of mixtures. Formation of powder products. Cold pressing in steel molds. Hot pressing; isostatic; step by step. Lamination; extrusion of sinter powder. Molding by injection, by injection, by free pouring into molds, by vibration. Electromagnetic field formation. Choosing the training process. Sintering of powder products.	4
					Fundamentals of Experimental Research General considerations. Theoretical research and applied research. Experimental research. Research methods. Stages of the research process. The profile of the scientific researcher: types of researchers, research motivation, research education. General methodology of scientific research. Planning and scheduling experimental research. Quantitative research in engineering sciences. The ethics of scientific research. Bibliographic references, methods of use and citation in scientific research.	3
					Practice Activities in a Specific Scientific Field Use of the driving software of the agglomeration machines (Win CC + Step 7). Programming of Siemens PLCs for the pressure regulation system at the furnace neck. Programming of Siemens PLCs for the temperature control system in bell ovens in Cold Roll Laminator. Calculator simulator reductions in the vertical and horizontal boxes in the thickening train. Artificial view algorithms for industrial video-inspection system - identification of 2D form defects. Image identification of metallographic structures using artificial sighting techniques. Optimization of the end-of-lamination temperature according to the chemical composition of the material, the applied reduction scheme and the required mechanical characteristics. Computer-assisted management of the rolling process. Computer aided manufacturing systems - optimization of technological parameters.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**3**	**2**	**Measurement Technique and Data Acquisition** History of data acquisition. Evolution of technological systems. The utility of data in decision making. Sensors, measuring systems and recording systems. Database. Technological processes. Characterization. Variables and parameters. Use of exploratory statistics on process evolution. Correction in technological processes. Data acquisition systems. Data acquisition and control systems. Physical and chemical phenomena. Sensors, adapters, transducers, signals, examples. Structures. Coupling (interface) of data acquisition systems.	4
					Design of the Mold and of the Devices for Obtaining the Mold Prototype piece. The concept of rapid prototyping. CAD model. 3D scanning techniques. Deposition of molten material. Manufacture of laminated parts. Selective laser sintering. 3D printing. Rapid prototyping by material sampling - milling. Selective laser sintering. CNC automatic machining machines. CNC programming language. Use of CAD model for manufacturing. Process planning. CAM software systems. Use of the CAD model for the realization of the CNC program.	3
			4	**1**	**Modeling and Simulation in Materials Engineering II** Use of the MATLAB software package in modeling. The mathematical model of optimization problems. Optimizations on open sets. Optimizations with equality restrictions. Elements of convex analysis. Optimal conditions. Numerical methods for solving unrestricted optimization problems.	4
					Automation of Technological Processes for Processing by Deformation of Materials General notions. Automatic adjustment systems. The main components of the automatic adjustment systems. The operating modes of the automatic systems and their characteristics. Automatic measurement of the main technological variables: temperature, fluid flow, pressure, humidity of air and gases, chemical composition, angular position, speed of rotation, thickness of sheets and strips, carbon potential and pour point. Extreme adjustment of the parameters of metallurgical installations.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**4**	**1**	**Technologies for Thermal and Thermochemical Processing of Materials** Introduction to the design activity in the field of technology of thermal and thermochemical treatments Technical documentation of the technological process of heat treatment. Design of thermal and thermochemical treatment technologies on product groups. Heat treatment technologies applied to semi-finished products. Technology of heat treatments applied to steel pipes. Technologies of thermal and thermochemical treatment applied to parts and tools. Criteria for establishing the technology. Quality control of heat-treated products. The objectives of the control activity, methods and conditions specific to the control of the thermal and thermochemical treatment technologies. Control through structure analysis. Control by mechanical tests. Modeling and optimization of thermal and thermochemical treatment processes. Optimization techniques specific to thermal and thermochemical treatment processes.	5
					Composite Materials Processing Technologies Composites with polymers. Methods of obtaining and processing. Advanced ceramic materials. Definition, classification. Functions and uses (with an example).	5
					Ceramics Materials Processing Technologies Ceramic materials. General. Classification. Ceramic materials - processing methods. Advanced ceramic materials used in transport. Advanced ceramic materials used in the cutting process. Advanced ceramic materials used in electronics. Advanced ceramic materials for nuclear techniques. Ceramic and refractory materials. Mineral binders. Advanced ceramic materials with electromagnetic properties. Advanced ceramic materials with tribological properties. Refractory ceramic materials.	4
					Polymer Materials Processing Technologies Processes of forming polymeric products. Compression molding. Transfer molding. Injection molding. The formation by extrusion. Blow molding. Modeling of processes for forming polymeric materials.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**4**	**1**	**Modeling the processing of materials in liquid state** The advantages of mathematical modeling. Linear or nonlinear models. Deterministic or probabilistic models. Static or dynamic models. Discrete or continuous models. Parameters of industrial processes. Input sizes, output sizes, status sizes. The methodology of analytical mathematical modeling. Functional characterization of systems.	3
				2	**Composite Materials Processing Technologies** Functional ceramic composites. Obtaining metallic composites by direct solidification. Methods for obtaining metallic powders. Sintering of powder tablets.	3
					Biomaterials Processing Technologies Behavior on plastic deformation of biocompatible metallic materials. Design of technologies for processing metal biomaterials. Modeling of corrosion processes of metallic biomaterials. Polymeric biomaterials. Identification of methods for modeling the degradation processes of biocompatible polymers. Design of technologies for obtaining and processing ceramic biomaterials. Analysis and selection of methods for designing technologies for obtaining and processing composite biomaterials. Thermal/thermochemical/thermo-mechanical processing of bio alloys used in implantology. Unconventional processing methods for obtaining nanostructured biomaterials.	3
					Optimization of Technological Processes for the Elaboration and Processing of Materials Classification of types of mathematical models. Parameters of industrial processes. Methodology of analytical mathematical modeling. Functional characterization of systems. Function and transfer matrix. Experimental mathematical modeling (identification). Use of the MATLAB software package in modeling. The mathematical model of optimization problems. Optimizations on open sets. Optimizations with equality restrictions. Elements of convex analysis. Optimal conditions. Numerical methods for solving unrestricted optimization problems.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**4**	**2**	**Nanomaterials and Nanotechnologies** Organization of nanotechnology. Nanostructured materials. Analysis and control tools. Functional nanodevices. Nanostructured materials. Nanomaterials: nanocrystalline materials; fullerenes; nanotubes; nanofibers and nanofibers; semiconductor quantum particles; organic hybrid architectures; functional nanostructures. Dispersions and coatings. Materials with large surface area. Massive nanostructured materials. Manufacturing techniques. Physical methods. Gaseous phase synthesis. Methods of wet chemistry. Modeling processes for obtaining nanomaterials. Design of technologies for the manufacture of nanomaterials (nanowires, nanoparticles, functional nanostructured films). Applications of nanostructured materials. Optical. Magnetic. Thermal. Mechanical. Energy. Biomedical. Environmental protection.	4
					Completion of Graduation Paper	4
					Practical Training for the Graduation Paper	4
					Modeling the processing of materials in liquid state Input-output models. Input-state-output models. Function and transfer matrix. Establishing the transfer function for equivalent systems. Experimental mathematical modeling (identification). Process data acquisition systems. Offline modeling. Online modeling. Use of the MATLAB software package in modeling. Presentation of the MATLAB interface. Instructions and control functions. Numerical calculation with MATLAB. Graphics in MATLAB. Creating interactive graphical interfaces. The mathematical model of optimization problems. Optimizations on open sets. Optimizations with equality restrictions. Elements of convex analysis. Optimal conditions. Numerical methods for solving unrestricted optimization problems.	3

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**BA**	**Applied Informatics in Materials Engineering**	**4**	**2**	**Modeling the processing of materials in solid state** Assisted design objectives. General aspects regarding the assisted design in CATIA V5. CATIA Sketcher module. Sketching tools. Tools for constraint. Part Design module. Tools for three-dimensional modeling. Tools for editing three-dimensional models. CATIA Drafting module. Interactive Drafting sub-module. The Generative Drafting sub-module. Basic concepts in finite element analysis method.	3
					Advanced Materials Processing Technologies Considerations regarding the structure of materials. Structure and organization of solids. Alloys and alloy systems. Otherwise ferrous. Hard sintered alloys. Structure, characteristics and use of non-ferrous alloys. Plastics, properties, characteristics and uses. Ceramic materials, structure, properties and method of production. Amorphous metallic materials, characterization, properties, way of obtaining, uses. Composite materials, properties, characteristics, method of production. Structural and functional materials. Characterization, properties and uses. Hybrid materials. New and advanced materials with special destinations.	3
HEAT SYSTEMS AND EQUIPMENTS AND ENVIRONMENTAL PROTECTION - MA						
Mechanical Engineering	**MA**	**Heat Systems and Equipments and Environmental Protection**	**1**	**1**	**Advanced CAD** Introduction to CATIA assisted design. Generation of sketch - Sketcher module. Three-dimensional generation of solids - Part Design module. Generation of execution drawings - Drafting module.	4
					Numerical Modeling of Thermal-Gas-Dynamic Processes General notions regarding numerical modeling in fluid dynamics and heat transfer. Equations that govern fluid dynamics and the heat transfer phenomena. Elementary numerical modeling techniques. Fundamental aspects of numerical meshing. General study on boundary conditions. Analysis of numerical modeling methods: preprocessing, problem solving, post-processing. Generation of mesh networks. The boundary conditions and initial conditions. Modeling of conductive, convective and periodically heat transfer. Modeling of heat transfer by radiation. Post-processing and analysis of the convergence of the solution.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Heat Systems and Equipments and Environmental Protection**	**1**	**1**	**Installations and Equipment for Ensuring Air Quality** Climatic and physiological bases. Wet air. Air treatment procedures. Systems for civil buildings. Industrial ventilation. Component elements of the installations. Calculation and dimensioning of installations. Attenuation of the noises and vibrations produced by the ventilation and air conditioning systems. Ventilation and air conditioning solutions depending on the destination of the rooms.	6
					Advanced Thermodynamics The methods of thermodynamics. Thermodynamic potentials. Characteristic functions. Heat exergy. Mass exergy in closed and open thermodynamic system. The combined application of principles I and II of thermodynamics. The third principle of thermodynamics. Thermodynamics of compressible fluids with high speeds. Carnot cycle with external irreversibility. Thermodynamics in finite time.	4
					Ethics and Academic Integrity Academic responsibilities and rights. Intellectual property and copyright. Lack of academic integrity. Plagiarism. Forms of plagiarism. Other forms of lack of academic honesty. Identification of plagiarism. Consequences and sanctions. The social effects of the lack of academic integrity.	1
					Design Practice I Choosing the research topic. Bibliographic documentation. Presentation of the current state of knowledge in the field of theoretical modeling, in the technological field and in the field of experimental modeling of the research topic. Establishing scientific research directions. Report of research and design practice.	10
				2	**Advanced Elements of Heat and Mass Transfer** Introduction. Sizes characteristic of heat transfer. Elementary modes of heat transfer. Thermal conduction. Modeling of thermal conduction. Thermal convection. Modeling elements in free convection. Modeling elements in forced convection. Thermal convection with change of fluid aggregation state. Numerical modeling of heat transfer taking into account conduction and convection. Numerical modeling of the total heat transfer taking into account convection and radiation. Heat exchangers. Mass transfer.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Heat Systems and Equipments and Environmental Protection**	**1**	**2**	**Technologies for Environmental Treatment** Equipment and installations for wastewater treatment. Equipment and installations for phase separation. Methods and equipment for biological treatment. Equipment for water oxygenation.	4
					Impact of Refrigeration Installations on the Environment Defining the processes that take place in refrigeration installations with potential for negative action on the environment. The classification of refrigerants according to the degree of impact on the environment. Refrigeration installations with ecological refrigerants, for obtaining average negative temperatures. Possibilities to improve the conditions imposed on the environmental impact of the refrigeration systems in operation.	4
					Technologies of Emissions Reduction in Transports General considerations on the pollution of the environment by internal combustion engines used in transport. Pollutant emissions from engines used in transport. Technologies for reducing polluting emissions of engines used in transport. Methods of measuring the pollutant emissions produced by the engines used in transport. The noise pollution produced by the engines used in transport. Reduction of pollutant emissions produced by engines used in transport.	4
					Energy and Environment Policies Environmental policy of the European Union. Strategies of environmental policy. Energy management and its purpose. Implementation of an energy management program. Energy audit. Management of environmental systems.	4
					Design Practice II Analysis and selection of theoretical study methods, technological research methods and experimental modeling methods applicable in the area of the research topic. Analysis of the capabilities of numerical investigation, technological research capabilities and experimental investigation capabilities at the „Dunarea de Jos" University in Galati, in the field of research topic. Report of research and design practice.	10

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Heat Systems and Equipments and Environmental Protection**	**2**	**1**	**Energy Conservation Technologies** Need for energy. Energy sources. Energy policies. Methods of energy analysis. Residual heat recovery. Integration of heating and cooling systems. Fuel Cells. Cogeneration and trigeneration systems. Energy storage.	4
					Non-Polluting Propulsion Systems Non-polluting propulsion systems. General objectives and design specifications for electric and hybrid vehicles. Accumulators used on electric and hybrid vehicles. Comparison of current hybrid electric vehicles. Electric motors used for the propulsion of electric and hybrid electric vehicles.	4
					Technologies and Equipment to Reduce Emissions in Energy Industry The impact of the operation of the thermoelectric power stations on the environment. Equipment for reducing solid particulate emissions. Equipment for reducing sulfur oxide emissions. Installations for reducing nitrogen oxide emissions. Installation for reducing the emission of carbon oxides. Equipment for simultaneous reduction of pollutant emissions.	4
					Research Practice I Theoretical modeling of the research topic. Realization of the theoretical model. Theoretical results. Numerical modeling of the research topic. Realization of the numerical model. Numerical results. Making experimental determinations. Analysis and comparison of theoretical and experimental results. Report of research and design practice.	10
					Renewable Energy Sources Introduction. Solar energy. The characteristics of solar energy. Thermal analysis of solar collectors. Biomass. Biomass resources. Potential and availability. Conversion of biomass into energy. Wind energy. Hydraulic energy. Geothermal energy.	4
					Environmental Impact Assessment The need to evaluate the ecological impact. Theoretical aspects of ecological impact assessment. Components and stages of impact studies. Indicators of impact studies. Procedure for authorizing activities with environmental impact.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Heat Systems and Equipments and Environmental Protection**	**2**	**2**	**Research Practice II** Comparison of theoretical, numerical and / or experimental results. Highlighting the innovative solutions applied in theoretical, numerical, technological and / or experimental modeling. Highlighting the optimal solutions applied in solving the research topic. The conclusions of theoretical, numerical, technological and / or experimental research. Report of research and design practice.	10
					Elaboration of Dissertation Thesis The dissertation paper will include the following main chapters: formulation of the research theme; current state of knowledge in the field of research; presentation of the theoretical, numerical, experimental, technological study methods applied for the development of the research theme; realization of the theoretical, numerical, experimental, technological model within the research theme; the conclusions of theoretical, numerical, experimental, technological research; bibliographical references.	20
MODELING AND SIMULATION IN MECHANICAL ENGINEERING - MA						
Mechanical Engineering	**MA**	**Modeling and Simulation in Mechanical Engineering**	**1**	**1**	**Advanced Methods of Finite Element Analysis** Recapitulation. Linear-elastic calculation. Non-linear geometric calculation. Non-linear physical calculation. Dynamic calculation. Structural optimization.	5
					Solid Modeling Introduction. 3D modeling of castings. 3D modeling of sheet metal parts. 3D modeling of assemblies. Development of 3D models of welded assemblies. 3D design of mechanical structures from profiles. Specific procedures for 3D modeling of plastic parts.	4
					Techniques of Modeling and Simulation of Thermo-Mechanical and Hydrodynamic Phenomena Fundamental equations of the dynamics of mechanical systems. Elements of continuous environment mechanics. Elements of thermoelasticity. Calculation of thermal loads in machines and installations. Calculation of gas temperature and instantaneous coefficient of heat transfer from gases to walls. Thermal stress in turbines and boilers.	6

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Modeling and Simulation in Mechanical Engineering**	**1**	**1**	**Modeling Using CATIA** Introduction to CATIA assisted design. Generation of sketch - Sketcher module. Three-dimensional generation of solids - Part Design module. Generation of execution drawings - Drafting module. The assembly drawing - the Assembly Design module.	4
					Ethics and Academic Integrity Academic responsibilities and rights. Intellectual property and copyright. Lack of academic integrity. Plagiarism. Forms of plagiarism. Other forms of lack of academic honesty. Identification of plagiarism. Consequences and sanctions. The social effects of the lack of academic integrity.	1
					Research and Design Practice Choosing the research topic. Bibliographic documentation. Presentation of the current state of knowledge in the field of theoretical modeling, in the technological field and in the field of experimental modeling of the research topic. Establishing scientific research directions. Report of research and design practice.	10
				2	**Complex Modeling in Vibration Mechanics** Mechanical vibration - general considerations. The vibrations of the elastic linear systems with a degree of freedom. Vibrations of elastic linear systems with finite number of degrees of freedom. Vibrations of continuous systems. Approximate methods in vibration study. Vibration analysis of linear gyroscopic systems. Vibration analysis of branched shaft systems using specific finite element method. Small oscillations of a rigid on elastic suspension having a built-in rotor. Small oscillations of a mechanical system with respect to a landmark in uniform rotation. Analysis of the behavior of metallic structures in the dynamic action produced by earthquakes.	4
					Modeling and Simulation of Processes CATIA Generative Sheetmetal Design module. CATIA Weld Design module. CATIA Generative Structural Analysis module. CATIA Knowledge Advisor module. The CATIA DMU Kinematics module.	6

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Modeling and Simulation in Mechanical Engineering**	**1**	**2**	**Elements of Standardization** General notions. Guiding principles in standardization. International standardization organizations. The Standardization Association of Romania (ASRO). The European standardization system. Standardization strategy as a factor of economic growth. New fields of standardization in mechanical engineering. Infrastructure for a global market. Application and verification of application of standards. Quality audit. Ethics in the development and use of standards.	6
					Modeling of Reliability System, technical system, tribosystem, tribomodel, wear. Elements of mathematical analysis, probability theory and statistics with application in reliability problems. Reliability indicators and its distribution laws. Weibull distribution. Estimation of the theoretical distribution model. Failure of mechanical systems. Modeling the reliability of the systems. Modeling the sustainability of systems. Reliability tests.	4
					Research and Design Practice Analysis and selection of theoretical study methods, technological research methods and experimental modeling methods applicable in the area of the research topic. Analysis of the capabilities of numerical investigation, technological research capabilities and experimental investigation capabilities at the „Dunarea de Jos" University in Galati, in the field of research topic. Report of research and design practice.	10
			2	**1**	**Simulation of Mechanical Systems** Introduction to the technique of manipulating and simulating mobile mechanical structures. Virtual space. Creating kinematic couplings. Creating, editing and manipulating cinematic elements. Simulation interface. Running simulations. Analysis of the trajectory of the different component parts of the assembly. Methods of optimization and testing of the functional parameters of the model and the assembly. Import and export of files and data. How to make the exploded presentation of an assembly and the animation of the assembly of the component parts.	6

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Modeling and Simulation in Mechanical Engineering**	**2**	**1**	**Advanced Methods of Designing Mechanical Systems** Introductory notions specific to parametric design. Parametric families of parts. The study of parametric design. Parametric analysis of the design constraints in order to improve the functional characteristics of the components of an assembly. Methods of optimization and testing of the functional parameters of the model and the assembly. ICopy technology. ILogic technology. IDrop technology. Dynamic simulation of the assembly.	4
					CAM Basics in CATIA CATIA Prismatic Machining module. CATIA Lathe Machining module. Module interface. Setting working parameters. Specific working tools. Generation of the numeric control machine program code. Program verification and simulation.	4
					Design of Mechanical Systems Based on Sustainability Criteria Modeling of the damage processes. Analysis of the durability of the construction elements subjected to damage processes. Cumulating of degradation. CAD methods of design for durability - evolution of cracks, defects allowed, limited durability.	6
					Research and Design Practice Theoretical modeling of the research topic. Realization of the theoretical model. Theoretical results. Numerical modeling of the research topic. Realization of the numerical model. Numerical results. Making experimental determinations. Analysis and comparison of theoretical and experimental results. Report of research and design practice.	10
				2	**Completion of the Dissertation Paper** The dissertation paper will include the following main chapters: formulation of the research theme; presentation of the current state of knowledge in the field of research; presentation of the theoretical, numerical, experimental, technological study methods applied for the development of the research theme; realization of the theoretical, numerical, experimental, technological model within the research theme; case studies corresponding to the dissertation theme; the conclusions of research; bibliographical references.	20

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**MA**	**Modeling and Simulation in Mechanical Engineering**	**2**	**2**	**Methodology of Scientific Research** Comparison of theoretical, numerical and / or experimental results. Highlighting the innovative solutions applied in theoretical, numerical, technological and / or experimental modeling. Highlighting the optimal solutions applied in solving the research topic. The conclusions of theoretical, numerical, technological and / or experimental research. Report of research and design practice.	10
QUALITY MANAGEMENT IN INDUSTRIAL ENGINEERING - MA						
Industrial Engineering	**MA**	**Quality Management in Industrial Engineering**	**1**	**1**	**Quality Policies and Strategies** The concept of quality. Quality tools. Strategic management. Human resources management. Carrying out the quality function. International quality standards: ISO 9000, ISO 9001, ISO TR 10013: 2003.	5
					Total Quality Management Quality in the traditional model. Total quality. Tools and techniques for improving quality. Quality audit. Quality certification. Quality management documents.	5
					Computerized Measuring Systems Reverse engineering methods and techniques. Data collection and surface identification. Devices and programs for computer-assisted measurement. Choosing the optimal computerized measurement system. Coordinate measuring machines. Measuring devices of the profile projector type. Video measuring devices. Optical measurement systems.	4
					Environmental Audit Audit concept. Environmental audit. The main environmental audit groups. The process of environmental audit. General notions regarding environmental pollution. The European System of Environmental Management and Audit - EMAS. Audit of environmental management systems. Audit of environmental impact assessment. Pollution prevention audit. Case studies on pollution prevention.	5
					Research Project I The design activities are partially supervised. These are carried out in the teaching and research laboratories of the department, under the guidance of a senior lecturer in the master's degree program.	10

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**MA**	**Quality Management in Industrial Engineering**	**1**	**1**	**Ethics and Academic Integrity** Academic responsibilities and rights. Intellectual property and copyright. Lack of academic integrity. Plagiarism. Forms of plagiarism. Other forms of lack of academic honesty. Identification of plagiarism. Consequences and sanctions. The social effects of the lack of academic integrity.	1
				2	**Innovation Management** Basics of management knowledge. Research-Development and Innovation. The innovation processes. Quality Function Deployment (QFD). Innovation in Romania and the European Union. Innovation management systems. Intellectual property. Copyright. The technology transfer system and tools. Creativity in the context of innovation management. Sources of innovation.	5
					Quality Systems Assurance and Certification Development of standards regarding quality management systems according to ISO 9001. Certification of quality management systems according to ISO 9001. The context of the organization. Leadership and commitment. Planning. Support. Operation. Performance evaluation. Continuous improvement of the effectiveness of the quality management system. The stages of the certification of the quality management system.	5
					Benchmarking Introduction. Benefits of benchmarking. Presentation of the AHP and ANP methods. Identification of comparison companies. Methods of data collection. Determining the current competitive difference. Design of future levels of performance. Communicating Benchmarking findings. Establishing functional goals. Development of action plans. Implementation of specific actions and monitoring progress. Recalibration. Beyond Benchmarking.	5
					Sustainable Development Evolution of the concept of sustainable development. The challenges. Sustainable development in the context of the European Union. Current sustainable development practices. Sustainable development in developing countries. Use of market mechanisms to stimulate sustainable development.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	MA	Quality Management in Industrial Engineering	1	2	**Research Project II** The design activities are partially supervised. These are carried out in the teaching and research laboratories of the department, under the guidance of a senior lecturer in the master's degree program.	10
			2	1	**Interactive Design and Processing of Experimental Data** Introduction to statistics in engineering. Processing of statistical data specific to engineering. Error assessment. Notions of probability theory. Laws of distribution. Statistical hypotheses. Verification of statistical hypotheses. Statistical control of processes. Experiment planning. Taguchi method. Signal-to-noise analysis.	5
					Optimization of Manufacturing Processes Optimization concept. Optimization stages. Construction of the optimization processing model. Sources of error in using the model for the decision factor. Basic concepts in model construction. The general mathematical model of an optimization problem. Types of optimization problems. The dimension of optimization problems. Methods for solving optimization problems.	5
					Research Project III The design activities are partially supervised. These are carried out in the teaching and research laboratories of the department, under the guidance of a senior lecturer in the master's degree program.	10
					Product Development Management Purpose and objectives of the course in product development management. Development stages of a product. The Product Lifecycle Management (PLM) concept. PLM implementation models. PLM components that underlying the development of a new product. Benefits of PLM adoption.	5
					Non-Destructive Control Methods Defects and control methods. Control methods specific to welded joints. Control with penetrating liquids. Magnetic control. Ultrasonic control. Control with penetrating radiation. Tightness control.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**MA**	**Quality Management in Industrial Engineering**	**2**	**2**	**Research-Design Practice** Specific researches on modeling, simulation design and optimization of material and information flows. Specific researches to evaluate the performances of the industrial flow of production from an economic point of view. Researches regarding the use of the necessary tools to ensure the quality of the production processes in the field of industrial engineering.	15
					Elaboration of Dissertation Thesis	15
DESIGN AND SIMULATION IN WELDING ENGINEERING - MA						
Industrial Engineering	**MA**	**Design and Simulation in Welding Engineering**	**1**	**1**	**Statistical Methods Applied in Engineering** Introductory statistics in engineering. Processing of statistical data specific to engineering. Descriptive statistics. Typical selection sizes. Notions of probability theory. Elements of probability theory. Design of Experiments-DoE. Multidimensional optimization of process parameters in engineering experiences. Methods of organizational diagnosis of data obtained during welding processes.	4
					CAD Simulation in Welding Engineering The AutoCAD interfaces. 2D drawing, editing and simulation tools. Dimensioning of 2D drawings. Technological dimensions specific to welding engineering. Parametric dimensioning. Printing, exporting, publishing AutoCAD projects. Drawing primitive objects and manipulating them in 3D space. Automatically obtain projections / sections from the 3D model. Adaptive design and simulation of welded structures.	5
					Welded Ship Structures Component elements of some types of ships. Notions about the shape of the ship. Types of ships. Ship construction. Loads acting on the ship. Maneuvering and lifting systems. Tools and equipment used to assemble the ship. Assembly and welding of prefabricated elements. The technology of assembly and welding of the block sections and the body of the ship. Methods of assembling and welding the body of the ship on the dock.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**MA**	**Design and Simulation in Welding Engineering**	**1**	**1**	**Design and Certification of Welding Procedures Specification** Coordination of welding and welding operations according to standard EN 719. Qualification of welders and welding operators according to current European standards. Specification and qualification of welding procedures according to SR EN ISO 15614. Welding procedures in industry. Technical requirements regarding the authorization of the welders and the approval of the welding procedures used for the execution of the works at the mechanical installations under pressure, at the lifting installations and in the naval field.	6
					Research Project I Elaboration of a research topic in welding engineering, customized for each student, according to the topic of the dissertation work and the coordinating didactic framework: elaboration of a bibliographic study oriented to the approached topic; carrying out a bibliographic synthesis, highlighting the characteristic elements of the theme addressed; designing an experimental program within the theme elaborated with the highlighting of the personal contributions obtained from the research activity; elaboration of the conclusions resulting from the research activity undertaken; writing a scientific report.	10
				2	**Ethics and Academic Integrity** Academic responsibilities and rights. Intellectual property and copyright. Lack of academic integrity. Plagiarism. Forms of plagiarism. Other forms of lack of academic honesty. Identification of plagiarism. Consequences and sanctions. The social effects of the lack of academic integrity.	1
					Visualization and Monitoring Systems of Welding Processes Modern welding procedures in a protective gas environment. Dynamic characteristics of modern welding sources. Solutions and systems for visualizing the electric arc. Sensors and methods for monitoring welding. Acquisition and processing of signals from the welding arc. Virtual instrumentation. Data acquisition systems and virtual programming in LabView. Systems for measuring, visualizing and dimensional control of welded structures, using systems based on 3D digitization. Techniques and methods of artificial intelligence.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**MA**	**Design and Simulation in Welding Engineering**	**1**	**2**	**Design of Robotic Welding Systems** Types of robots and industrial applications. Current trends and perspectives in robotic welding. Electric arc welding systems. Kinematics of industrial robots for welding. Dynamics of industrial robots for welding. Drive systems of industrial robots for welding. The integrated system. Functions of the management system. Programming languages. Elements of programming and simulation of industrial robots in integrated industrial applications. Adaptive programming of industrial robots for welding.	6
					Research Project II Elaboration of a research topic in welding engineering, customized for each student, according to the topic of the dissertation work and the coordinating didactic framework: elaboration of a bibliographic study oriented to the approached topic; carrying out a bibliographic synthesis, highlighting the characteristic elements of the theme addressed; designing an experimental program within the theme elaborated with the highlighting of the personal contributions obtained from the research activity; elaboration of the conclusions resulting from the research activity undertaken; writing a scientific report.	10
					Unconventional Pressure Welding Technologies Embossed welding. Welding in line. Electrical welding between surfaces. Welding with capacitors. Welding in high frequency currents. Electric arc welding. Welding with turning electric arc. Friction welding. Cold welding. Ultrasonic welding. Explosion welding. Diffusion welding. Process parameters. Industrial applications.	4
					Characterization of Welded Joints Identification of methods and techniques for mechanical and metallurgical characterization of welded joints. The thermal effects generated by the welding process and their influence on the behavior of the materials. Estimation of the chemical composition of welds. Estimating the structure of welded joints. Mechanical and metallurgical characterization of welded joints. Case studies: characterization of welded joints in the shipping industry and gas transportation.	6

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**MA**	**Design and Simulation in Welding Engineering**	**2**	**1**	**Modelling and Simulation of Welding Processes** The analytical model of the thermal transfer by conduction, by convection and by radiation in the welding processes. General equations for thermal field analysis. The mathematical model for estimating the areas of participation in the welding of the basic materials. The mathematical model to estimate the chemical composition of the weld at the joining of materials used in welded constructions. Numerical modeling and temperature distribution analysis. Simulation of the welding process of the materials used in welded constructions.	6
					Design of Complex Welded Structures Steel metal constructions and fields of use. Jointing and clamping techniques according to EUROCODE 3 rules. Calculation elements in the design of welded structures. Elements of fatigue calculation of welded structures. Calculation of stresses and strains in welded structures caused by the welding process. Design and calculation of elements of welded structures. Design of the metal columns and calculation of the buckling. Design and calculation of master pipelines.	6
					Research Project III Elaboration of a research topic in welding engineering, according to the topic of the dissertation work: elaboration of a bibliographic study oriented to the approached topic; carrying out a bibliographic synthesis, highlighting the characteristic elements of the theme addressed; designing an experimental program within the theme elaborated with the highlighting of the personal contributions obtained from the research activity; elaboration of the conclusions resulting from the research activity undertaken; writing a scientific report.	10
					Ecotechnologies of Welding The potential for risk at welding. Gases resulting from welding operations. The metallic constituents of the smoke resulting from welding. Elaboration of tubular wires with low smoke emissions. Determination of pollutants at mechanized welding MAG. SEM and EDX analyzes of the microparticles resulted in the MAG mechanized welding. MAG welding with ordinary and environmentally friendly tubular wires on flat ceramic support.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Industrial Engineering	**MA**	**Design and Simulation in Welding Engineering**	**2**	**1**	**Management of Research, Development and Innovation** Terms and definitions specific to the field of Research-Development-Innovation (RDI). Research policies and strategies. Human resources management from research. Evaluation of performance in research. Management of the implementation of the RDI project. Quality management of RDI projects. Financial management of Research-Development-Innovation projects. Risk management.	4
				2	**Research-Design Practice** Elaboration of a research topic in welding engineering, according to the topic of the dissertation work: elaboration of a bibliographic study oriented to the approached topic; carrying out a bibliographic synthesis, highlighting the characteristic elements of the theme addressed; designing an experimental program within the theme elaborated with the highlighting of the personal contributions obtained from the research activity; elaboration of the conclusions resulting from the research activity undertaken; writing a scientific report.	15
					Elaboration of Dissertation Thesis Establishing the content of the dissertation paper specific to the master's degree program. Planning of activities. Elaboration of the current state of research. Research proposed in the activity plan. Processing of data / results obtained in the research plan. Analysis and interpretation of the results obtained in the research plan. Writing the dissertation thesis. Elaboration of the presentation of the dissertation thesis.	15
ADVANCED MATERIALS AND INNOVATIVE TECHNOLOGIES - MA						
Materials Engineering	**MA**	**Advanced Materials and Innovative Technologies**	**1**	**1**	**Advanced Methods of Material Investigation** General classification of methods of material investigation. Choice of investigation methods. Scanning Electron Microscopy (SEM). Transmission electron microscopy (TEM). Scanning Auger Microscopy (SAM). X-ray photoelectron spectroscopy (XPS). Ultraviolet photoelectron spectroscopy (UPS). Mass spectrometry. Rutherford reflection spectroscopy (RBS). Elastic Recoil Detection Analysis (ERDA). Proton-induced X-ray emission (PIXE). Morphological analysis of surfaces. Thermal analysis. Analysis of very thin films.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**MA**	**Advanced Materials and Innovative Technologies**	**1**	**1**	**Structural Transformations in Crystalline Materials** Structural transformations that occur at the crystallization of materials. Diffusion in crystalline materials. Solid state transformations when heating and cooling steels. Structural transformations and modification of properties in plastic deformation and recrystallization processes. Structural transformations in alloy steels. Hardening by dispersion with hard, thermostable and / or thermoreactive phases. Thermodynamics of mass transfer processes at the dispersed phase / matrix interface. Structural transformations to materials with shape memory.	4
					Materials for Renewable Energy Sources Materials for the conversion of solar energy into electricity. Materials for solar thermal panels. Materials for combustion cells and for electric batteries. Dielectric and ferroelectric materials. Magnetic materials. Conductive and superconducting materials. Energetic materials with applications in the military field.	4
					Design, Modeling and Simulation of Processing Technologies of Advanced Materials The purpose and importance of mathematical modeling in industrial processes. Classification of types of mathematical models. Parameters of industrial processes. Methodology of analytical mathematical modeling. Methods of characterization of systems (processes). Function and transfer matrix. Experimental mathematical modeling (identification). Creating interactive graphical interfaces. Simulation of industrial processes.	7
					Research-Design Practice Choosing the research topic. Bibliographic documentation. Presentation of the current state of knowledge in the field of theoretical modeling of the research topic. Presentation of the current state of knowledge in the technological field of the research topic. Presentation of the current state of knowledge in the field of experimental modeling of the research topic. Establishing scientific research directions (theoretical, numerical, technological and / or experimental) in the research topic. Report of research and design practice.	10

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**MA**	**Advanced Materials and Innovative Technologies**	**1**	**1**	**Ethics and Academic Integrity** Plagiarism. Ethical issues of research and publication. Forms of plagiarism. Corruption - concept, prevention, combating. Professional ethical codes. Vulnerability and risk in school and university. Ethical issues and the internet.	1
				2	**Research and Design Practice** Analysis and selection of theoretical study, technological research and experimental modeling methods applicable in the area of the research topic. Analysis of the capabilities of numerical investigation, technological research and experimental research at the „Dunarea de Jos" University of Galati, in the field of research topic. Report of research and design practice.	10
					Technologies for Obtaining Micro- and Nanostructured Materials Introduction to the field of nanomaterials. Classification of nanomaterials. Synthesis of nanomaterials. Theoretical considerations on the advanced finishing of the structure of the metallic materials by severe plastic deformation. Severe plastic deformation by HPT method. Theoretical principles of granulation finishing by pressing through a constant section angular channel - ECAP. Theoretical principles of granulation finishing by severe plastic deformation using repeated lamination in the package - ARB. Severe plastic deformation of hard deformable materials. HSHPT method.	4
					Manufacture of Thin Films Multifunctional thin films. Methods of manufacturing thin films: physical methods of vapor phase deposition, chemical methods of vapor phase deposition, chemical methods of solution deposition. Methods for characterizing thin films. Types of multifunctional thin films.	6
					Advanced Composites and Sintered Materials Advanced methods for obtaining metallic powders. Powder sizing. Properties of superfine powders. Advanced processes for forming powder products. Sintering of powder products. Processes for obtaining advanced composite materials by powder metallurgy. Characterization of sintered products.	6

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**MA**	**Advanced Materials and Innovative Technologies**	**1**	**2**	**Advanced Materials for Machine Manufacturing and Aeronautics** Ferrous alloys used in the automotive and aerospace industry. Alloys based on aluminum, copper, titanium or magnesium with special properties used in the automotive and aerospace industry. Composite materials used in the automotive and aerospace industry. Polymer materials used in the automotive and aeronautical construction industry.	4
			2	**1**	**Advanced Metallic Materials Science and Expertise** Advanced metallic materials and key generic technologies. The science of obtaining and advanced processing of ferrous and non-ferrous metallic materials. Metal glass, metal foam, metal nano powder. Optimal selection and design of advanced metal materials. Assessing the impact of new metallic materials and advanced processing technologies on the environment.	5
					Innovative Technologies for Obtaining Biocompatible Materials Biomaterials - definition, characterization. Metal materials used for implants. Polymer materials used for implants. Ceramic materials used for implants. New biocompatible materials for custom implants manufactured by Selective Laser Sintering (SLS) and by Selective Laser Melting (SLM). New biocompatible materials manufactured by Fused Deposition Modeling (FDM).	7
					Functional Polymeric Materials Types of polymeric materials. Processes for obtaining polymers. Structure of polymers. Mechanical behavior of polymers. Mechanisms of deformation and increase of polymer resistance. Crystallization, melting and glass transition. Processes for moulding polymer products. Polymer processing equipment.	4
					Innovative Technologies for Surface Modification and Protection Metals and metal surfaces. Metal-solution interfaces. Kinetics and mechanism of electrodeposition. Nucleus and layer growth models in electro crystallization processes. Effect of additives in the kinetics and electro crystallization mechanism. Structure and morphology of nano- and micro-composite surfaces. Influence factors in the process of functionalization of surfaces by electrochemical methods. Corrosion and tribocorrosion behavior of functional surfaces.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Materials Engineering	**MA**	**Advanced Materials and Innovative Technologies**	**2**	**1**	**Research and Design Practice** Theoretical modeling of the research topic. Realization of the theoretical model. Theoretical results. Numerical modeling of the research topic. Realization of the numerical model. Numerical results. Technological modeling of the research topic. Realization of the technological model. Technological results. Experimental modeling of the research topic. Realization of the experimental model. Results on experimental model. Transposition of experimental results from model to nature. Report of research and design practice.	10
				2	**Research and Design Practice** Comparison of theoretical, numerical, technological and / or experimental results. Highlighting the innovative solutions applied in theoretical, numerical, technological and / or experimental modeling. Highlighting the optimal solutions applied in solving the research topic. The conclusions of theoretical, numerical, technological and / or experimental research. Future directions applicable in solving the research topic. Report of research and design practice.	10
					Elaboration of Dissertation Thesis	20
ENVIRONMENTAL QUALITY AND SUSTAINABLE DEVELOPMENT - MA						
Environmental Engineering	**MA**	**Environmental Quality and Sustainable Development**	**1**	**1**	**Soil Chemistry, Pollution and Preservation** General notions about soil. Soil chemistry. Soil pollution and degradation. Methods of soil depollution. Ecological soil conservation and restoration.	5
					Generation, Prevention and Processing of Polluting Emissions Powdered materials involved in air and gas currents. Persistent organic pollutants. Dioxins and furans. Prevention, reduction and control of persistent organic pollutants. The emissions of oxides of sulfur, nitrogen and carbon. Heavy metals.	5
					Sustainable Development and Product Life Cycle Concept of sustainable development. Sustainable development in the context of the E.U. Current sustainable development practices. Use of market mechanisms to stimulate sustainable development. Life cycle impact assessment. Information management in life cycle analysis. Introducing life cycle assessment in companies. Life cycle analysis of systems. Management tools for the product life cycle.	4

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**MA**	**Environmental Quality and Sustainable Development**	**1**	**1**	**Research and Design Practice** Choosing the research topic. Bibliographic documentation. Presentation of the current state of knowledge in the field of theoretical modeling, in the technological field and in the field of experimental modeling of the research topic. Establishing scientific research directions in the research topic. Report of research and design practice.	10
				2	**Ethics and Academic Integrity** Plagiarism. Ethical issues of research and publication. Forms of plagiarism. Corruption - concept, prevention, combating. Professional ethical codes. Vulnerability and risk in school and university. Ethical issues and the internet.	1
					Water Management Water management. Water quality. Processes used to treat wastewater. General principles of water management. The impact of wastewater on the environment.	5
					Waste Monitoring and Management Types of waste. Collection and transport, monitoring and management procedures. Waste treatment and analysis methods. Waste avoidance and disposal methods. Dangerous waste. End-of-life vehicles. Waste from electrical and electronic equipment. Integrated waste management.	5
					Integrated Management of Environment, Quality and Safety Total quality management. ISO model for integrated management. ISO 14001 model for environmental management. ISO 45001 model for Occupational health and safety management systems. Integrated system of management of the environment, quality and safety of work. Audit and certification of the system of management of the environment, quality, health and occupational safety.	5
					Research and Design Practice Analysis and selection of theoretical study, technological research and experimental modeling methods applicable in the area of the research topic. Analysis of the capabilities of numerical investigation, technological research and experimental research at the „Dunarea de Jos" University of Galati, in the field of research topic. Report of research and design practice.	10

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**MA**	**Environmental Quality and Sustainable Development**	**1**	**2**	**Environmental Technology** The concept of "Cleaner Production". Government policies and strategies for adopting "cleaner" practices in industry. Technological innovation and "Cleaner production". Prevention of pollution by eco-design of technological processes. Ecotechnological analysis of the technological process. “Clean” process technologies for limiting environmental pollution. Treatment, recovery and ecological disposal of waste, including hazardous waste. Renewable energy sources for sustainable development.	5
					Political, Social and Cultural Aspects in Environmental Engineering Politico-social and cultural aspects in environmental engineering. Environmental policy in the EU. Environmental policy in Romania. The current situation of the socio-economic system and the natural capital of Romania. Horizon 2020. National objective.	5
SUSTAINABLE DEVELOPMENT AND SAFETY IN INDUSTRY (in English) - MA						
Environmental Engineering	**MA**	**Sustainable Development and Safety in Industry (in English)**	**1**	**1**	**European Strategies and Policies for Sustainable Development and Security in Industry** Sustainable development. International engagement with sustainable development. Global environmental issues. Sustainable development indicators. Action towards sustainable development. Practical industrial safety.	3
					Environmental Security in Natural Resources Management Disaster Risk Reduction at the Local Level. Environmental Security Assessment. Environmental Conflict Management. Urban Environmental Security. Agriculture, Natural Resources and Sustainable Development. Hunger, Famine and Food Security. Measuring Sustainability. Global approach to the problem. Addressing the Romanian space. Romania's natural resource assessment. Summary of the economic situation of Romania. Quality of the Environment in Romania.	5
					Industrial Hygiene and Safety Basic Principles in Occupational Hygiene. Measurement of Hazardous Substance. Assessment of health risks. Measurement of atmospheric pollutants. The noise. Effects of thermal stress on human health. Ergonomics Essentials.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**MA**	**Sustainable Development and Safety in Industry (in English)**	**1**	**1**	**Risk Assessment and Environmental Security** Environmental risk in the entrepreneurial system. Elements for the main environmental risks apply to the industrial plant. Strategies for the risk evaluation within eco-entrepreneurial systems. Firms capacity to manage the environmental risk. Elements of environmental security in the entrepreneurial system. Statistical methods for the analysis of data in the system of environmental security assessment.	6
					Research and Design Practice Choosing the research topic. Bibliographic documentation. Presentation of the current state of knowledge in the field of theoretical modeling of the research topic. Presentation of the current state of knowledge in the technological field of the research topic. Presentation of the current state of knowledge in the field of experimental modeling of the research topic. Establishing scientific research directions in the research topic. Report of research and design practice.	10
					Ethics and Academic Integrity Plagiarism. Ethical issues of research and publication. Forms of plagiarism. Corruption - concept, prevention, combating. Professional ethical codes. Vulnerability and risk in school and university. Ethical issues and the internet.	1
				2	**Sustainable Development and Environmental Management** Sustainable development policies. Water management. Air quality control. Waste management. Energy efficiency and renewable. Eco-building. Energy policy. Sustainable industrial development. Sustainable urban development. Agriculture and natural resource management.	5
					Green Chemistry Application for Sustainable Development History of Green Chemistry. The principles of green chemistry. Prevention. Atom Economy. Less hazardous chemical syntheses. Designing safer chemicals. Safer solvents and auxiliary substances. Energy efficiency. Renewable feedstocks. Reduce derivatives. Catalysis. Design for degradation. Real-time analysis for pollution prevention. Inherently safer chemistry. Green chemicals used by human.	5

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Environmental Engineering	**MA**	**Sustainable Development and Safety in Industry (in English)**	**1**	**2**	**Advanced Methods of Water Treatment** Health and Environment Concerns in waste water management. Waste water characteristics. Waste water treatment methods. Waste water constituents. Classification of technologies. Introduction to depth filtration. Surface filtration. Membrane filtration process. Adsorption. Ion exchange. Advanced oxidation process.	5
					Advanced Materials for Renewable Energy Advanced Materials for Our Energy Future. Energy and the Environment. Energy sources. Advanced materials for enabling efficient energy harvesting. Advanced Materials for Energy Transport and Storage. Advanced Materials for Energy Conversion.	5
					Research and Design Practice Analysis and selection of theoretical study, technological research and experimental modeling methods applicable in the area of the research topic. Analysis of the capabilities of numerical investigation, technological research and experimental research at the „Dunarea de Jos" University of Galati, in the field of research topic. Report of research and design practice.	10