***Dunarea de Jos* University of Galati**
Faculty of Engineering
Study programme – Materials engineering

Domain of study	Level (BA/MA)	Study programme	Year of study	Semester	Course title	Credit units
Computer Science Applied in Materials Engineering	**bachelor, level 6 from NQF, EQF**	**Materials Engineering**	1-st Year	1	**Mathematical Analysis** **Course content:** Chapter I. Strings and series of real numbers. Convergence of strings and real number series. Convergence criteria. Head. II. Differential calculus. Real variability of real variable function. Taylor's form. Series of powers. Functions of several variables. Limit, continuity, derivability, and differentiability for multi-variable functions. Partial derivatives of superior order. Extremes free and with links. Elements of field theory (gradient, divergence, rotor). Head. III. Full calculation. Primitive. Methods for determining primitives. Integrals definite. Incorrect integrations. Integral curves of spheres I and II. Integrates the curves independent of the road. Multiple integrations (double, triple, surface). Integer formulas. Chapter IV. Differential Equations. Differential equations of order I: differential equations with separable, homogeneous, linear variables, Bernoulli, Riccati, Lagrange, Clairaut. Problem of Cauchy. Higher linear differential equations. **The content of the seminar or practical papers:** Applications to the coursework topics.	5
			1-st Year	1	**Chemistry** **Course content:** 1. The History of Chemistry Development. Fundamental notions. Classification of chemicals. Aggregation states of matter. Status Transformations. 2. Fundamental Laws of Chemistry. Elements of structure of	5

					atoms. 3. Atomic models. Orbital atomic. Quantum numbers. Electronic layers. Electronic substrates. Periodic system of elements. 4. Law of periodicity and properties of elements. Rules for setting oxidation numbers. Electronic configurations of atoms. Chemical connections. The ionic bond. 5. Chemical bonds. The covalent bond. Coordinative link. Metal bond. Intermolecular links. 6. Disperse systems. Classification of solutions. Modes of expression of solution concentrations. Solutions Laws. Suspensions. Colloidal systems. Acid-base reactions (neutralization reactions). PH indicators. Balances in salt solutions. 7. Redox reactions. Types of redox reactions. Series of redox activity. Galvanic cells. Electrolysis. The laws of electrolysis. Applications of electrolysis. Precipitation reactions. Complexity reactions. 8. HYDROGEN. Natural state. Obtaining. Physical and chemical properties. Use. METALS. Natural state. General methods of obtaining and purifying metals. General physical properties of metals. General chemical properties of metals. Alloys. 9. Group 1 of the Periodic System. General characterization of the element and combinations of Group IA elements. Natural state. Obtaining. Physical and chemical properties. Main combinations. Uses. Group 2 of the regular system. General characterization of elements and combinations of Group IIA elements. Natural state. Obtaining. Physical and chemical properties. Main combinations. Uses. 10. GROUP 13 of the Periodic System. General characterization of elements and	

					combinations of elements in Group IVA. ALUMINUM: Natural condition. Obtaining. Physical and chemical properties. Main combinations. Uses. Group 14a (IVA) of the Periodic System. General characterization of elements and combinations of elements in Group IVA. Carbon and Silicon: Natural state. Allotropic forms. Obtaining. Physical and chemical properties. Main combinations. Uses. 11. GROUP 15 of the Periodic System. General characterization of elements and combinations of elements in group VA. Nitrogen and Phosphorus: Natural state. Allotropic forms. Obtaining. Physical and chemical properties. Main combinations. Uses. Group 16 of the regular system. General characterization of elements and combinations of Group VI elements A. Oxygen and Sulfur: Natural state. Allotropic forms. Obtaining. Physical and chemical properties. Main combinations. Uses. 12. GROUP 17 of the Periodic System. General characterization of elements and combinations of elements of group VII A. CLOR: Natural state. Obtaining. Physical and chemical properties. Main combinations. Uses. GROUP 18th. Rare gases (noble) .Style natural. Obtaining. Physical and chemical properties. Main combinations. Uses. 13. Transitional metals: Groups III B - VII B. General characterization. Important combinations. Uses. Group VIIIB (groups 8, 9, 10). Fe, Co, Ni: General characterization. Natural state. Methods of obtaining. Physical and chemical properties. Uses 14. GROUP I B. General characterization. Natural state. Methods of obtaining. Physical and chemical	

					properties. Group II uses B. General characterization. Natural state. Methods of obtaining. Physical and chemical properties. uses **The content of the seminar or practical works:** 1. Labor protection in the chemistry lab. Presentation of laboratory work. 2. Modes of expression of solution concentrations (c%, n, m, t, f). Troubleshooting modes. 3. Ways to solve chemistry problems. Applications. 4. Introductory notions in quantitative analytical chemistry. PH measurement. Titration 5. Alkalimetry: Determination of titre, factor and normality of NaOH solution ~ 0.1N. 6. Acidimetry: Preparation of 0.1N HCl solution. Determination of titre, factor and normality of HCl solution ~ 0.1N. 7.Determination of water hardness 8.Gravimetry. Fe Fe in oxide form. 9.Measures to solve chemistry problems. Applications. 10. Introductory notions in qualitative analytical chemistry. Analytical classification of cations and anions. Preliminary analysis of cation dosing. 11. Recognition of Group V cations. 12. Recognition of Group Anions. I. Recognition of Group II Anions. Recognition of Group III anions. 13.Measures to solve chemistry problems. Applications. 14. Laboratory colloquium	
			1-st Year	1	**Communication** Communication, principles, units and characteristics of communication; the effects of communication, the intelligibility of the message; levels of human communication. The principles of effective communication: clear, complete, concise, concrete, fair,	2

					receptive, courteous message. Nonverbal communication. Communication networks. Communication in conflict management. Communication and listening. Presentation of techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Data integration. Media elements. Structure of technical-scientific works: papers, studies completion, papers and scientific papers, projects. Human-to-human interaction mediated by web and audio-video technologies.	
			1-st Year	1	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports	1

					Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			1-st Year	1	**Physics** **Course content:** Elements of physical mechanics Statics and dynamics of fluids. Oscillations and elastic waves. Elements of molecular physics. Thermodynamic elements. Elements of quantum mechanics, atomic and nuclear physics. **Content of seminar or practical works:** Processing of experimental data. Electrical and magnetic methods. Methods for determination of the propagation velocity of waves. Methods of temperature determination. Determination of liquid viscosity. Determination of density and superficial tension. Experiments in atomic physics. Problems related to the chapters studied at the course.	5
			1-st Year	1	**Descriptive Geometry** **Course content:** Chapter 1. Projection systems: Conical projection, cylindrical projection, quoted projection. Chapter 2. Representation of the	5

					point, the straight and the plane: The representation of the point in space and in the purge in the double and triple orthogonal projection. Representation of the straight into space and purge, simple straight and double particular, relative positions of the two straight. The representation of the plane in space and in the purge, the right and the point contained in the plane, the particular straight lines contained in the plan, the simple and double particular plane, the relative position of the two planes, the relative positions of a straight to a plane, the straight and the plane perpendicular, purge. Head. 3. Polyhedra: Definition, classification, representation of polyhedra. Polyline flat sections. Intersection of polyhedra with right. Deploying polyhedra. Head. 4. Cylinder and cone: Definition, classification, representation of cylindrical-conical bodies. Flat sections with cylindrical conical bodies. Intersection of cylindrical-conical with right. Deploying the cylinder and cone. Head. 5. Sphere: Sphere representation, points on the sphere, plane tangent to the sphere, plane spheres through the sphere, intersection of a straight with a sphere, unfolded to the sphere. Head. 6. Intersections of geometrical bodies: Polyhedral intersections, intersections of cylindrical-conical bodies, cone and cone intersections with cone and cylinder **The content of the seminar or practical works:** 1.Applications to the representation of the point, the right and the plane: The representation of the point in space and in the purge, in the double and in the triple	

					orthogonal projection; representation of straight and double private straight lines, determination of traces and crossings crossed by the right, intersections of planes and plates, visibility in the purge. 2. Applications in the Polyhedra chapter: The intersection of some particular planes with pyramid and prism, straight intersections with prism and pyramid, prism and pyramid deployments. 3. Applications in the chapter cylinder and cone: The intersection of any planes and particular planes with the cone and the cylinder, the intersections of straight with the cylinder and the cone, the rollers of the cylinder and the cone. 4. Sphere applications: Sphere intersection with particular plane and planar plane, the intersection of the straight line with the sphere, unfolded to the sphere. 5. Applications in the intersection of geometric bodies: Intersections of polyhedres, intersections of cylindrical-conical bodies, intersections of sphere with cone and prism.	
			1-st Year	1	**English** **Course content:** Communication, principles, units and characteristics of communication; the effects of communication, the intelligibility of the message; levels of human communication. The principles of effective communication: clear, complete, concise, concrete, fair, receptive, courteous message. Nonverbal communication. Communication networks. Communication in conflict management. Communication and listening. Presentation of techniques for making oral and written scientific presentations. Formats for	2

					presentations. Organization of the presentation. Data integration. Media elements. Structure of technical-scientific works: papers, studies completion, papers and scientific papers, projects. Human-to-human interaction mediated by web and audio-video technologies. **The content of the seminar or practical works:** Technical and business correspondence. Design and drafting CV (European format). Letter of intent. Interview selection, employment, promotion on the job. Oral and written presentations. Technical and scientific works: papers, studies completion, papers and scientific papers, projects.	
			1-st Year	1	**Materials Science and Engineering** Introduction. Types of materials. The link between chemical composition-processing conditions-property structure. Atomic architecture. Crystalline structure, crystalline imperfections. The amorphous structure. Diffusion. Diffusion laws. Solidification of metallic materials. Alloy systems. Diagram of phase equilibrium. Fe-C alloy system. Transformations of solid state phases. Thermal treatments; Non-ferrous alloys. Aluminum and copper; Ceramic materials. Plastic materials. Composite materials	5
			1-st Year	2	**Linear Algebra, Analytic Geometry and Differential** **Course contents:** Cap. I. Matrices, determinants. Systems of linear equations. Assembling and multiplying two matrices, calculating the determinant of a matrix, inverse of a matrix. Solving systems of linear equations. Head. II. Vector spaces.	4

					Space and vector subspace. Linear variety. Addiction and linear independence. Base and size. Changing the coordinates of a vector when changing the base. Head. III. Linear Applications. Definition of a linear application, examples, properties, image and kernel, associated matrix. Isomorphism of vector spaces. Own vectors and own values. Diagonalization of a matrix. Head. IV. Functional linear, bilinear, square. Definition, matrix attached, canonical expression of a square functional. Head. V. Euclidean vector spaces. Scalar product, norm, angle, projections. Ortonormate bases. Orthorhombic procedures. Head. VI. Free vectors. The notion of free vector and bound vector. Vector space of free vectors. Scalar product, vector product, mixed product, double vector vector of free vectors. Head. ARE YOU COMING. Plan and right in E3. Cartesian landmark, coordinate systems in space and plan. Changing the landmark. Equations of the plan. Distance from one point to a plane. Relative positions of two planes, planar beam. Types of equations of a straight line in E3. Relative positions of two straight lines; competition and common perpendicular; point of intersection. The distance between two straight lines. Relative positions of the plane and the straight. Orthogonal projections. The symmetry of a point towards a plan, respectively face o right. Head. VIII. Cuadra. Sphere: sphere definition, sphere determination by given conditions. Intersection of the sphere with a plane. Intersection of the sphere with a right. Tangent, plane tangent to a sphere.	

					Cuadrices on reduced equations: ellipsoid, hyperboloid, paraboloid, cylinder, con. Head. IX Elements of Differential Curve Theory. Analytical representation of plane curves and space. Parameterization by arc length. Calculate the length of a curve arc. Frenet's formulas, curvature and torsion of a curve. Frenet's class. Geometric interpretation of curvature and torsion. Cap.X. Elements of surface differential theory. Analytical representation of surfaces; plane tangent and normal to a surface; calculating arc lengths of the curve and angles between two curves located on a surface. The first and second fundamental form of a surface; surface orientation. Cylindrical conical surfaces. Rotating surfaces. **The content of the seminar or practical papers:** Applications to the coursework topics. (students will learn to use the lessons studied at the course to solve problems related to course topics.)	
			1-st Year	2	**Physical chemistry** **Course content:** Chemical thermodynamics. Basic notions and magnitudes of chemical thermodynamics. Principles of thermodynamics. Phase transformations. Surface phenomena. Chemical kinetics. General aspects (kinetic parameters, classification of kinetic dpv reactions, modes of expression of reaction velocity). Formal kinetics of simple elementary reactions and complex reactions. Influence of temperature and pressure on reaction velocity, theories on reaction velocities. Elements of electrochemistry.	5

					Equilibrium phenomena in electrolyte solutions (electrolytic dissociation, ionic strength, Debye-Huckel theory). Transport phenomena in electrolyte solutions (transport numbers, electrical conductivity). Phenomena at the metal / electrolyte interface (double electrode potential, electrode potential, Nernst equation). Galvanic cells (General aspects, Classification, Thermodynamics of galvanic cells, Electrochemical generating currents / Electrochemical cells). **The content of the seminar or practical papers:** Determination of heat of reaction. Hess's law; Partially mild sizes. Determination of partial molar volumes; Ternary systems. Gibbs diagram for the water-alcohol-toluene system. The equilibrium distribution of a substance between two non-viscous solvents. Nernst's law. Adsorption. Adsorption of acetic acid on activated carbon. Influence of surfactant concentration on superficial water tension. Determination of chemical reaction rate constant. Kinetics of elemental elemental reactions I. Study of catalytic promoter and inhibitor effect on the rate of decomposition of hydrogen peroxide. Influence of temperature on reaction speed. The Arrhenius Law. Measurement of the electrical conductivity of electrolyte solutions. Electrolytic crystallization of metals. Measuring the standard potential of reversible electrodes. Electromotive force of galvanic cells.	
			1-st Year	2	**Drawings and Infographics** **Course content:** C1- Rules for drawing STAS 6134-84; C2 - Inscription of the precision elements of the	5

					execution; dimensional tolerances STAS ISO406-91, adjustments; geometric tolerances SR EN ISO 7083-2002; STAS 7385 / 1,2-1985; STAS 7391 / 1,2,3,4,5- 76; C3 - Representation and quotation of STAS 5013 / 1,2,3,4-82 toothed wheels; C4- Representation of gears SR EN ISO 2203-2002; C5- Demountable assemblies: threaded assemblies, feather assemblies; Slot assemblies SR EN ISO 6413-1997; elastic fittings SR EN ISO 2162 / 1,2-1997. C6 - tree representation; drawing the execution drawing for a tree; C7 - Representation of sliding bearings and rolling bearings STAS 8953-85; SR EN ISO 8826 / 1.2-2002; C8- Representation of elements and sealing devices SR ISO 9222 / 1,2-1994; C9-C10-Representation of non-demountable assemblies: welded assemblies SR EN 22553-1995 and riveting assemblies; C11- Rules for the drawing of metal constructions STAS 11634-83; C12- Drawing rules for civil construction SR EN ISO7518-2002; C13 - Drawings of installation drawings; Symbols SR EN ISO 6412 / 1,2,3-2002; C14- Representation of kinematic schemes; symbology. **Content of seminar or practical works:** L1 - 4 hours Representation of flanges and threads. Threaded threads and threads SR ISO6410 / 1,2,3-1995. (Teaching + planing) - / LP1L2 - 4 hours - Drawings of some parts by means of revealing (cap, gear pump body); tolerances and roughness SR RN ISO 1302-2002 .- / LP2 / 1,2, L3 - 4ore - finishing LP2 L4 -4 hours- Execution drawings for sprockets in a toothed wheel assembly	

					(cylindrical gear pump) representation of centering holes SR EN ISO 6411: 2001. Applications to STAS 5013 / 1,2, -82, SR EN ISO 2203-2002. LP3 / 1.2 L5, 6 - 8 hours Gear shapes: cylindrical, conical, worm gears.LP4 / 1,2,3; L7-4 hours Compact gear pump design; LP5; L8-4 hours Overall design for a conical gearbox; the design drawing of a conical wheel STAS 5013 / 3-82 and the marking of heat treatment stas 7650-89. LP6 / 1.2; L9-4 hours Readings: Overall drawing for a cylindrical, worm gear reducer; Extraction of details and representation of: assembled assemblies - threaded assemblies, feathers STAS 1004-81, 1007-81, 1012-77, grooves and elastic, SR EN ISO 6413-1997; SR EN ISO 2162 / 1,2-1997 - LP7;	
			1-st Year	2	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores,	1

					the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			1-st Year	2	**Electrotechnics** **Course content:** 1. General Electrotechnics: DC Electric Circuits: Printed Electrical Fields. Electricity. The Law of Electric Driving. Law of energy transformation into conductors. Kirchhoff's theorems. Resolving DC circuits. The balance of powers. Maximum power transfer. Theorem of power conservation in DC. Electromagnetism: The magnetic field. Magnetic induction. Magnetic Field Intensity. The magnetic flux. Magnetisation of bodies. The hysteresis phenomenon. The fundamental law of the magnetic circuit. The phenomenon of electromagnetic induction. Autoinducer. Mutual induction. Eddy currents (Foucault). The magnetic field energy. Electromagnets. Single-phase alternating current circuits: Single-phase alternating	3

					current generation. Characteristic dimensions of the single-phase alternating current. Symbolic representation of sinusoidal sizes. Laws and theorems in c.a. AC Circuit Elements. Series circuits and alternating current. Power in c.a. phase. Improving the power factor. Resonance in electrical circuits. Three-phase electric circuits: Polyphase systems. Three-phase systems. Star connection. Triangle connection. Electrical powers in three-phase circuits. Connecting the receivers in three-phase electrical networks. Connect in star. connecting in the triangle. Electrical Measurement: Classification of Electrical Measurement Devices. General notions of metrology. Constructive Principles of Measuring Devices. Analogue measuring instruments. Measurement of current intensity. Measurement of voltages. Resistance measurement. Measurement of active and reactive DC and single-phase and three-phase powers. Measurement of active and reactive DC and single-phase and three-phase energies. Measurement of impedances (inductances and capacities). Measurement of power factor. Frequency measurement. 2. Electric Machines: Electric Transformers: Single-Phase Transformer. Constructive elements. Principle of operation. Operation of the single-phase transformer. Functioning in pregnancy. Single-phase transformer yield. Three-phase transformers. Autotransformer. Welding transformers. Transformers for electric arc furnaces. Asynchronous machines: Construction elements of the three-phase asynchronous machine. Motor	

					operation of the asynchronous machine. Electromagnetic torque of the asynchronous machine. Characteristics of three-phase asynchronous motor. Starting the three-phase asynchronous motor. Adjusting the speed and reversing the rotation direction. Single-phase asynchronous motor. Synchronous machine: Construction principles of the three-phase synchronous machine. Operation of the synchronous machine as a generator. Characteristics of the synchronous generator. Parallel operation of synchronous generators. Synchronous engine operation and characteristics. Starting the three-phase synchronous motor. DC machine: Construction of the c.c. Operation of the c.c. in generator mode. Characteristics of the c.c. with independent excitement and derivation. Characteristics of the c.c. with serial excitement. Characteristics of the c.c. with mixed excitement. Operation of the c.c. in engine mode. Speed and torque of the engine torque. Engine features of c.c. with separate excitation and derivation. Engine features of c.c. with serial excitement. Engine features of c.c. with mixed excitement. The losses and the efficiency of the c.c. **Content of the seminar or practical papers:** Strength and power in DC. 2. Own inductivities, mutualities and capabilities. 3. Series circuits and current derivation Alternative. 4. Power in AC circuits. Improving power factor. 5. Single-phase transformer. Trace the transformer characteristics. 6. Asynchronous engine study. 7. Diesel engine study	

			1-st Year	2	**English** **The content of the seminar or practical works:** Semester 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 (past simple, past continuous, past perfect). 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. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	2
			1-st Year	2	**Computers Programming and Programming Languages I** **Objectives:** Understanding the basic concepts of structure programming and building the skills needed to design advanced applications. Knowing the facilities of a modern programming environment. • Developing and testing some	5

					C language applications. **Course Content** Representation of information in numerical computers, numbering systems, alphanumeric codes, numeric codes. Algorithms and logic schemes, pseudocode language. Fundamental algorithms. Language C, introduction. Instructions. Types Input / Output Functions. Operators and phrases. Panels. **Application Content** Numerical systems: binary, octal, hexadecimal. Convert numbers from one counting system to another. Numeric codes. Representation of numbers in complement to 2. Sorting and intercalating algorithms. Fast search algorithms. Application for displaying integer values with words. Application for graphic representation of trigonometric functions over a certain range. Representing surfaces in space. Application for adding and subtracting numbers as large as possible. Show contents of whole variables in binary format. Duplicate elimination application in a text. Define some exceptions. Remove a specific word from a text. Sorting and fast search applications.	
			1-st Year	2	**Materials Technology** **Course contents:** Structure of materials. Crystalline structures. Types of metal-specific crystalline structures. Crystal imperfections Deformation in metallic crystals.Deformation of polycrystalline aggregates. Amorphous structures. Mechanical properties of materials. Resistance and plasticity. Variation of conventional voltage R with specific	5

					deformation e. Voltage variation s with deformation degree e. Rational curve. Elongation at break. Tackle at break. Hardness. Determination of Brinell hardness. Determination of hardness by Vickers method. Rockwell Hardness Determination. Resilience. Influence of temperature on material properties. Fluid properties. Visco-elastic behavior of polymers. Physical Properties of Materials. Density. Thermal expansion. Melting properties. Specific heat and thermal conductivity. Diffusion. Resistivity and conductivity. Electrochemical processes. Processing of metallic materials. Obtaining metallic nanostructures through Several Deformation Processing. Processing sheets and bands. Welding of metallic materials. Overview of welding technology. Physics of welding. Structure of welded joints. Solderability of metallic materials. Arc welding. Arc welding arc. The arc welding technology. Welding under flow layer. Welding in the protective gas environment. Welding in a slag bath. Aluminotermic welding. Welding by pressing and heating by contact electrical resistance. Plasma welding. Coating and deposition processes. Electrodeposition. Physical and chemical deposits. Organic coatings. Ceramic coatings. Coatings by thermal and mechanical processes. Bottling of bottles. Raw materials used in the manufacture of bottles. The process of manufacturing glass. Processing of ceramic materials and ceramics. Processing of plastics. Rubber processing. Processed Integrated Circuits. Silicon processing. Lithography. Thermal oxidation.	

					Chemical deposition in the vapor state. Integrated circuits encapsulation. **Content of the seminar or practical works:** Presentation of the laboratory, SSM and specific SU; The hardness attempt. Traction test. Bending on shock. The properties of the formation mixtures. Formation in two frames with classic mixture and gravitational casting. Forging, forging operations, forging in molds, molding of liquid metal. Rolling, lamination, rolling friction coefficient, variation of lamination coefficients with deformation degree. Extrusion. Processing by severe plastic deformation in order to obtain materials with ultrafine structure. Welding with manual and automatic arc under flow layer. Welding by pressure and heating by its own strength. Welding with oxyacetylene flame. Flame cutting.	
			2-nd Year	1	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by	2

					working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			2-nd Year	1	**Engineering of manufacturing** **Course content:** Technological parameters of machines and metallurgical installations Machines and equipment specific to foundry installations. Continuous steel casting machines Rolling mills and specific equipment Types of rolling mills: flow equipment, main machinery. Construction of rolling beads and its components. Rigidity of rolling beads. Pretensioned trays: computational elements, construction. Roller Cylinders: Positioning, Balancing and Adjustment of Rolling Cylinders. Equipment serving laminating beads. Semi-finished machinery heating equipment Racking and related equipment Laminating machinery and equipment:	4

					Cutting machines, machines and straightening machines Technological equipment specific for forging, molding, extruding technology Technological equipment specific to heat treatment plants Reliability and maintenance of machinery metallurgical plants Content or practical works: Analytical and experimental determinations, calculations of the technical-functional parameters, of the drive power at the following installations and equipment shall be carried out :. Rolling paths. Straight straight straightening machines. Scissors with sloping knives and scissors with parallel knives. Scissors with disc knives. Hammer for free forging. Machine flow within the main casting sections Flow of machines in the main rolling sections Determination of the rolling forces, moments and power of the drive motor in a dual duo for cold rolling of the plates Analytical and experimental determination of forces, moments and power of the drive motor on a common drive roller The analytical and experimental determination of the forces, the mechanical work and the power of the drive motor on a scissor blade scissors and a scissors with parallel knives The analytical and experimental determination of the power of the drive motor and power consumption in a straight roll machine Determination of the constructive and functional parameters of a hammer for free forging.	
			2-nd Year	1	**English** **The content of the seminar or practical works:** Semester I - Production. Specialized	2

					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 (past simple, past continuous, past perfect). 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. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	1	**Numerical Methods** **Course content:** 1. ERRORS IN NUMERICAL METHODS. Introduction. Truncation Errors. Representing numbers in your computer. Errors by rounding. LINING EQUIPMENT SYSTEMS DIRECT METHODS. Introduction. Gauss removal and elimination Gauss-Jordan. Pitching and elimination Gauss-standard. Matrix operations. Inversion of a matrix Determinant of a matrix. Private Matrices. ITERATIVE METHODS.	4

					Introduction. Vector and matrix rules. The Jacobi method uses the Gauss - Seidel method. Relaxation methods. NUMERICAL INTERPOLATION. Introduction. Lagrange interpolation formula. Newton interpolation formulas by equidistant nodes. Analysis of polynomial interpolation. Cubic spline functions. NUMERICAL CUADRATURE. Introduction Rule of rectangle and trapezoid rule. Simpson's rules. Quantum Formulas Newton - Cotes. Gauss quadrature. **The content of the seminar or practical papers:** Review of programming knowledge in C ++ .. Errors in numerical methods: CONVERSIA FROM ZECIMAL IN BINAR. Gauss removal with pivoting. The reverse of a matrix. LU decomposition. Unspecified M systems. The Jacobi method. Gauss-Seidel iterative method. Lagrange interpolation. Cubic spline interpolation. Numerical quadrature: Rectangle method and trapezoid method. Quantum formula Newton-Cotes. VERIFICATION OF KNOWLEDGE.	
			2-nd Year	1	**Computers Programming and Programming Languages II** **Objectives:** Understanding the basic concepts of structure programming and building the skills needed to design advanced applications. Knowing the facilities of a modern programming environment. • Developing and testing some C language applications. **Course Content** Representation of information in numerical computers, numbering systems, alphanumeric codes, numeric codes.	4

					Algorithms and logic schemes, pseudocode language. Fundamental algorithms. Language C, introduction. Instructions. Types Input / Output Functions. Operators and phrases. Panels. **Application Content** Numerical systems: binary, octal, hexadecimal. Convert numbers from one counting system to another. Numeric codes. Representation of numbers in complement to 2. Sorting and intercalating algorithms. Fast search algorithms. Application for displaying integer values with words. Application for graphic representation of trigonometric functions over a certain range. Representing surfaces in space. Application for adding and subtracting numbers as large as possible. Show contents of whole variables in binary format. Duplicate elimination application in a text. Define some exceptions. Remove a specific word from a text. Sorting and fast search applications.	
			2-nd Year	1	**Materials Strength** **Course contents:** Chapter 1 Introduction: Definitions, structural concepts (bars), requests, approaches. Chapter 2 Cutting forces and bending moments. Chapter 3 Behavior of Materials. Chapter 4 Expansion / Compression of bars. Chapter 5 Straight section cross sections. Chapter 6 Bending of bars. Chapter 7 Bars with circular or annular section; torsion of rectangular cross-section bars. Chapter 8 Sizing / Verification Methodology of Bars. **Seminar content or practical works: Seminar** 1. Efforts diagrams on plain beams and	4

					console beams. Efforts diagrams at simple beams with consoles and inclined beams. 2. Efforts diagrams of Gerber beams and plain frames. Effort diagrams for bar systems. 3. Calculation of the main center inertia moments of the composite sections with a symmetry axis. Calculation of main center inertia moments of sections without axis of symmetry. 4. Straight bars required for stretching or compression: verification, sizing and resistance calculation. Calculation of unstable static simple axial load systems with temperature variations and displacements due to errors found during assembly. 5. Verification, sizing and calculation of resistance strength of bars required at bending. 6. Calculation of the beams displacements required at bending with the initial parameter method. 7. Verification, sizing and calculation of the resistance strength of the circular (or ring) section bars required at free torsion. Laboratory Learning to work with programs for Straight Bar Resistance and Flat and Bar Systems efforts).	
			2-nd Year	1	**Technique of analysis and characterization materials** Structure. Definition. Classification. Methods and devices that give the image of the surface structure. Methods and devices that give the image of the distribution of chemical elements. Methods and devices that give the image of crystalline network diffraction.	4
			2-nd Year	1	**Thermotechnics** **Objectives:** Presenting some general aspects to establish minimal knowledge about the thermal	4

					phenomena encountered in the technique, fundamental notions regarding thermodynamic systems. Knowledge of the fundamental thermodynamic notions necessary for the understanding and deepening of the knowledge at the specialized courses of the later years; providing the minimum knowledge necessary to establish the optimal operating conditions of thermomechanical systems and equipment. **Course Content** Fundamentals of thermotechnics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic system. Simple, reversible, open gas transformations. Periodic open thermodynamic study. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Potential thermodynamics: thermodynamics methods; the exergy of a fluid in continuous flow and permanent regime; the exergy of a fluid in a closed volume; chemical exergy. Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isocratic, isobar, isothermal, reversible and irreversible adiabatic). Wet air thermodynamics: the physical properties of wet air; i-x wet air diagram; graphical determination of wet air	

					status; Simple wet air conversions (constant humidity content, constant temperature, constant enthalpy and mixing of two wet air flows with different states). Thermodynamics of compressible fluids at high speeds. Thermodynamics of combustion of fuels. Thermodynamics of thermal machine cycles. **Application Content** Methods of temperature measurement. Measurement of gas pressure, velocity and flow. Determination of the pressure-vapor pressure dependence. Determination of wet air parameters. Determination of flow rate with diaphragms.	
			2-nd Year	2	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in	2

					semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			2-nd Year	2	**Electronics and automation** **Course content:** ELECTRONIC CIRCUIT DEVICES. Semiconductor electrical conduction concepts. Electronic Components: Diodes, Bipolar transistors. Unipolar transistors, Special semiconductor devices. AMPLIFIERS AND OSCILATORS. General properties and features of the amplifiers. AC Amplifiers (voltage amplifiers, power amplifiers). DC power amplifiers. Negative reaction to amplifiers and its consequences. Perational Amplifiers. Oscillators. REDRESSORS NOT MADE OF POWER. One-phase single-phase rectifiers. Single-phase single-phase rectifiers with resistive load. Single-phase alternating resistors with resistive load. Re-straining the filtered voltage. Three phase rectifiers. ELECTRONIC STABILIZERS. Parameters of stabilizers. Parametric stabilizers. Reacting stabilizers. Integrated voltage stabilizers. REDRESSES COMBINED BY MICE	3

					POWER. Vertical and Horizontal Command Principle. Specialized cascades for thyristor grid control. COMBINATION AND SECVENTIAL LOGIC CIRCUITS. Elementary logical functions. Fundamental relationships in logic algebra. Logical circuits. Integrated logic circuits. Combined Logic Circuits. Sequential sequential logic circuits. APPLICATIONS OF COMBINATION AND SECVENTIAL LOGIC CIRCUITS. Encoders and decoders. Electronic counters. Numeric-Analog Converters. Analog-Numeric Converters. Memory circuits. Structure of a microprocessor and a microcomputer. **The content of the seminar or practical works:** 1. Measuring and control devices specific to the electronics lab (cathodic oscilloscope, electronic voltmeter, signal generator, etc.). 2. Photoelectric elements 3. Bipolar and unipolar transistor. 4. AC signal amplifiers for small signals. Operational Amplifiers. Single-phase single-phase rectifiers and filters. Rectifiers Ordered. 6. Continuous voltage stabilizers. 7. Combined logic circuits.	
			2-nd Year	2	**English** **The content of the seminar or practical works:** Semester 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 (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized	2

					vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	2	**Fluid Mechanics** **Course contents:** Chapter 1. Measurement units. Fluid properties. The notion of continuous environment. Chapter 2. Fluid statics: Pressure and pressure measurement. Hydrostatic forces on flat surfaces. Relative equilibrium of fluids with free surface in rectilinear motion or rotation. Forces that act on immersed bodies - the principle of Archimedes. Chapter 3. Basic equations of fluid mechanics: Notions of fluid kinematics. Total Derivative. The gearbox. Acceleration field. Line current equation. The infinitesimal fluid element method. Bernoulli's equation. The laws fundamental preservation of mass, impulse and energy. Equation of continuity. Chapter 4. Navier-Stokes Equations: Deduction of the Navier-Stokes equations. Applications in case	3

					of laminar flow. Turbulent flow. Chapter 5. Dimensional Analysis and Similarity Theory. Fundamental and derived physical quantities. The principle of dimensional homogeneity. The Rayleigh method. Pi Theorem. Definition of similarity. Analysis of similarity criteria Re, Fr, Sh, Eu, Ma. Model Law. Chapter 6 Limit layer theory. Limit turbulent limit. Applications to flow around bodies. Cap 7 Flow through pipes: Laminar flow and turbulence. Effect of viscosity. The motion equation. Friction coefficient and pipe roughness. Local pressure losses. Hydraulic slope and energy slope. Pipelines - pipes connected in series and parallel. Hit of a ram. **The content of the seminar or practical papers:** Measurement of pressure. Measuring viscosity. Measure the impulse. Reynolds's experience. Flow through pipes: Calculation of friction pressure losses and calculation of local pressure losses. Flow through pipelines: Flow measurement methods. Hit of a ram.	
			2-nd Year	2	**Physical Metallurgy I** Introduction to material science. Definition, relationship with other branches of technical sciences. Correlation composition - structure - properties - uses. Classification of materials: metallic materials, ceramics, polymers, composites, nanomaterials and multifunctional materials. Material properties. Structure and organization of materials. Crystalline structures specific to metals. Punctual, linear, surface imperfections. Structure of Polymers Amorphous and Semicrystalline Structure. Polymorphism.	3

					Physical and chemical constitution of metallic materials. The constitutive phases. Structural constituents. Non-metallic inclusions. Crystallization of metals. Thermodynamic conditions of crystallization. The mechanisms of crystallization. Crystallization kinetics. Structure of castings and ingots. Phenomena related to solidification. Diffusion. Balance diagrams. Binary equilibrium charts. Balance in alloy systems. Phase law. The main types of binary equilibrium diagrams. Cooling curves in steady and practical conditions. Correlation of the balance diagram - physico-mechanical and technological properties. Ternary equilibrium diagrams. Plastic deformation. Mechanism of plastic deformation of monocrystals and polycrystalline metallic materials. Ecrusion and anisotropy. Recrystallization. Cold and hot plastic deformation. Breaking of metallic materials. Creep. General notions regarding the structure of the technical materials. The balance system Fe - C. The pure iron. Iron - carbon alloys. Metastable balance, iron - cementitious (Fe - Fe3C) balance diagram. Phase transformations to the crystallization of white steels and pigments. Quantitative determinations on the Fe-Fe3C diagram. Carbon steels. The influence of carbon on the mechanical properties of steels. Influence of permanent accompanying elements. Destination and symbolization of carbon steels. White fonts. Stable equilibrium, iron - graphite (Fe - G) balance diagram. Ash gray. Influence of chemical composition and cooling rate on the structure and properties of the cast iron. Modified castles. Malleable cast	

					iron. Destination and symbolization of the cast iron. Solid phase transformations. Critical points. The main transformations to the heating and cooling of steels. TTTI, TTTC diagrams. The main thermal treatments applied to steels. Allied steels. Non-ferrous alloys. Aluminum, aluminum alloys. Copper, copper alloys. Magnesium, zinc, titanium and their alloys.	
			2-nd Year	2	**Machine parts and mechanisms** **Course contents:** Chapter 1. General problems of machine building. Chapter 2. Mechanical engineering calculation principles. Mechanical characteristics of materials used in machine building. Form and dimensional accuracy of car bodies. Calculation at simple and compound queries. Calculation at variable requests. Safety criteria for car bodies. Reliability of car bodies. Chapter 3. Non-demountable joints. Threaded joints. Welded joints. Joining by soldering. Joint joining. Chapter 4. Removable assemblies. Threaded assemblies: thread classification; geometrical elements; screw and nut materials; the friction moment in the thread; auto-fatigue condition; the moment of friction between the nut and the bearing surface; thread calculation; calculation of assemblies with bolts without initial clamping; calculation of assemblies with initial clamping screws; fatigue calculation of assemblies with initial clamping screws; calculation of assemblies with eccentric eccentric screws; calculating the screws required at the shock. Joining of hubs and shafts: feather assemblies; chisel assemblies; pressed assemblies, polygonal assemblies.	3

					Chapter 5. Elastic assemblies Springs with traction-compression voltages; Springs with torsional voltages; Springs with bending stresses. **The content of the seminar or practical works:** Paper no. 1 - Experimental determination of fatigue resistance. Calculation of fatigue strength of machine parts; Work no. 2 - Experimental determination of the coefficient of friction in screw assemblies; Work no. 3 - Experimental determination of the load bearing capacity of a screwed-in assembled load with transverse forces; Work no. 4 - Determination of the stiffness of the elements of an assembly with bolts with initial clamping; Work no. 5 - Determination of the carrying capacity of an elastic bracelet assembly; Work no. 6 - Experimental determination of load distribution along a joint through bilateral corner welding; Work no. 7 - Experimental determination of the elastic characteristic of helical springs.	
			2-nd Year	2	**Domain Practical Training** Casting of metallic materials in castings (Mixed Casting, Turnarom): machinery and equipment for preparation of forming and milling mixtures, machinery, equipment, tools and tools for forming and milling, forming, casting and solidifying technologies, debating, cleaning, finishing, treatment thermal casting, casting special methods, casting of CTC. Hot rolling. Shed storage: reception and preparation of slates. Laminating of thick sheets (LTG): heating, furnaces, lamination line, characteristic equipment, rolling technologies, controlled thermomechanical	4

					lamination. Thermal treatment of laminated sheets, furnaces and treatment plants for thick sheets. Adjustment lines. Quality control of thick boards. Hot Rolling of Steel Strips (LBC): Heating, Furnaces, Rolling Line, Features Equipment, Rolling Technology, Controlled Thermomechanical Rolling. Adjusting Hot Rolled Strips.	
			2-nd Year	2	**Material properties** 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 material control.	3
			2-nd Year	2	**Environmental protection in industry** Environment and environmental quality. Environmental pollution. Air quality and protection. Quality and soil protection. Quality and protection of aquatic ecosystems. Monitoring the quality of environmental factors. General notions in epidemiology. Introduction to public health: definitions, purpose, objectives. Health inequities and inequalities	3
			2-nd Year	2	**The theory of plasticity and material breakage** Stresses and Strains. Strain state. Stress state. Plane strain and plane stress. Analysis of Stress. Mohr's Representation of Stress. Analysis of Strain Rate. Plasticity criteria. Von Mises and Tresca criteria. Laws of deformation. Constitutive equations. Basic Concepts of Dislocations . Characteristics of Dislocations. Slip Systems. Slip in Single Crystals. Plastic Deformation of	3

					Polycrystalline. Deformation by Twinning. Failure. Fundamentals of Fracture. Ductile Fracture. Brittle Fracture. Principles of Fracture Mechanics. Brittle Fracture. Static Fatigue. Impact Fracture. Cyclic Stresses. Crack Initiation and Propagation. Crack Propagation Rate. Factors That Affect Fatigue Life. Environmental Effects.	
			3-rd Year	1	**Database** Getting Started with Databases: Exposing, Probleming, Exposing, Database Databases and Database Management Systems: Defining the Database. Properties. Definition of SGBD. Functions. Classification. Data models. Relational Model Relational Database Operations Language for Relational Databases. SQL commands. Design of relational databases: Data dependence. Normalization. Examples. Other objects of the database. Data protection.	3
			3-rd Year	1	**Elaboration of Non-Ferrous Metals and Alloys** Classification of non-ferrous metals and alloys Elaboration of heavy non-ferrous alloys Elaboration of light non-ferrous alloys Physico-chemical processes occurring in non-ferrous metals and alloys production Casting of non-ferrous metals and alloys. Elaboration of heavy non-ferrous alloys Elaboration of light non-ferrous alloys Calculation of load for various non-ferrous alloys. Determination of the different elaboration of metals and alloys	4
			3-rd Year	1	**Computer-Assisted Manufacturing and Prototyping Techniques** Prototype piece. The concept of rapid prototyping. CAD model. 3D scanning	5

					techniques. Patterns. Classification. Stages of obtaining a prototype model quickly. Making patterns by stereolithography (SLA). Making models by the LOM process. Making models by Digital Light Exposure (DLP). Making models using the Laser Selective Sintering Process (SLS). Making patterns by deposition process melt (FDM). Making models by laser metal sintering (SLM). Making models using the polyjet printing process with photopolymers (PJP). Models obtained by treating the base layer (SGC). Inkjet printing (3DP) models. Technological problems of manufacturing and applications.	
			3-rd Year	1	**Composite Materials** Introduction. Definition and classification of composite materials. Areas of use of composites. Comparisons between the properties of classical materials and the properties of composite materials. The constituent phases of composite materials. Matrices. Reinforcements. Composites with metal matrix. Composites with polymeric matrix. Composites with ceramic matrix. Fiber used for hardening of composites. Matrix-armature load transfer. Mechanical properties of fiber reinforced composites.	4
			3-rd Year	1	**Physical Metallurgy** Introduction to material science. Definition, relationship with other branches of technical sciences. Correlation composition - structure - properties - uses. Classification of materials: metallic materials, ceramics, polymers, composites, nanomaterials and multifunctional materials. Material properties. Structure and organization of materials. Crystalline structures specific to metals.	5

					Punctual, linear, surface imperfections. Structure of Polymers Amorphous and Semicrystalline Structure. Polymorphism. Physical and chemical constitution of metallic materials. The constitutive phases. Structural constituents. Non-metallic inclusions. Crystallization of metals. Thermodynamic conditions of crystallization. The mechanisms of crystallization. Crystallization kinetics. Structure of castings and ingots. Phenomena related to solidification. Diffusion. Balance diagrams. Binary equilibrium charts. Balance in alloy systems. Phase law. The main types of binary equilibrium diagrams. Cooling curves in steady and practical conditions. Correlation of the balance diagram - physico-mechanical and technological properties. Ternary equilibrium diagrams. Plastic deformation. Mechanism of plastic deformation of monocrystals and polycrystalline metallic materials. Ecrusion and anisotropy. Recrystallization. Cold and hot plastic deformation. Breaking of metallic materials. Creep. General notions regarding the structure of the technical materials. The balance system Fe - C. The pure iron. Iron - carbon alloys. Metastable balance, iron - cementitious (Fe - Fe3C) balance diagram. Phase transformations to the crystallization of white steels and pigments. Quantitative determinations on the Fe-Fe3C diagram. Carbon steels. The influence of carbon on the mechanical properties of steels. Influence of permanent accompanying elements. Destination and symbolization of carbon steels. White fonts. Stable equilibrium, iron - graphite (Fe - G) balance diagram. Ash gray.	

					Influence of chemical composition and cooling rate on the structure and properties of the cast iron. Modified castles. Malleable cast iron. Destination and symbolization of the cast iron. Solid phase transformations. Critical points. The main transformations to the heating and cooling of steels. TTTI, TTTC diagrams. The main thermal treatments applied to steels. Allied steels. Non-ferrous alloys. Aluminum, aluminum alloys. Copper, copper alloys. Magnesium, zinc, titanium and their alloys.	
			3-rd Year	1	**Differences and Finite Elements Method** Introduction. Definitions. Application area. Schemes of finite differences. Approximation of finite differences of partial derivatives. Approximation with finite differences of partial parabolic derivative equations. Equation of diffusion. Applications. Finite differences applied to partial parabolic derivative equations. Equation of wave propagation. Finite differences applied to equations with elliptical partial derivatives. Laplace equation. Poisson equation. Applications. Stationary heat transfer. Non-stationary heat transfer. The precision and stability of solutions obtained by approximating with partial differences equations with finite differences. Applications for heat transfer. Finite differences in non-angled coordinates: cylindrical. spherical. Applications for heat transfer. Integration using finite differences. Applications.	3
			3-rd Year	1	**Sensors and Actuators** Contemporary sensors and actuators, mathematical models and related microprocessor systems, and ultimately to	5

					increase the share of their use. Over the last half century, computers have evolved at a very fast pace, which has made them today part of our existence through PC (Personal Computer) and DA & C (Data Aquisition and Control). Sensors, actuators and microprocessors have evolved continuously and today data acquisition and automation of local processes is feasible at low cost. The main sensors (for electrical, mechanical, magnetic, etc.) and the most important actuators (servomotor, stepper motor, relay etc.) The Arduino "open source" environment and Atmel 328U microprocessors are used.	
			3-rd Year	2	**Elaboration of Ferrous Alloys** Elaboration of the cast iron,by first fusion, in the furnace: raw materials (ores, additions, fluxes, fuels, preparation of raw materials - agglomeration and pelletization); furnace operation, furnace construction and adjacent facilities; processes that take place in the furnace). Elaboration of cast iron, of foundry: physico-chemical processes, which take place in the production of cast iron in electric arc and induction furnaces; obtaining castings with nodular graphite. Steel production: processes in the production of steel (oxidation of silicon, manganese, decarburization, dewaxing, desulphurisation, deoxidation, alloying); processes and technologies for the production of steel in the electric arc furnace and converter.	5
			3-rd Year	2	**Informatics Applied in The Structural Analysis of Materials** The equilibrium system Fe - C. The pure iron. Iron - carbon alloys. Metastable balance, iron	4

					- cementitious (Fe - Fe3C) balance diagram. Phase transformations and crystallization of steels and cast iron. Quantitative determinations on the Fe-Fe3C diagram. Carbon steels. The influence of carbon on the mechanical properties of steels. Influence of permanent accompanying elements. Destination and symbolization of carbon steels. White cast iron. Stable equilibrium, iron - graphite (Fe - G) balance diagram. Gray cast iron. Influence of chemical composition and cooling rate on the structure and properties of the gray cast iron. Modified gray cast iron. Malleable cast iron. Destination and symbolization of the gray cast iron. Solid phase transformations. Critical points. The main transformations to the heating and cooling of steels. TTTI, TTTC diagrams. The main thermal treatments applied to steels. Allied steels. Non-ferrous alloys. Aluminum, aluminum alloys. Copper, copper alloys. Magnesium, zinc, titanium and their alloys.	
			3-rd Year	2	**Multifunctional Materials** Overview of multifunctional materials. Nanostructured materials. Definition, classification and applications of multifunctional materials. The importance of multifunctional materials. Multifunctionality of nano / smart materials. Specific properties of multifunctional and intelligent nanomaterials. Characterization methods for chemical composition and structure in accordance with the properties of nanomaterials. Multifunctional materials for sustainable development. The concept of sustainable development and the impact of sustainable development	3

					Nano / Semiconductor materials. Definition, Carriers, Classification, Generation-Recombination, Size variation of nanomaterial with properties. Applications of nano / semiconductor materials. Composite materials. Characteristic features of matrix composite materials. Metal, organic, ceramic matrix. Complementary materials in the structure of composite materials. Fiber. Areas of use of nano / composite materials. Biomaterials. Types of biomaterials. Bioactivity. Bioreactivity, definition, classification, types of bioreales. Biocompatibility, definition, factors affecting biocompatibility, parameters on which biocompatibility depends, Opto / electronics materials. LED technology based on thin films. Plasma Vs. LCD. Optical and electrical properties	
			3-rd Year	2	**Practical Training** General Labor Safety Training. Using the aging machine driving ArcelorMittal Galati. Programming of Siemens PLCs for the pressure regulating system at the neck of Furnal 5 - ArcelorMittal Galati. Programming of Siemens PLCs for the temperature control system in the bell furnace of the ArcelorMittal Galati Cold Rolling Mill. Calculation Simulator Reductions in Vertical and Horizontal Cavities in the Gross Train Wagon Laminor - ArcelorMittal Galati. Artificial Visual Algorithms for Industrial Video Inspection System - Identification of defects of Form 2d - ArcelorMittal Galati. Identification of metalographic structures in images using artificial sight techniques - ArcelorMittal	3

					Galati. Optimization of the lamination end temperature according to the chemical composition of the material, the applied reduction scheme and the mechanical characteristics required by ArcelorMittal Galati. Computer-assisted management of the production line for composite aluminum panels - S.C. Profiland S.A. Galati. Modeling of sheet and strip pieces - S.C. Steel Trade Galati. Computer Assisted Management of Cold Rolling Process - S.C. Galfinband S.A. Galati. Presentation of the projects developed by the Galati software companies. Computer Assisted Manufacturing Systems - Optimizing Trajectories for Milling on NURBS - S.C. Menarom S.A. Galati. Computer assisted manufacturing systems - optimization of the technological parameters for the milling operation for NURBS surfaces - S.C. Menarom S.A. Galati. Assessment of practice practice.	
			3-rd Year	2	**Casting Processing** Shapes - Shells with Fusible Patterns Forms with Self-Adhesive Bindings. Casting Forms without Binder. Forms for casting art pieces. Forms for casting naval propellers. Casting into metallic shapes by free-flowing alloy. Casting by electric rewinding under the slag. Casting continues. Low pressure casting. .Turn to high rises. Casting centrifuge. Aspiration casting. Casting works of art using wax patterns. Special techniques for obtaining various accessories by casting. The technology of obtaining the ship's propellers. Case study - thematic films on the special processes of casting bells, jewelery and wax statues. The	4

					process and phenomena that take place at continuous casting.	
			3-rd Year	2	**Programming Graphical Interfaces** Introduction. Interface command. Graphical interfaces. Objectual programming notions. Software-specific interfaces. Interfaces for industrial software. Introduction to MFC. Application background. Animation controls. Radio button control. Label controls, editing boxes. List controls. Values-oriented controls. Modal and non-modal dialog boxes. Drag and drop control Control histogram. Derived controls	4
			3-rd Year	2	**Acquisition Systems, Interfaces and Virtual Instrumentation** General aspects of artificial vision systems (SVA). Image acquisition systems. Image preprocessing. Segmenting images. Characterization of images using histograms. Recognizing contours. Motion Detection. Calibrate the camera. 3D reconstruction algorithms. Automatic learning techniques for image recognition. Recognition techniques using neural networks. SVM techniques applied in SVA. Evaluating the robustness and performance of algorithms.	5
			4-th Year	1	**Management and Marketing** Management issues: principles and management system. Enterprise as an economic agent. Enterprise sizing and place of small and medium sized enterprises in market economy. Organizational structure of industrial enterprises. Managerial functions and functions of the enterprise. Information system. Business decision-making system. The production process and its organization. Production capacity. Operational	4

					management of production. Organization of service processes: maintenance and repair of equipment and organization of Tools, Devices and Verifiers sections.	
			4-th Year	1	**Environmental and Waste Management** Factors that have stimulated the emergence of eco-management. The purpose, objectives and functions of ecological management. Environmental management tools (action, verification, analysis, economic and financial). Environmental management systems. Implementation of an Environmental Management System (EMS) according to ISO14001. EU Eco - Management and Audit Scheme (EMAS). Environmental risk management. Industrial waste management. The main problems in the field of waste management. Sources of solid waste. Types of waste. Solid waste composition. Physical, chemical and biological properties of municipal solid waste. Technologies for the basic processing of solid waste. Biological waste treatment procedures. Waste composting. Waste methanisation. Thermal waste treatment procedures. Waste incineration. Waste pyrolysis. Waste thermolysis. Waste gasification.	4
			4-th Year	1	**Modeling Liquid Materials Processing** The object and importance of mathematical modeling in industrial processes. Advantages of mathematical modeling. The using of mathematical modeling in Romania and over the world. Classification of types of mathematical models. Linear or nonlinear patterns. Deterministic or probabilistic patterns. Static or dynamic patterns. Discrete or continuous patterns. Parameters of	5

					industrial processes. Input sizes, output sizes, state sizes. Methodology of mathematical analytical modeling: establishment of contours, determination of state equations, explanation of intermediate variables, ordering of mathematical model. Functional characterization of systems. Input-Output Models. Input - status - exit models. Function and transfer matrix. Establish the transfer function for equivalent systems. Experimental mathematical modeling (identification). Process data acquisition systems. Off-line modeling. Online modeling. Using the MATLAB program package in modeling. Introducing the MATLAB interface. Instructions and control functions. Numerical calculation with MATLAB. Graphics in MATLAB. Creating interactive graphical interfaces. The mathematical model of optimization problems. Optimization on open sets. Optimizations with equality restrictions. Elements of convex analysis. Optimal conditions. Numerical methods to solve optimization problems without restrictions.	
			4-th Year	1	**Plastic Processing of Materials** Elements of plasticity theory. Plastic deformation behavior of materials. Drawing and trenching of metals. Extrusion. Forge Metal. Molding process. Severe plastic deformation. Cold processing of sheets and strips. Processing and obtaining glass products. Processing of plastics. Technology of wood products.	4
			4-th Year	1	**Computer Networks** Getting started in the field of computer networks and data communications. Characteristics. Classification criteria.	3

					Standardization and protocols. Standardization and reference models. ISO-OSI and TCP / IP. Application support OSI levels: Session, Presentation, and Application. Internet Application Level (TCP / IP protocol suite). IP Network Equipment Configuration: BOOTP and DHCP. Name Services: DNS. World Wide Web: HTTP. Email services: SMTP, POP, IMAP. File transfer: FTP, SFTP, TFTP. Remote Access: TELNET. Network Management: SNMP. Transport Level. Elements of Transport Level Protocols. Internet Transport Level Protocols: TCP and UDP. Network Level. Short presentation. Interconnecting computer networks. Network layer in the Internet: IPv4 and IPv6, ARP and RARP, ICMP. General aspects of packet routing in TCP / IP networks. Static routing and dynamic routing: RIP, OSPF, BGP. Data Link Level. Structure. Addressing. Services and protocols. Controlling access to the environment. Ethernet, Fast Ethernet, GigaEthernet, and FDDI. Physical Level. Types of transmission media and their characteristics. Aspects of designing and managing computer networks. Structured cabling. Logical installation and configuration of a local computer network. Legal issues related to cybercrime.	
			4-th Year	1	**Powder Processing Technology** Obtaining powders: Mechanical, physico-mechanical, chemical, physico-chemical methods. Criteria for choosing the production process. Powder classification. Classification methods; Installations, working parameters. Powder properties: physical properties, chemical properties, technological properties.	4

					Preparation of powder mixtures: components of addition, dosing of mixtures, homogenization of mixtures. Formation of powdered products: cold pressing in steel molds, hot pressing, isostatic, step by step. Laminating, powder extrusion and sinter matritation. Casting molding; by injection; through free spill in molds, through vibration. Field electromagnetic field training. Choosing the pressing process. Sintering of powdered products. Solid phase sintering of monocomponent systems, polycomponents. Sintering in the presence of a liquid phase. Processing of sintered products. Machining, calibration, thermal and thermochemical treatments, infiltration, steam oxidation. Characterization of sintered products.	
			4-th Year	1	**Thermal and Thermochemical Treatments** The importance and efficiency of applying heat treatments; The place (role) of thermal treatments in the production of metallurgical products (flat laminates, forged parts, castings); Development trends and new technologies for thermal and thermo-chemical treatment. The structural, use and technological characteristics of the metallic materials that are thermally and / or thermochimically treated. Characteristics of the chemical interaction between the heating / cooling media and the surface of the heat-treated metal products. Specific heating / cooling processes and their thermal regimes. Thermal and Thermochemical Technology Designing by Product Groups. Technical documentation of the technological process of heat treatment (operation plan, technological sheet, drawing of the piece, organization of	5

					the technological flow). Technology of thermal treatments applied to semi-finished products, bars and profiles, rolled and extruded from steel. Technology of thermal treatments applied to wire. Technology of thermal treatments applied to steel sheets and strip. Technology of thermal treatments applied to steel pipes. Thermal and thermochemical treatment technologies applied to steel, cast iron and non-ferrous alloys. Thermal and thermochemical treatment technologies applied to steel tools. Quality control of thermally treated products. The objectives of the control activity, methods and conditions specific to the control of 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.	
			4-th Year	2	**Automation of technological processes** General notions. Automatic adjustment systems. The main components of automatic control systems. Operating systems of automatic systems and their characteristics. Automatic measurement of the main technological variables: temperature, fluid flow, pressure, air and gas humidity, chemical composition, angular position, rotational speed, sheet and band thickness, carbon potential and dew point. Extreme regulation of metallurgical plant parameters.	4
			4-th Year	2	**Materials Degradation and Protection** Mechanisms of surface degradation.	4

					Measures to reduce wear. Modeling the tribological behavior of materials. Increase product durability through surface engineering technologies. Modeling of surface modification processes. Corrosion and corrosion protection of metallic materials. Modeling of corrosion processes of alloys. Corrosion of metallic materials at high temperatures. Methods of protection of metals and alloys against corrosion.	
			4-th Year	2	**Graduation project elaboration** Content: Bibliographic documentation. Identify and describe the materials and methods used for the license work. Experimental research on the proposed theme. Visits to medical units, laboratories for the purpose of data collection and harmonization with the theme of the chosen research. Interpretation of results and their reporting to other results from the literature. Modeling / optimization of the technological process. Making a synthetic presentation of the results.	3
			4-th Year	2	**Quality Management** Quality concept. Definitions. The concept of quality. Characteristics of the quality. The new signification of the quality. Evolution of the quality concept. Breakthroughs in evolution of the human society and the quality. Total Quality. The structure of the industrial organizations. Customers. Suppliers. Staff of the organization. Fundamental processes in Quality Management. Management by policies. Continuous improvement. Intensive training. The management of the processes. Activity in participatory groups. Management	3

					of the product / service. Diagnosis of the quality system. Leadership. Quality Instruments. The seven statistic instruments. ISO 9000: 2015 norms. General description of ISO 9000. The requirements of ISO 9001: 2015 for quality management. ISO 9004: 2010 Leading an organization to sustainable success. An approach based on quality management. OHSAS 18001: 2008 for Occupational Health and Safety Management. OHSAS 18001 norm. General description. Requirements of the health and safety standard at the workplace. Guidelines for integrated management system. Audit and certification of the quality management system. Quality Audit. ISO 19011: 2011. Quality Certification. Certification organizations. Quality Awards. The EFQM model.	
			4-th Year	2	**Ceramic and Refractory Materials** Definition and classification of ceramic materials. Ceramic materials structure. Phase equilibria in ceramic oxide systems. Traditional ceramic materials. Advanced ceramic materials. Ceramic materials with applications in the electrical / electronic field. Ceramic materials with applications in the mechanical field. Ceramic super-refactories materials. Nanostructured ceramic materials	4
			4-th Year	2	**Process Modeling and Optimization** The object and importance of mathematical modeling in industrial processes. Classification of types of mathematical models. Parameters of industrial processes. Methodology of mathematical analytical modeling. Functional characterization of systems. Function and transfer matrix.	4

					Experimental mathematical modeling (identification). Using the MATLAB program package in modeling. The mathematical model of optimization problems. Optimization on open sets. Optimizations with equality restrictions. Elements of convex analysis. Optimal conditions. Numerical methods to solve optimization problems without restrictions.	
			4-th Year	2	**Modeling and Simulation of Solid State Processing** Objectives of assisted design. General aspects of assisted design in CATIA V5. Module CATIA Sketcher. Tools for sketching. Constraint tools. Part Design Module. Tools for three-dimensional modeling. Three dimensional model editing tools. Module CATIA Drafting. Interactive Drafting sub-module. Generative Drafting submodule. Basic concepts in finite element analysis. Determination of Finite Element Analysis Parameters. Processing the results of the finite element analysis.	4
			4-th Year	2	**Design and Use of Materials** General considerations on the selection of materials and their processing. Material information and processing. National and international standardization. Selection methodology: the competitive principle of the market economy Selection methodology: Requirements analysis of the material Selection methodology: adapting methods to company production capabilities Selection methodology: material costs, material workability Economical aspects of materials	3

					Qualitative assessment of material properties. Coefficient of use of materials. Material competition. Requirements imposed on materials. Classification of material requirements. The process of designing products and technologies. General. Steps of the design process: project definition. Stages. Designing the technological process (system, technology). Steps of the design process: Identify the design problem. Problem determination (details of the design theme). Organization of design work. Planning the design activity. Running the project and recording progress. Programming activities. Sequence chart of activities. Brainstorming. Improve preliminary ideas. Analysis of preliminary ideas. Decision. Presentation of the project. Implementation.	

***Dunarea de Jos* University of Galati**
Faculty of Engineering
Study programme – Materials engineering

Materials Science	**bachelor, level 6 from NQF, EQF**	**Materials Engineering**	**1-st Year**	1	**Mathematical Analysis** **Course content:** Chapter I. Strings and series of real numbers. Convergence of strings and real number series. Convergence criteria. Head. II. Differential calculus. Real variability of real variable function. Taylor's form. Series of powers. Functions of several variables. Limit, continuity, derivability, and differentiability for multi-variable functions. Partial derivatives of superior order. Extremes free and with links. Elements of field theory (gradient, divergence, rotor). Head. III. Full calculation. Primitive. Methods for determining primitives. Integrala definita. Incorrect integrations. Integral curves of spheres I and II. Integrates the curves independent of the road. Multiple integrations (double, triple, surface). Integer formulas. Chapter IV. Differential Equations. Differential equations of order I: differential equations with separable, homogeneous, linear variables, Bernoulli, Riccati, Lagrange, Clairaut. Problem of Cauchy. Higher linear differential equations. **The content of the seminar or practical papers:** Applications to the coursework topics.	5
			1-st Year	1	**Chemistry** **Course content:** 1. The History of Chemistry Development. Fundamental notions. Classification of chemicals. Aggregation states of matter. Status Transformations. 2. Fundamental Laws of Chemistry. Elements of structure of atoms. 3. Atomic models. Orbital atomic. Quantum numbers. Electronic layers. Electronic substrates. Periodic system of	5

					elements. 4. Law of periodicity and properties of elements. Rules for setting oxidation numbers. Electronic configurations of atoms. Chemical connections. The ionic bond. 5. Chemical bonds. The covalent bond. Coordinative link. Metal bond. Intermolecular links. 6. Disperse systems. Classification of solutions. Modes of expression of solution concentrations. Solutions Laws. Suspensions. Colloidal systems. Acid-base reactions (neutralization reactions). PH indicators. Balances in salt solutions. 7. Redox reactions. Types of redox reactions. Series of redox activity. Galvanic cells. Electrolysis. The laws of electrolysis. Applications of electrolysis. Precipitation reactions. Complexity reactions. 8. HYDROGEN. Natural state. Obtaining. Physical and chemical properties. Use. METALS. Natural state. General methods of obtaining and purifying metals. General physical properties of metals. General chemical properties of metals. Alloys. 9. Group 1 of the Periodic System. General characterization of the element and combinations of Group IA elements. Natural state. Obtaining. Physical and chemical properties. Main combinations. Uses. Group 2 of the regular system. General characterization of elements and combinations of Group IIA elements. Natural state. Obtaining. Physical and chemical properties. Main combinations. Uses. 10. GROUP 13 of the Periodic System. General characterization of elements and combinations of elements in Group IVA. ALUMINUM: Natural condition. Obtaining. Physical and chemical properties. Main	

					combinations. Uses. Group 14a (IVA) of the Periodic System. General characterization of elements and combinations of elements in Group IVA. Carbon and Silicon: Natural state. Allotropic forms. Obtaining. Physical and chemical properties. Main combinations. Uses. 11. GROUP 15 of the Periodic System. General characterization of elements and combinations of elements in group VA. Nitrogen and Phosphorus: Natural state. Allotropic forms. Obtaining. Physical and chemical properties. Main combinations. Uses. Group 16 of the regular system. General characterization of elements and combinations of Group VI elements A. Oxygen and Sulfur: Natural state. Allotropic forms. Obtaining. Physical and chemical properties. Main combinations. Uses. 12. GROUP 17 of the Periodic System. General characterization of elements and combinations of elements of group VII A. CLOR: Natural state. Obtaining. Physical and chemical properties. Main combinations. Uses. GROUP 18th. Rare gases (noble) .Style natural. Obtaining. Physical and chemical properties. Main combinations. Uses. 13. Transitional metals: Groups III B - VII B. General characterization. Important combinations. Uses. Group VIIIB (groups 8, 9, 10). Fe, Co, Ni: General characterization. Natural state. Methods of obtaining. Physical and chemical properties. Uses 14. GROUP I B. General characterization. Natural state. Methods of obtaining. Physical and chemical properties. Group II uses B. General characterization. Natural state. Methods of obtaining. Physical and chemical properties.	

					uses **The content of the seminar or practical works:** 1. Labor protection in the chemistry lab. Presentation of laboratory work. 2. Modes of expression of solution concentrations (c%, n, m, t, f). Troubleshooting modes. 3. Ways to solve chemistry problems. Applications. 4. Introductory notions in quantitative analytical chemistry. PH measurement. Titration 5. Alkalimetry: Determination of titre, factor and normality of NaOH solution ~ 0.1N. 6. Acidimetry: Preparation of 0.1N HCl solution. Determination of titre, factor and normality of HCl solution ~ 0.1N. 7.Determination of water hardness 8.Gravimetry. Fe Fe in oxide form. 9.Measures to solve chemistry problems. Applications. 10. Introductory notions in qualitative analytical chemistry. Analytical classification of cations and anions. Preliminary analysis of cation dosing. 11. Recognition of Group V cations. 12. Recognition of Group Anions. I. Recognition of Group II Anions. Recognition of Group III anions. 13.Measures to solve chemistry problems. Applications. 14. Laboratory colloquium	
			1-st Year	1	**Communication** Communication, principles, units and characteristics of communication; the effects of communication, the intelligibility of the message; levels of human communication. The principles of effective communication: clear, complete, concise, concrete, fair, receptive, courteous message. Nonverbal communication. Communication networks. Communication in conflict management.	2

					Communication and listening. Presentation of techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Data integration. Media elements. Structure of technical-scientific works: papers, studies completion, papers and scientific papers, projects. Human-to-human interaction mediated by web and audio-video technologies.	
			1-st Year	1	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a	1

					bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			1-st Year	1	**Physics** **Course content:** Elements of physical mechanics Statics and dynamics of fluids. Oscillations and elastic waves. Elements of molecular physics. Thermodynamic elements. Elements of quantum mechanics, atomic and nuclear physics. **Content of seminar or practical works:** Processing of experimental data. Electrical and magnetic methods. Methods for determination of the propagation velocity of waves. Methods of temperature determination. Determination of liquid viscosity. Determination of density and superficial tension. Experiments in atomic physics. Problems related to the chapters studied at the course.	5
			1-st Year	1	**Descriptive Geometry** **Course content:** Chapter 1. Projection systems: Conical projection, cylindrical projection, quoted projection. Chapter 2. Representation of the point, the straight and the plane: The representation of the point in space and in the purge in the double and triple orthogonal	5

					projection. Representation of the straight into space and purge, simple straight and double particular, relative positions of the two straight. The representation of the plane in space and in the purge, the right and the point contained in the plane, the particular straight lines contained in the plan, the simple and double particular plane, the relative position of the two planes, the relative positions of a straight to a plane, the straight and the plane perpendicular, purge. Head. 3. Polyhedra: Definition, classification, representation of polyhedra. Polyline flat sections. Intersection of polyhedra with right. Deploying polyhedra. Head. 4. Cylinder and cone: Definition, classification, representation of cylindrical-conical bodies. Flat sections with cylindrical conical bodies. Intersection of cylindrical-conical with right. Deploying the cylinder and cone. Head. 5. Sphere: Sphere representation, points on the sphere, plane tangent to the sphere, plane spheres through the sphere, intersection of a straight with a sphere, unfolded to the sphere. Head. 6. Intersections of geometrical bodies: Polyhedral intersections, intersections of cylindrical-conical bodies, cone and cone intersections with cone and cylinder **The content of the seminar or practical works:** 1.Applications to the representation of the point, the right and the plane: The representation of the point in space and in the purge, in the double and in the triple orthogonal projection; representation of straight and double private straight lines, determination of traces and crossings	

					crossed by the right, intersections of planes and plates, visibility in the purge. 2. Applications in the Polyhedra chapter: The intersection of some particular planes with pyramid and prism, straight intersections with prism and pyramid, prism and pyramid deployments. 3. Applications in the chapter cylinder and cone: The intersection of any planes and particular planes with the cone and the cylinder, the intersections of straight with the cylinder and the cone, the rollers of the cylinder and the cone. 4. Sphere applications: Sphere intersection with particular plane and planar plane, the intersection of the straight line with the sphere, unfolded to the sphere. 5. Applications in the intersection of geometric bodies: Intersections of polyhedres, intersections of cylindrical-conical bodies, intersections of sphere with cone and prism.	
			1-st Year	1	**English** **Course content:** Communication, principles, units and characteristics of communication; the effects of communication, the intelligibility of the message; levels of human communication. The principles of effective communication: clear, complete, concise, concrete, fair, receptive, courteous message. Nonverbal communication. Communication networks. Communication in conflict management. Communication and listening. Presentation of techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Data integration. Media elements. Structure of technical-scientific	2

					works: papers, studies completion, papers and scientific papers, projects. Human-to-human interaction mediated by web and audio-video technologies. **The content of the seminar or practical works:** Technical and business correspondence. Design and drafting CV (European format). Letter of intent. Interview selection, employment, promotion on the job. Oral and written presentations. Technical and scientific works: papers, studies completion, papers and scientific papers, projects.	
			1-st Year	1	**Materials Science and Engineering** Introduction. Types of materials. The link between chemical composition-processing conditions-property structure. Atomic architecture. Crystalline structure, crystalline imperfections. The amorphous structure. Diffusion. Diffusion laws. Solidification of metallic materials. Alloy systems. Diagram of phase equilibrium. Fe-C alloy system. Transformations of solid state phases. Thermal treatments; Non-ferrous alloys. Aluminum and copper; Ceramic materials. Plastic materials. Composite materials	5
			1-st Year	2	**Linear Algebra, Analytic Geometry and Differential** **Course contents:** Cap. I. Matrices, determinants. Systems of linear equations. Assembling and multiplying two matrices, calculating the determinant of a matrix, inverse of a matrix. Solving systems of linear equations. Head. II. Vector spaces. Space and vector subspace. Linear variety. Addiction and linear independence. Base and size. Changing the coordinates of a vector	4

					when changing the base. Head. III. Linear Applications. Definition of a linear application, examples, properties, image and kernel, associated matrix. Isomorphism of vector spaces. Own vectors and own values. Diagonalization of a matrix. Head. IV. Functional linear, bilinear, square. Definition, matrix attached, canonical expression of a square functional. Head. V. Euclidean vector spaces. Scalar product, norm, angle, projections. Ortonormate bases. Orthorhombic procedures. Head. VI. Free vectors. The notion of free vector and bound vector. Vector space of free vectors. Scalar product, vector product, mixed product, double vector vector of free vectors. Head. ARE YOU COMING. Plan and right in E3. Cartesian landmark, coordinate systems in space and plan. Changing the landmark. Equations of the plan. Distance from one point to a plane. Relative positions of two planes, planar beam. Types of equations of a straight line in E3. Relative positions of two straight lines; competition and common perpendicular; point of intersection. The distance between two straight lines. Relative positions of the plane and the straight. Orthogonal projections. The symmetry of a point towards a plan, respectively face o right. Head. VIII. Cuadra. Sphere: sphere definition, sphere determination by given conditions. Intersection of the sphere with a plane. Intersection of the sphere with a right. Tangent, plane tangent to a sphere. Cuadrices on reduced equations: ellipsoid, hyperboloid, paraboloid, cylinder, con. Head. IX Elements of Differential Curve Theory.	

					Analytical representation of plane curves and space. Parameterization by arc length. Calculate the length of a curve arc. Frenet's formulas, curvature and torsion of a curve. Frenet's class. Geometric interpretation of curvature and torsion. Cap.X. Elements of surface differential theory. Analytical representation of surfaces; plane tangent and normal to a surface; calculating arc lengths of the curve and angles between two curves located on a surface. The first and second fundamental form of a surface; surface orientation. Cylindrical conical surfaces. Rotating surfaces. **The content of the seminar or practical papers:** Applications to the coursework topics. (students will learn to use the lessons studied at the course to solve problems related to course topics.)	
			1-st Year	2	**Physical chemistry** **Course content:** Chemical thermodynamics. Basic notions and magnitudes of chemical thermodynamics. Principles of thermodynamics. Phase transformations. Surface phenomena. Chemical kinetics. General aspects (kinetic parameters, classification of kinetic dpv reactions, modes of expression of reaction velocity). Formal kinetics of simple elementary reactions and complex reactions. Influence of temperature and pressure on reaction velocity, theories on reaction velocities. Elements of electrochemistry. Equilibrium phenomena in electrolyte solutions (electrolytic dissociation, ionic strength, Debye-Huckel theory). Transport	5

					phenomena in electrolyte solutions (transport numbers, electrical conductivity). Phenomena at the metal / electrolyte interface (double electrode potential, electrode potential, Nernst equation). Galvanic cells (General aspects, Classification, Thermodynamics of galvanic cells, Electrochemical generating currents / Electrochemical cells). **The content of the seminar or practical papers:** Determination of heat of reaction. Hess's law; Partially mild sizes. Determination of partial molar volumes; Ternary systems. Gibbs diagram for the water-alcohol-toluene system. The equilibrium distribution of a substance between two non-viscous solvents. Nernst's law. Adsorption. Adsorption of acetic acid on activated carbon. Influence of surfactant concentration on superficial water tension. Determination of chemical reaction rate constant. Kinetics of elemental elemental reactions I. Study of catalytic promoter and inhibitor effect on the rate of decomposition of hydrogen peroxide. Influence of temperature on reaction speed. The Arrhenius Law. Measurement of the electrical conductivity of electrolyte solutions. Electrolytic crystallization of metals. Measuring the standard potential of reversible electrodes. Electromotive force of galvanic cells.	
			1-st Year	2	**Drawings and Infographics** **Course content:** C1- Rules for drawing STAS 6134-84; C2 - Inscription of the precision elements of the execution; dimensional tolerances STAS ISO406-91, adjustments; geometric tolerances SR EN ISO 7083-2002; STAS	5

					7385 / 1,2-1985; STAS 7391 / 1,2,3,4,5- 76; C3 - Representation and quotation of STAS 5013 / 1,2,3,4-82 toothed wheels; C4- Representation of gears SR EN ISO 2203-2002; C5- Demountable assemblies: threaded assemblies, feather assemblies; Slot assemblies SR EN ISO 6413-1997; elastic fittings SR EN ISO 2162 / 1,2-1997. C6 - tree representation; drawing the execution drawing for a tree; C7 - Representation of sliding bearings and rolling bearings STAS 8953-85; SR EN ISO 8826 / 1.2-2002; C8- Representation of elements and sealing devices SR ISO 9222 / 1,2-1994; C9-C10-Representation of non-demountable assemblies: welded assemblies SR EN 22553-1995 and riveting assemblies; C11- Rules for the drawing of metal constructions STAS 11634-83; C12- Drawing rules for civil construction SR EN ISO7518-2002; C13 - Drawings of installation drawings; Symbols SR EN ISO 6412 / 1,2,3-2002; C14- Representation of kinematic schemes; symbology. **Content of seminar or practical works:** L1 - 4 hours Representation of flanges and threads. Threaded threads and threads SR ISO6410 / 1,2,3-1995. (Teaching + planing) - / LP1L2 - 4 hours - Drawings of some parts by means of revealing (cap, gear pump body); tolerances and roughness SR RN ISO 1302-2002 .- / LP2 / 1,2, L3 - 4ore - finishing LP2 L4 -4 hours- Execution drawings for sprockets in a toothed wheel assembly (cylindrical gear pump) representation of centering holes SR EN ISO 6411: 2001. Applications to STAS 5013 / 1,2, -82, SR EN	

					ISO 2203-2002. LP3 / 1.2 L5, 6 - 8 hours Gear shapes: cylindrical, conical, worm gears.LP4 / 1,2,3; L7-4 hours Compact gear pump design; LP5; L8-4 hours Overall design for a conical gearbox; the design drawing of a conical wheel STAS 5013 / 3-82 and the marking of heat treatment stas 7650-89. LP6 / 1.2; L9-4 hours Readings: Overall drawing for a cylindrical, worm gear reducer; Extraction of details and representation of: assembled assemblies - threaded assemblies, feathers STAS 1004-81, 1007-81, 1012-77, grooves and elastic, SR EN ISO 6413-1997; SR EN ISO 2162 / 1,2-1997 - LP7;	
			1-st Year	2	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in	1

					semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			1-st Year	2	**Electrotechnics** **Course content:** 1. General Electrotechnics: DC Electric Circuits: Printed Electrical Fields. Electricity. The Law of Electric Driving. Law of energy transformation into conductors. Kirchhoff's theorems. Resolving DC circuits. The balance of powers. Maximum power transfer. Theorem of power conservation in DC. Electromagnetism: The magnetic field. Magnetic induction. Magnetic Field Intensity. The magnetic flux. Magnetisation of bodies. The hysteresis phenomenon. The fundamental law of the magnetic circuit. The phenomenon of electromagnetic induction. Autoinducer. Mutual induction. Eddy currents (Foucault). The magnetic field energy. Electromagnets. Single-phase alternating current circuits: Single-phase alternating current generation. Characteristic dimensions of the single-phase alternating current. Symbolic representation of sinusoidal sizes.	3

					Laws and theorems in c.a. AC Circuit Elements. Series circuits and alternating current. Power in c.a. phase. Improving the power factor. Resonance in electrical circuits. Three-phase electric circuits: Polyphase systems. Three-phase systems. Star connection. Triangle connection. Electrical powers in three-phase circuits. Connecting the receivers in three-phase electrical networks. Connect in star. connecting in the triangle. Electrical Measurement: Classification of Electrical Measurement Devices. General notions of metrology. Constructive Principles of Measuring Devices. Analogue measuring instruments. Measurement of current intensity. Measurement of voltages. Resistance measurement. Measurement of active and reactive DC and single-phase and three-phase powers. Measurement of active and reactive DC and single-phase and three-phase energies. Measurement of impedances (inductances and capacities). Measurement of power factor. Frequency measurement. 2. Electric Machines: Electric Transformers: Single-Phase Transformer. Constructive elements. Principle of operation. Operation of the single-phase transformer. Functioning in pregnancy. Single-phase transformer yield. Three-phase transformers. Autotransformer. Welding transformers. Transformers for electric arc furnaces. Asynchronous machines: Construction elements of the three-phase asynchronous machine. Motor operation of the asynchronous machine. Electromagnetic torque of the asynchronous machine. Characteristics of three-phase	

					asynchronous motor. Starting the three-phase asynchronous motor. Adjusting the speed and reversing the rotation direction. Single-phase asynchronous motor. Synchronous machine: Construction principles of the three-phase synchronous machine. Operation of the synchronous machine as a generator. Characteristics of the synchronous generator. Parallel operation of synchronous generators. Synchronous engine operation and characteristics. Starting the three-phase synchronous motor. DC machine: Construction of the c.c. Operation of the c.c. in generator mode. Characteristics of the c.c. with independent excitement and derivation. Characteristics of the c.c. with serial excitement. Characteristics of the c.c. with mixed excitement. Operation of the c.c. in engine mode. Speed and torque of the engine torque. Engine features of c.c. with separate excitation and derivation. Engine features of c.c. with serial excitement. Engine features of c.c. with mixed excitement. The losses and the efficiency of the c.c. **Content of the seminar or practical papers:** Strength and power in DC. 2. Own inductivities, mutualities and capabilities. 3. Series circuits and current derivation Alternative. 4. Power in AC circuits. Improving power factor. 5. Single-phase transformer. Trace the transformer characteristics. 6. Asynchronous engine study. 7. Diesel engine study	
			1-st Year	2	**English** **The content of the seminar or practical works:**	2

					Semester 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 (past simple, past continuous, past perfect). 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. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			1-st Year	2	**Computers Programming and Programming Languages I** **Objectives:** Understanding the basic concepts of structure programming and building the skills needed to design advanced applications. Knowing the facilities of a modern programming environment. • Developing and testing some C language applications. **Course Content** Representation of information in numerical	5

					computers, numbering systems, alphanumeric codes, numeric codes. Algorithms and logic schemes, pseudocode language. Fundamental algorithms. Language C, introduction. Instructions. Types Input / Output Functions. Operators and phrases. Panels. **Application Content** Numerical systems: binary, octal, hexadecimal. Convert numbers from one counting system to another. Numeric codes. Representation of numbers in complement to 2. Sorting and intercalating algorithms. Fast search algorithms. Application for displaying integer values with words. Application for graphic representation of trigonometric functions over a certain range. Representing surfaces in space. Application for adding and subtracting numbers as large as possible. Show contents of whole variables in binary format. Duplicate elimination application in a text. Define some exceptions. Remove a specific word from a text. Sorting and fast search applications.	
			1-st Year	2	**Materials Technology** **Course contents:** Structure of materials. Crystalline structures. Types of metal-specific crystalline structures. Crystal imperfections Deformation in metallic crystals.Deformation of polycrystalline aggregates. Amorphous structures. Mechanical properties of materials. Resistance and plasticity. Variation of conventional voltage R with specific deformation e. Voltage variation s with deformation degree e. Rational curve. Elongation at break. Tackle at break.	5

					Hardness. Determination of Brinell hardness. Determination of hardness by Vickers method. Rockwell Hardness Determination. Resilience. Influence of temperature on material properties. Fluid properties. Visco-elastic behavior of polymers. Physical Properties of Materials. Density. Thermal expansion. Melting properties. Specific heat and thermal conductivity. Diffusion. Resistivity and conductivity. Electrochemical processes. Processing of metallic materials. Obtaining metallic nanostructures through Several Deformation Processing. Processing sheets and bands. Welding of metallic materials. Overview of welding technology. Physics of welding. Structure of welded joints. Solderability of metallic materials. Arc welding. Arc welding arc. The arc welding technology. Welding under flow layer. Welding in the protective gas environment. Welding in a slag bath. Aluminotermic welding. Welding by pressing and heating by contact electrical resistance. Plasma welding. Coating and deposition processes. Electrodeposition. Physical and chemical deposits. Organic coatings. Ceramic coatings. Coatings by thermal and mechanical processes. Bottling of bottles. Raw materials used in the manufacture of bottles. The process of manufacturing glass. Processing of ceramic materials and ceramics. Processing of plastics. Rubber processing. Processed Integrated Circuits. Silicon processing. Lithography. Thermal oxidation. Chemical deposition in the vapor state. Integrated circuits encapsulation. **Content of the seminar or practical works:**	

					Presentation of the laboratory, SSM and specific SU; The hardness attempt. Traction test. Bending on shock. The properties of the formation mixtures. Formation in two frames with classic mixture and gravitational casting. Forging, forging operations, forging in molds, molding of liquid metal. Rolling, lamination, rolling friction coefficient, variation of lamination coefficients with deformation degree. Extrusion. Processing by severe plastic deformation in order to obtain materials with ultrafine structure. Welding with manual and automatic arc under flow layer. Welding by pressure and heating by its own strength. Welding with oxyacetylene flame. Flame cutting.	
			2-nd Year	1	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development	2

					and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			2-nd Year	1	**Engineering of manufacturing** **Course content:** Technological parameters of machines and metallurgical installations Machines and equipment specific to foundry installations. Continuous steel casting machines Rolling mills and specific equipment Types of rolling mills: flow equipment, main machinery. Construction of rolling beads and its components. Rigidity of rolling beads. Pretensioned trays: computational elements, construction. Roller Cylinders: Positioning, Balancing and Adjustment of Rolling Cylinders. Equipment serving laminating beads. Semi-finished machinery heating equipment Racking and related equipment Laminating machinery and equipment: Cutting machines, machines and straightening machines Technological equipment specific for forging, molding,	4

					extruding technology Technological equipment specific to heat treatment plants Reliability and maintenance of machinery metallurgical plants Content or practical works: Analytical and experimental determinations, calculations of the technical-functional parameters, of the drive power at the following installations and equipment shall be carried out :. Rolling paths. Straight straight straightening machines. Scissors with sloping knives and scissors with parallel knives. Scissors with disc knives. Hammer for free forging. Machine flow within the main casting sections Flow of machines in the main rolling sections Determination of the rolling forces, moments and power of the drive motor in a dual duo for cold rolling of the plates Analytical and experimental determination of forces, moments and power of the drive motor on a common drive roller The analytical and experimental determination of the forces, the mechanical work and the power of the drive motor on a scissor blade scissors and a scissors with parallel knives The analytical and experimental determination of the power of the drive motor and power consumption in a straight roll machine Determination of the constructive and functional parameters of a hammer for free forging.	
			2-nd Year	1	**English** **The content of the seminar or practical works:** Semester I - Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect,	2

					Research and Development, Specialized vocabulary and discourse situations.) Grammar in focus: Past tenses (past simple, past continuous, past perfect). 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. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	1	**Numerical Methods** **Course content:** 1. ERRORS IN NUMERICAL METHODS. Introduction. Truncation Errors. Representing numbers in your computer. Errors by rounding. LINING EQUIPMENT SYSTEMS DIRECT METHODS. Introduction. Gauss removal and elimination Gauss-Jordan. Pitching and elimination Gauss-standard. Matrix operations. Inversion of a matrix Determinant of a matrix. Private Matrices. ITERATIVE METHODS. Introduction. Vector and matrix rules. The Jacobi method uses the Gauss - Seidel method. Relaxation methods. NUMERICAL	4

					INTERPOLATION. Introduction. Lagrange interpolation formula. Newton interpolation formulas by equidistant nodes. Analysis of polynomial interpolation. Cubic spline functions. NUMERICAL CUADRATURE. Introduction Rule of rectangle and trapezoid rule. Simpson's rules. Quantum Formulas Newton - Cotes. Gauss quadrature. **The content of the seminar or practical papers:** Review of programming knowledge in C ++ .. Errors in numerical methods: CONVERSIA FROM ZECIMAL IN BINAR. Gauss removal with pivoting. The reverse of a matrix. LU decomposition. Unspecified M systems. The Jacobi method. Gauss-Seidel iterative method. Lagrange interpolation. Cubic spline interpolation. Numerical quadrature: Rectangle method and trapezoid method. Quantum formula Newton-Cotes. VERIFICATION OF KNOWLEDGE.	
			2-nd Year	1	**Computers Programming and Programming Languages II** **Objectives:** Understanding the basic concepts of structure programming and building the skills needed to design advanced applications. Knowing the facilities of a modern programming environment. • Developing and testing some C language applications. **Course Content** Representation of information in numerical computers, numbering systems, alphanumeric codes, numeric codes. Algorithms and logic schemes, pseudocode language. Fundamental algorithms. Language C, introduction. Instructions. Types	4

					Input / Output Functions. Operators and phrases. Panels. **Application Content** Numerical systems: binary, octal, hexadecimal. Convert numbers from one counting system to another. Numeric codes. Representation of numbers in complement to 2. Sorting and intercalating algorithms. Fast search algorithms. Application for displaying integer values with words. Application for graphic representation of trigonometric functions over a certain range. Representing surfaces in space. Application for adding and subtracting numbers as large as possible. Show contents of whole variables in binary format. Duplicate elimination application in a text. Define some exceptions. Remove a specific word from a text. Sorting and fast search applications.	
			2-nd Year	1	**Materials Strength** **Course contents:** Chapter 1 Introduction: Definitions, structural concepts (bars), requests, approaches. Chapter 2 Cutting forces and bending moments. Chapter 3 Behavior of Materials. Chapter 4 Expansion / Compression of bars. Chapter 5 Straight section cross sections. Chapter 6 Bending of bars. Chapter 7 Bars with circular or annular section; torsion of rectangular cross-section bars. Chapter 8 Sizing / Verification Methodology of Bars. **Seminar content or practical works: Seminar** 1. Efforts diagrams on plain beams and console beams. Efforts diagrams at simple beams with consoles and inclined beams. 2. Efforts diagrams of Gerber beams and plain	4

					frames. Effort diagrams for bar systems. 3. Calculation of the main center inertia moments of the composite sections with a symmetry axis. Calculation of main center inertia moments of sections without axis of symmetry. 4. Straight bars required for stretching or compression: verification, sizing and resistance calculation. Calculation of unstable static simple axial load systems with temperature variations and displacements due to errors found during assembly. 5. Verification, sizing and calculation of resistance strength of bars required at bending. 6. Calculation of the beams displacements required at bending with the initial parameter method. 7. Verification, sizing and calculation of the resistance strength of the circular (or ring) section bars required at free torsion. Laboratory Learning to work with programs for Straight Bar Resistance and Flat and Bar Systems efforts).	
			2-nd Year	1	**Technique of analysis and characterization materials** Structure. Definition. Classification. Methods and devices that give the image of the surface structure. Methods and devices that give the image of the distribution of chemical elements. Methods and devices that give the image of crystalline network diffraction.	4
			2-nd Year	1	**Thermotechnics** **Objectives:** Presenting some general aspects to establish minimal knowledge about the thermal phenomena encountered in the technique, fundamental notions regarding thermodynamic systems. Knowledge of the	4

					fundamental thermodynamic notions necessary for the understanding and deepening of the knowledge at the specialized courses of the later years; providing the minimum knowledge necessary to establish the optimal operating conditions of thermomechanical systems and equipment. **Course Content** Fundamentals of thermotechnics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic system. Simple, reversible, open gas transformations. Periodic open thermodynamic study. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Potential thermodynamics: thermodynamics methods; the exergy of a fluid in continuous flow and permanent regime; the exergy of a fluid in a closed volume; chemical exergy. Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isocratic, isobar, isothermal, reversible and irreversible adiabatic). Wet air thermodynamics: the physical properties of wet air; i-x wet air diagram; graphical determination of wet air status; Simple wet air conversions (constant humidity content, constant temperature, constant enthalpy and mixing of two wet air	

					flows with different states). Thermodynamics of compressible fluids at high speeds. Thermodynamics of combustion of fuels. Thermodynamics of thermal machine cycles. **Application Content** Methods of temperature measurement. Measurement of gas pressure, velocity and flow. Determination of the pressure-vapor pressure dependence. Determination of wet air parameters. Determination of flow rate with diaphragms.	
			2-nd Year	2	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports	2

					games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			2-nd Year	2	**Electronics and automation** **Course content:** ELECTRONIC CIRCUIT DEVICES. Semiconductor electrical conduction concepts. Electronic Components: Diodes, Bipolar transistors. Unipolar transistors, Special semiconductor devices. AMPLIFIERS AND OSCILATORS. General properties and features of the amplifiers. AC Amplifiers (voltage amplifiers, power amplifiers). DC power amplifiers. Negative reaction to amplifiers and its consequences. Perational Amplifiers. Oscillators. REDRESSORS NOT MADE OF POWER. One-phase single-phase rectifiers. Single-phase single-phase rectifiers with resistive load. Single-phase alternating resistors with resistive load. Re-straining the filtered voltage. Three phase rectifiers. ELECTRONIC STABILIZERS. Parameters of stabilizers. Parametric stabilizers. Reacting stabilizers. Integrated voltage stabilizers. REDRESSES COMBINED BY MICE POWER. Vertical and Horizontal Command Principle. Specialized cascades for thyristor grid control. COMBINATION AND	3

					SECVENTIAL LOGIC CIRCUITS. Elementary logical functions. Fundamental relationships in logic algebra. Logical circuits. Integrated logic circuits. Combined Logic Circuits. Sequential sequential logic circuits. APPLICATIONS OF COMBINATION AND SECVENTIAL LOGIC CIRCUITS. Encoders and decoders. Electronic counters. Numeric-Analog Converters. Analog-Numeric Converters. Memory circuits. Structure of a microprocessor and a microcomputer. **The content of the seminar or practical works:** 1. Measuring and control devices specific to the electronics lab (cathodic oscilloscope, electronic voltmeter, signal generator, etc.). 2. Photoelectric elements 3. Bipolar and unipolar transistor. 4. AC signal amplifiers for small signals. Operational Amplifiers. Single-phase single-phase rectifiers and filters. Rectifiers Ordered. 6. Continuous voltage stabilizers. 7. Combined logic circuits.	
			2-nd Year	2	**English** **The content of the seminar or practical works:** Semester 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 (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse	2

					situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	2	**Fluid Mechanics** **Course contents:** Chapter 1. Measurement units. Fluid properties. The notion of continuous environment. Chapter 2. Fluid statics: Pressure and pressure measurement. Hydrostatic forces on flat surfaces. Relative equilibrium of fluids with free surface in rectilinear motion or rotation. Forces that act on immersed bodies - the principle of Archimedes. Chapter 3. Basic equations of fluid mechanics: Notions of fluid kinematics. Total Derivative. The gearbox. Acceleration field. Line current equation. The infinitesimal fluid element method. Bernoulli's equation. The laws fundamental preservation of mass, impulse and energy. Equation of continuity. Chapter 4. Navier-Stokes Equations: Deduction of the Navier-Stokes equations. Applications in case of laminar flow. Turbulent flow. Chapter 5. Dimensional Analysis and Similarity Theory. Fundamental and derived physical quantities.	3

					The principle of dimensional homogeneity. The Rayleigh method. Pi Theorem. Definition of similarity. Analysis of similarity criteria Re, Fr, Sh, Eu, Ma. Model Law. Chapter 6 Limit layer theory. Limit turbulent limit. Applications to flow around bodies. Cap 7 Flow through pipes: Laminar flow and turbulence. Effect of viscosity. The motion equation. Friction coefficient and pipe roughness. Local pressure losses. Hydraulic slope and energy slope. Pipelines - pipes connected in series and parallel. Hit of a ram. **The content of the seminar or practical papers:** Measurement of pressure. Measuring viscosity. Measure the impulse. Reynolds's experience. Flow through pipes: Calculation of friction pressure losses and calculation of local pressure losses. Flow through pipelines: Flow measurement methods. Hit of a ram.	
			2-nd Year	2	**Physical Metallurgy I** Introduction to material science. Definition, relationship with other branches of technical sciences. Correlation composition - structure - properties - uses. Classification of materials: metallic materials, ceramics, polymers, composites, nanomaterials and multifunctional materials. Material properties. Structure and organization of materials. Crystalline structures specific to metals. Punctual, linear, surface imperfections. Structure of Polymers Amorphous and Semicrystalline Structure. Polymorphism. Physical and chemical constitution of metallic materials. The constitutive phases. Structural constituents. Non-metallic inclusions.	3

					Crystallization of metals. Thermodynamic conditions of crystallization. The mechanisms of crystallization. Crystallization kinetics. Structure of castings and ingots. Phenomena related to solidification. Diffusion. Balance diagrams. Binary equilibrium charts. Balance in alloy systems. Phase law. The main types of binary equilibrium diagrams. Cooling curves in steady and practical conditions. Correlation of the balance diagram - physico-mechanical and technological properties. Ternary equilibrium diagrams. Plastic deformation. Mechanism of plastic deformation of monocrystals and polycrystalline metallic materials. Ecrusion and anisotropy. Recrystallization. Cold and hot plastic deformation. Breaking of metallic materials. Creep. General notions regarding the structure of the technical materials. The balance system Fe - C. The pure iron. Iron - carbon alloys. Metastable balance, iron - cementitious (Fe - Fe3C) balance diagram. Phase transformations to the crystallization of white steels and pigments. Quantitative determinations on the Fe-Fe3C diagram. Carbon steels. The influence of carbon on the mechanical properties of steels. Influence of permanent accompanying elements. Destination and symbolization of carbon steels. White fonts. Stable equilibrium, iron - graphite (Fe - G) balance diagram. Ash gray. Influence of chemical composition and cooling rate on the structure and properties of the cast iron. Modified castles. Malleable cast iron. Destination and symbolization of the cast iron. Solid phase transformations. Critical points. The main transformations to the	

					heating and cooling of steels. TTTI, TTTC diagrams. The main thermal treatments applied to steels. Allied steels. Non-ferrous alloys. Aluminum, aluminum alloys. Copper, copper alloys. Magnesium, zinc, titanium and their alloys.	
			2-nd Year	2	**Machine parts and mechanisms** **Course contents:** Chapter 1. General problems of machine building. Chapter 2. Mechanical engineering calculation principles. Mechanical characteristics of materials used in machine building. Form and dimensional accuracy of car bodies. Calculation at simple and compound queries. Calculation at variable requests. Safety criteria for car bodies. Reliability of car bodies. Chapter 3. Non-demountable joints. Threaded joints. Welded joints. Joining by soldering. Joint joining. Chapter 4. Removable assemblies. Threaded assemblies: thread classification; geometrical elements; screw and nut materials; the friction moment in the thread; auto-fatigue condition; the moment of friction between the nut and the bearing surface; thread calculation; calculation of assemblies with bolts without initial clamping; calculation of assemblies with initial clamping screws; fatigue calculation of assemblies with initial clamping screws; calculation of assemblies with eccentric eccentric screws; calculating the screws required at the shock. Joining of hubs and shafts: feather assemblies; chisel assemblies; pressed assemblies, polygonal assemblies. Chapter 5. Elastic assemblies Springs with traction-compression voltages; Springs with torsional voltages; Springs with	3

					bending stresses. **The content of the seminar or practical works:** Paper no. 1 - Experimental determination of fatigue resistance. Calculation of fatigue strength of machine parts; Work no. 2 - Experimental determination of the coefficient of friction in screw assemblies; Work no. 3 - Experimental determination of the load bearing capacity of a screwed-in assembled load with transverse forces; Work no. 4 - Determination of the stiffness of the elements of an assembly with bolts with initial clamping; Work no. 5 - Determination of the carrying capacity of an elastic bracelet assembly; Work no. 6 - Experimental determination of load distribution along a joint through bilateral corner welding; Work no. 7 - Experimental determination of the elastic characteristic of helical springs.	
			2-nd Year	2	**Domain Practical Training** Casting of metallic materials in castings (Mixed Casting, Turnarom): machinery and equipment for preparation of forming and milling mixtures, machinery, equipment, tools and tools for forming and milling, forming, casting and solidifying technologies, debating, cleaning, finishing, treatment thermal casting, casting special methods, casting of CTC. Hot rolling. Shed storage: reception and preparation of slates. Laminating of thick sheets (LTG): heating, furnaces, lamination line, characteristic equipment, rolling technologies, controlled thermomechanical lamination. Thermal treatment of laminated sheets, furnaces and treatment plants for	4

					thick sheets. Adjustment lines. Quality control of thick boards. Hot Rolling of Steel Strips (LBC): Heating, Furnaces, Rolling Line, Features Equipment, Rolling Technology, Controlled Thermomechanical Rolling. Adjusting Hot Rolled Strips.	
			2-nd Year	2	**Material properties** 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 material control.	3
			2-nd Year	2	**Environmental protection in industry** Environment and environmental quality. Environmental pollution. Air quality and protection. Quality and soil protection. Quality and protection of aquatic ecosystems. Monitoring the quality of environmental factors. General notions in epidemiology. Introduction to public health: definitions, purpose, objectives. Health inequities and inequalities	3
			2-nd Year	2	**The theory of plasticity and material breakage** Stresses and Strains. Strain state. Stress state. Plane strain and plane stress. Analysis of Stress. Mohr's Representation of Stress. Analysis of Strain Rate. Plasticity criteria. Von Mises and Tresca criteria. Laws of deformation. Constitutive equations. Basic Concepts of Dislocations . Characteristics of Dislocations. Slip Systems. Slip in Single Crystals. Plastic Deformation of Polycrystalline. Deformation by Twinning. Failure. Fundamentals of Fracture. Ductile	3

					Fracture. Brittle Fracture. Principles of Fracture Mechanics. Brittle Fracture. Static Fatigue. Impact Fracture. Cyclic Stresses. Crack Initiation and Propagation. Crack Propagation Rate. Factors That Affect Fatigue Life. Environmental Effects.	
			3-rd Year	1	**Database** Getting Started with Databases: Exposing, Probleming, Exposing, Database Databases and Database Management Systems: Defining the Database. Properties. Definition of SGBD. Functions. Classification. Data models. Relational Model Relational Database Operations Language for Relational Databases. SQL commands. Design of relational databases: Data dependence. Normalization. Examples. Other objects of the database. Data protection.	3
			3-rd Year	1	**Elaboration of Non-Ferrous Metals and Alloys** Classification of non-ferrous metals and alloys Elaboration of heavy non-ferrous alloys Elaboration of light non-ferrous alloys Physico-chemical processes occurring in non-ferrous metals and alloys production Casting of non-ferrous metals and alloys. Elaboration of heavy non-ferrous alloys Elaboration of light non-ferrous alloys Calculation of load for various non-ferrous alloys. Determination of the different elaboration of metals and alloys	4
			3-rd Year	1	**Computer-Assisted Manufacturing and Prototyping Techniques** Prototype piece. The concept of rapid prototyping. CAD model. 3D scanning techniques. Patterns. Classification. Stages of obtaining a prototype model quickly. Making	5

					patterns by stereolithography (SLA). Making models by the LOM process. Making models by Digital Light Exposure (DLP). Making models using the Laser Selective Sintering Process (SLS). Making patterns by deposition process melt (FDM). Making models by laser metal sintering (SLM). Making models using the polyjet printing process with photopolymers (PJP). Models obtained by treating the base layer (SGC). Inkjet printing (3DP) models. Technological problems of manufacturing and applications.	
			3-rd Year	1	**Composite Materials** Introduction. Definition and classification of composite materials. Areas of use of composites. Comparisons between the properties of classical materials and the properties of composite materials. The constituent phases of composite materials. Matrices. Reinforcements. Composites with metal matrix. Composites with polymeric matrix. Composites with ceramic matrix. Fiber used for hardening of composites. Matrix-armature load transfer. Mechanical properties of fiber reinforced composites.	4
			3-rd Year	1	**Physical Metallurgy** Introduction to material science. Definition, relationship with other branches of technical sciences. Correlation composition - structure - properties - uses. Classification of materials: metallic materials, ceramics, polymers, composites, nanomaterials and multifunctional materials. Material properties. Structure and organization of materials. Crystalline structures specific to metals. Punctual, linear, surface imperfections. Structure of Polymers Amorphous and	5

					Semicrystalline Structure. Polymorphism. Physical and chemical constitution of metallic materials. The constitutive phases. Structural constituents. Non-metallic inclusions. Crystallization of metals. Thermodynamic conditions of crystallization. The mechanisms of crystallization. Crystallization kinetics. Structure of castings and ingots. Phenomena related to solidification. Diffusion. Balance diagrams. Binary equilibrium charts. Balance in alloy systems. Phase law. The main types of binary equilibrium diagrams. Cooling curves in steady and practical conditions. Correlation of the balance diagram - physico-mechanical and technological properties. Ternary equilibrium diagrams. Plastic deformation. Mechanism of plastic deformation of monocrystals and polycrystalline metallic materials. Ecrusion and anisotropy. Recrystallization. Cold and hot plastic deformation. Breaking of metallic materials. Creep. General notions regarding the structure of the technical materials. The balance system Fe - C. The pure iron. Iron - carbon alloys. Metastable balance, iron - cementitious (Fe - Fe3C) balance diagram. Phase transformations to the crystallization of white steels and pigments. Quantitative determinations on the Fe-Fe3C diagram. Carbon steels. The influence of carbon on the mechanical properties of steels. Influence of permanent accompanying elements. Destination and symbolization of carbon steels. White fonts. Stable equilibrium, iron - graphite (Fe - G) balance diagram. Ash gray. Influence of chemical composition and cooling rate on the structure and properties of	

					the cast iron. Modified castles. Malleable cast iron. Destination and symbolization of the cast iron. Solid phase transformations. Critical points. The main transformations to the heating and cooling of steels. TTTI, TTTC diagrams. The main thermal treatments applied to steels. Allied steels. Non-ferrous alloys. Aluminum, aluminum alloys. Copper, copper alloys. Magnesium, zinc, titanium and their alloys.	
			3-rd Year	1	**Differences and Finite Elements Method** Introduction. Definitions. Application area. Schemes of finite differences. Approximation of finite differences of partial derivatives. Approximation with finite differences of partial parabolic derivative equations. Equation of diffusion. Applications. Finite differences applied to partial parabolic derivative equations. Equation of wave propagation. Finite differences applied to equations with elliptical partial derivatives. Laplace equation. Poisson equation. Applications. Stationary heat transfer. Non-stationary heat transfer. The precision and stability of solutions obtained by approximating with partial differences equations with finite differences. Applications for heat transfer. Finite differences in non-angled coordinates: cylindrical. spherical. Applications for heat transfer. Integration using finite differences. Applications.	3
			3-rd Year	1	**Sensors and Actuators** Contemporary sensors and actuators, mathematical models and related microprocessor systems, and ultimately to increase the share of their use. Over the last half century, computers have	5

					evolved at a very fast pace, which has made them today part of our existence through PC (Personal Computer) and DA & C (Data Aquisition and Control). Sensors, actuators and microprocessors have evolved continuously and today data acquisition and automation of local processes is feasible at low cost. The main sensors (for electrical, mechanical, magnetic, etc.) and the most important actuators (servomotor, stepper motor, relay etc.) The Arduino "open source" environment and Atmel 328U microprocessors are used.	
			3-rd Year	2	**Elaboration of Ferrous Alloys** Elaboration of the cast iron,by first fusion, in the furnace: raw materials (ores, additions, fluxes, fuels, preparation of raw materials - agglomeration and pelletization); furnace operation, furnace construction and adjacent facilities; processes that take place in the furnace). Elaboration of cast iron, of foundry: physico-chemical processes, which take place in the production of cast iron in electric arc and induction furnaces; obtaining castings with nodular graphite. Steel production: processes in the production of steel (oxidation of silicon, manganese, decarburization, dewaxing, desulphurisation, deoxidation, alloying); processes and technologies for the production of steel in the electric arc furnace and converter.	5
			3-rd Year	2	**Informatics Applied in The Structural Analysis of Materials** The equilibrium system Fe - C. The pure iron. Iron - carbon alloys. Metastable balance, iron - cementitious (Fe - Fe3C) balance diagram. Phase transformations and crystallization of	4

					steels and cast iron. Quantitative determinations on the Fe-Fe3C diagram. Carbon steels. The influence of carbon on the mechanical properties of steels. Influence of permanent accompanying elements. Destination and symbolization of carbon steels. White cast iron. Stable equilibrium, iron - graphite (Fe - G) balance diagram. Gray cast iron. Influence of chemical composition and cooling rate on the structure and properties of the gray cast iron. Modified gray cast iron. Malleable cast iron. Destination and symbolization of the gray cast iron. Solid phase transformations. Critical points. The main transformations to the heating and cooling of steels. TTTI, TTTC diagrams. The main thermal treatments applied to steels. Allied steels. Non-ferrous alloys. Aluminum, aluminum alloys. Copper, copper alloys. Magnesium, zinc, titanium and their alloys.	
			3-rd Year	2	**Multifunctional Materials** Overview of multifunctional materials. Nanostructured materials. Definition, classification and applications of multifunctional materials. The importance of multifunctional materials. Multifunctionality of nano / smart materials. Specific properties of multifunctional and intelligent nanomaterials. Characterization methods for chemical composition and structure in accordance with the properties of nanomaterials. Multifunctional materials for sustainable development. The concept of sustainable development and the impact of sustainable development Nano / Semiconductor materials. Definition, Carriers, Classification, Generation-	3

					Recombination, Size variation of nanomaterial with properties. Applications of nano / semiconductor materials. Composite materials. Characteristic features of matrix composite materials. Metal, organic, ceramic matrix. Complementary materials in the structure of composite materials. Fiber. Areas of use of nano / composite materials. Biomaterials. Types of biomaterials. Bioactivity. Bioreactivity, definition, classification, types of bioreales. Biocompatibility, definition, factors affecting biocompatibility, parameters on which biocompatibility depends, Opto / electronics materials. LED technology based on thin films. Plasma Vs. LCD. Optical and electrical properties	
			3-rd Year	2	**Practical Training** General Labor Safety Training. Using the aging machine driving ArcelorMittal Galati. Programming of Siemens PLCs for the pressure regulating system at the neck of Furnal 5 - ArcelorMittal Galati. Programming of Siemens PLCs for the temperature control system in the bell furnace of the ArcelorMittal Galati Cold Rolling Mill. Calculation Simulator Reductions in Vertical and Horizontal Cavities in the Gross Train Wagon Laminor - ArcelorMittal Galati. Artificial Visual Algorithms for Industrial Video Inspection System - Identification of defects of Form 2d - ArcelorMittal Galati. Identification of metalographic structures in images using artificial sight techniques - ArcelorMittal Galati. Optimization of the lamination end temperature according to the chemical	3

					composition of the material, the applied reduction scheme and the mechanical characteristics required by ArcelorMittal Galati. Computer-assisted management of the production line for composite aluminum panels - S.C. Profiland S.A. Galati. Modeling of sheet and strip pieces - S.C. Steel Trade Galati. Computer Assisted Management of Cold Rolling Process - S.C. Galfinband S.A. Galati. Presentation of the projects developed by the Galati software companies. Computer Assisted Manufacturing Systems - Optimizing Trajectories for Milling on NURBS - S.C. Menarom S.A. Galati. Computer assisted manufacturing systems - optimization of the technological parameters for the milling operation for NURBS surfaces - S.C. Menarom S.A. Galati. Assessment of practice practice.	
			3-rd Year	2	**Casting Processing** Shapes - Shells with Fusible Patterns Forms with Self-Adhesive Bindings. Casting Forms without Binder. Forms for casting art pieces. Forms for casting naval propellers. Casting into metallic shapes by free-flowing alloy. Casting by electric rewinding under the slag. Casting continues. Low pressure casting. .Turn to high rises. Casting centrifuge. Aspiration casting. Casting works of art using wax patterns. Special techniques for obtaining various accessories by casting. The technology of obtaining the ship's propellers. Case study - thematic films on the special processes of casting bells, jewelery and wax statues. The process and phenomena that take place at continuous casting.	4

			3-rd Year	2	**Programming Graphical Interfaces** Introduction. Interface command. Graphical interfaces. Objectual programming notions. Software-specific interfaces. Interfaces for industrial software. Introduction to MFC. Application background. Animation controls. Radio button control. Label controls, editing boxes. List controls. Values-oriented controls. Modal and non-modal dialog boxes. Drag and drop control Control histogram. Derived controls	4
			3-rd Year	2	**Acquisition Systems, Interfaces and Virtual Instrumentation** General aspects of artificial vision systems (SVA). Image acquisition systems. Image preprocessing. Segmenting images. Characterization of images using histograms. Recognizing contours. Motion Detection. Calibrate the camera. 3D reconstruction algorithms. Automatic learning techniques for image recognition. Recognition techniques using neural networks. SVM techniques applied in SVA. Evaluating the robustness and performance of algorithms.	5
			4-th Year	1	**Surfaces engineering** Surface characterization: Atomic surface structure. Microstructure of the superficial layer. Geometric deviations of the surface. Roughness parameters. Surface viewing methods. Methods for determination of microdurity and nanoidation. Surface friction: Friction and lubrication. Mechanisms of surface friction. Lubrication. Use of surfaces: Wear types. Abrasion use; Adhesion bonding; Contact Usage Termination by Surface Fatigue; Fatigue by thermal fatigue; Erosion	5

					bonding. Surface Engineering Technologies: Choosing the material for wear resistance. Classification of surface engineering technologies. Superficial calving. Surface melting. Thermochemical treatments. Coatings. Welding deposits. Spray with flame and plasma. Physical and chemical methods of deposition from the vapor phase.	
			4-th Year	1	**Management and Marketing** Management issues: principles and management system. Enterprise as an economic agent. Enterprise sizing and place of small and medium sized enterprises in market economy. Organizational structure of industrial enterprises. Managerial functions and functions of the enterprise. Information system. Business decision-making system. The production process and its organization. Production capacity. Operational management of production. Organization of service processes: maintenance and repair of equipment and organization of Tools, Devices and Verifiers sections.	4
			4-th Year	1	**Environmental and Waste Management** Factors that have stimulated the emergence of eco-management. The purpose, objectives and functions of ecological management. Environmental management tools (action, verification, analysis, economic and financial). Environmental management systems. Implementation of an Environmental Management System (EMS) according to ISO14001. EU Eco - Management and Audit Scheme (EMAS). Environmental risk management. Industrial waste management. The main problems in the field of waste management. Sources of solid waste. Types	4

					of waste. Solid waste composition. Physical, chemical and biological properties of municipal solid waste. Technologies for the basic processing of solid waste. Biological waste treatment procedures. Waste composting. Waste methanisation. Thermal waste treatment procedures. Waste incineration. Waste pyrolysis. Waste thermolysis. Waste gasification.	
			4-th Year	1	**Plastic Processing of Materials** Elements of plasticity theory. Plastic deformation behavior of materials. Drawing and trenching of metals. Extrusion. Forge Metal. Molding process. Severe plastic deformation. Cold processing of sheets and strips. Processing and obtaining glass products. Processing of plastics. Technology of wood products.	4
			4-th Year	1	**Computer-Aided Design** 1. User Interface; 2D procedures; 3D procedures; Design of landmarks; 2. Parametric design; Derivatives; Highlights from the board; Repetitive features; 3. Design of assemblies; Adaptive design; Standard benchmarks libraries; 4. Functional design of assemblies; 5. Generating structures; Welded landings; Generating drawings; 6. Rendering and animation; Dynamic simulation 7. Tension analysis.	3
			4-th Year	1	**Powder Processing Technology** Obtaining powders: Mechanical, physico-mechanical, chemical, physico-chemical methods. Criteria for choosing the production process. Powder classification. Classification methods; Installations, working parameters. Powder properties: physical properties, chemical properties, technological properties.	4

					Preparation of powder mixtures: components of addition, dosing of mixtures, homogenization of mixtures. Formation of powdered products: cold pressing in steel molds, hot pressing, isostatic, step by step. Laminating, powder extrusion and sinter matritation. Casting molding; by injection; through free spill in molds, through vibration. Field electromagnetic field training. Choosing the pressing process. Sintering of powdered products. Solid phase sintering of monocomponent systems, polycomponents. Sintering in the presence of a liquid phase. Processing of sintered products. Machining, calibration, thermal and thermochemical treatments, infiltration, steam oxidation. Characterization of sintered products.	
			4-th Year	1	**Thermal and Thermochemical Treatments** The importance and efficiency of applying heat treatments; The place (role) of thermal treatments in the production of metallurgical products (flat laminates, forged parts, castings); Development trends and new technologies for thermal and thermo-chemical treatment. The structural, use and technological characteristics of the metallic materials that are thermally and / or thermochimically treated. Characteristics of the chemical interaction between the heating / cooling media and the surface of the heat-treated metal products. Specific heating / cooling processes and their thermal regimes. Thermal and Thermochemical Technology Designing by Product Groups. Technical documentation of the technological process of heat treatment (operation plan, technological sheet, drawing of the piece, organization of	5

					the technological flow). Technology of thermal treatments applied to semi-finished products, bars and profiles, rolled and extruded from steel. Technology of thermal treatments applied to wire. Technology of thermal treatments applied to steel sheets and strip. Technology of thermal treatments applied to steel pipes. Thermal and thermochemical treatment technologies applied to steel, cast iron and non-ferrous alloys. Thermal and thermochemical treatment technologies applied to steel tools. Quality control of thermally treated products. The objectives of the control activity, methods and conditions specific to the control of 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.	
			4-th Year	2	**Automation of technological processes** General notions. Automatic adjustment systems. The main components of automatic control systems. Operating systems of automatic systems and their characteristics. Automatic measurement of the main technological variables: temperature, fluid flow, pressure, air and gas humidity, chemical composition, angular position, rotational speed, sheet and band thickness, carbon potential and dew point. Extreme regulation of metallurgical plant parameters.	4
			4-th Year	2	**Graduation project elaboration** Content: Bibliographic documentation.	3

					Identify and describe the materials and methods used for the license work. Experimental research on the proposed theme. Visits to medical units, laboratories for the purpose of data collection and harmonization with the theme of the chosen research. Interpretation of results and their reporting to other results from the literature. Modeling / optimization of the technological process. Making a synthetic presentation of the results.	
			4-th Year	2	**Quality Management** Quality concept. Definitions. The concept of quality. Characteristics of the quality. The new signification of the quality. Evolution of the quality concept. Breakthroughs in evolution of the human society and the quality. Total Quality. The structure of the industrial organizations. Customers. Suppliers. Staff of the organization. Fundamental processes in Quality Management. Management by policies. Continuous improvement. Intensive training. The management of the processes. Activity in participatory groups. Management of the product / service. Diagnosis of the quality system. Leadership. Quality Instruments. The seven statistic instruments. ISO 9000: 2015 norms. General description of ISO 9000. The requirements of ISO 9001: 2015 for quality management. ISO 9004: 2010 Leading an organization to sustainable success. An approach based on quality management. OHSAS 18001: 2008 for Occupational Health and Safety Management. OHSAS 18001 norm. General description. Requirements of the health and	3

					safety standard at the workplace. Guidelines for integrated management system. Audit and certification of the quality management system. Quality Audit. ISO 19011: 2011. Quality Certification. Certification organizations. Quality Awards. The EFQM model.	
			4-th Year	2	**Advanced materials** Considerations on material structure. Structure and organization of solids. Alloys and alloy systems. Ferrous alloys. Sintered hard alloys. Structure, characteristics and use of non-ferrous alloys. Plastics, properties, characteristics and uses. Ceramic materials, structure, properties and way of production. Amorphous metal materials, characterization, properties, way of production, uses. Composite materials, properties, characteristics, way of production. Structural and functional materials. Characterization, properties and uses. Hybrid materials. New and advanced materials with special destinations.	4
			4-th Year	2	**Process Modeling and Optimization** The object and importance of mathematical modeling in industrial processes. Classification of types of mathematical models. Parameters of industrial processes. Methodology of mathematical analytical modeling. Functional characterization of systems. Function and transfer matrix. Experimental mathematical modeling (identification). Using the MATLAB program package in modeling. The mathematical model of optimization problems. Optimization on open sets. Optimizations with equality restrictions. Elements of convex analysis.	3

					Optimal conditions. Numerical methods to solve optimization problems without restrictions.	
			4-th Year	2	**Special processing of materials** Molding of liquid metal - Generalities, difficulties in molding the liquid metal and ways of reducing or eliminating them; the influence of various factors on the quality of molded metal parts; the advantages and disadvantages of the process. Molding on horizontally forged machines - General, kinematic scheme and mode of operation Advantages and disadvantages of the process. Orbital molding - Generalities, kinematic scheme and the operation of the orbital forging machine, the advantages and disadvantages of the process. Radial Forging - General, kinematic scheme and radial forging operation, advantages and disadvantages of the process Electroreflection molding - General technological and defective factors of electroreflection parts, technical and economical aspects; Explosion deformation - Deformation with gas mixture, blasting explosives, in the electromagnetic field Description of the equipment Technical and economic aspects Severe plastic deformation - Severe plastic deformation methods. ECAE, HPT, ARB methods Laminating of the folded profiles - The conditions of clamping of the strip in the first profiling cylinders, the tools and installations for profiling, considerations regarding the calibration of the rollers (cylinders) in the	4

					manufacture of folded poles. Multilayer lamination - Parameters of deformation, the peculiarity of the joint formation between layers, technological aspects of bimetal rolling Lamination of metallic powders. Elements of particle lamination theory, deformation zone parameters, powder coating machines and tools	
			4-th Year	2	**Design and use of materials** General considerations on the selection of materials and their processing. Material information and processing. National and international standardization. Selection methodology: the competitive principle of the market economy Selection methodology: Requirements analysis of the material Selection methodology: adapting methods to company production capabilities Selection methodology: material costs, material workability Economical aspects of materials Qualitative assessment of material properties. Coefficient of use of materials. Material competition. Requirements imposed on materials. Classification of material requirements. The process of designing products and technologies. General. Steps of the design process: project definition. Stages. Designing the technological process (system, technology). Steps of the design process: Identify the design problem. Problem determination (details of the design theme). Organization of design work. Planning the design activity. Running the project and	4

					recording progress. Programming activities. Sequence chart of activities. Brainstorming. Improve preliminary ideas. Analysis of preliminary ideas. Decision. Presentation of the project. Implementation.	
			4-th Year	2	**Powder Processing Technology** Obtaining powders: Mechanical, physico-mechanical, chemical, physico-chemical methods. Criteria for choosing the production process. Powder classification. Classification methods; Installations, working parameters. Powder properties: physical properties, chemical properties, technological properties. Preparation of powder mixtures: components of addition, dosing of mixtures, homogenization of mixtures. Formation of powdered products: cold pressing in steel molds, hot pressing, isostatic, step by step. Laminating, powder extrusion and sinter matritation. Casting molding; by injection; through free spill in molds, through vibration. Field electromagnetic field training. Choosing the pressing process. Sintering of powdered products. Solid phase sintering of monocomponent systems, polycomponents. Sintering in the presence of a liquid phase. Processing of sintered products. Machining, calibration, thermal and thermochemical treatments, infiltration, steam oxidation. Characterization of sintered products.	4