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

Study domain	Level (BA/MA)	Study programme	Study year	Semester	Course title and brief description	Credit units
Mechanical Engineering	**bachelor, level 6 from NQF, EQF**	**Mechanical 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.	5

					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 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**	5

					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 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	2

					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 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	1

					physics. Problems related to the chapters studied at the course.	
			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 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	5

					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	5

					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 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** **Course contents:** 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	2/5

					solid state phases. Thermal treatments; Non-ferrous alloys. Aluminum and copper; Ceramic materials. Plastic materials. Composite materials **The content of the seminar or practical works:** Metalographic Microscope. Research on the structure of materials. by optical microscopy. Sample preparation for exaggeration. to the optical microscope. Macroscopic analysis of metallic materials; Determination of non-metallic inclusions in steels. Quantitative structural determinations. Structural constituents in metallic materials; The Fe-Fe3C system. Carbon and white steel steels. Fe-graphite system. Gray fonts; Structure of plastic deformed steels. Structure of thermally treated steels. Structure of thermo-chemically treated steels. Structure and properties of welded joints. Structure of Allied Steels. Structure of non-ferrous alloys. Plastics, structure and properties. Structure of ceramic and composite materials.	
			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 when changing the base. Head. III.	5

					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	**Drawings and Infographics I** **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 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	4

					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 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	5

					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. Laws and theorems in c.a. AC Circuit Elements. Series circuits and alternating current. Power in c.a. phase. Improving the power factor.	1

					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:**	5

					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	**Mechanics I** **Course content:** Recapitulative notions about vector operations, principles and the axioms of mechanics. Moments theory: Moment of force in relation to a point and an axis; Central Axis Reduction Cases; Reducing particular systems of forces; Center of Parallel Forces. Static moments and centers of gravity, Guldin's theorems. Equilibrium of rigid subject to	2/5

					ideal bonds, types of bonds. Methods and theorems in statics of material systems: Element isolation method; Method of solidification; Method of isolating parts. Beam beams. Rubbing in the technique: Rubbing; Rolling friction; Pivoting rubbing; Rubbing in joints and bearings. Static of yarns: General equation of yarns; Wire rubbing. Applications in static technique: Parga and inclined plane; Scrapers and pulley systems; Even the screw; Brake band brake and sabot brake. Point Cinematic: Coordinate Systems; Speed and acceleration; Particular moves of the point. **The content of the seminar or practical works:** S1 - Introduction - vector operations. Applications. S2 - Moment of force relative to a point and an axis. Applications. S3 - Reduction of force systems, center axis, reduction cases. Applications. S4 - Table Centers. Applications. S5 - Equilibrium of the rigid subject to ideal bonds. Applications. S6 - Statics of material systems. Applications. S7 - Friction systems. Applications.	
			1-st Year	2	**Computers Programming and Programming Languages** **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**	5

					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	4

					conventional voltage R with specific 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	**Drawings and Infographics II** **Course content:** AutoCAD - Overview. Basics for Drawing. Enter text into graphic files. Orders for multiplying objects. Tentative notions. Polylines. Editing commands Advanced Drawing commands. 3D drawing commands: nonprimitive. 3D drawing commands: primitive. 3D editing commands. Preparation of product technical documentation **The content of the seminar or practical works:**	3

					Using basic drawing commands in AutoCAD and editing completed drawings. Quotation of drawings executed in AutoCAD. Use advanced drawing commands in AutoCAD. 3D modeling: drawing, editing. Preparation of product technical documentation.	
			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 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	3

					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	**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:	2

					Ability and inability. Assessment test.	
			2-nd Year	1	**Machine-Tools and Cutting Processing** **Course content:** Elementary notions about surface generation on machine tools. General considerations. The kinematics of generation. Generating curve: definition, materialized generators, kinematic generators resulting as a trajectory of a point or as a winding of a curved family, programmed generators. Directional curve: definition, materialized directories and kinematic directories. Basic notions of the theory of cutting and cutting tools. Construction of cutting tools. Geometry of cutting tools. Sharpening. Cutting forces. Heat sources and heat balance of the cutting process. Wear cutting tools; wear criteria. Durability of cutting tools. Cutting parameter parameters: speed, feed, depth of cut. The kinematic chain theory. Mechanism: definition, transfer ratio, linking the series. Kinematic chain: definition, classification, structure. Adjustment of kinematic chains. Links between kinematic chains. Closed kinematic chains. The main kinematic chain. Defining. Specific structures. The theory of speed. Mechanisms for speed adjustment of gears: ballad block mechanisms, with articulated, mixed wheels, with simple or complex intermediate. Mechanisms for continuously adjusting the speed: definition, structure, characteristics; constructive solutions of mechanical variators. The kinematic feed chain. Defining. Specific structures. Overlapped breasts. Specific regulation	3

					mechanisms. Kinematic chains and intermittent feeders. Kinematic threading chains, threading boxes. Special purpose mechanisms. Mechanisms for reversing the rotation direction: generalities, classification, constructive solutions. Mechanisms for transformation of movement: generalities, classification. Transformation mechanisms with self-reversing: bell-crank, oscillating sliding, rotating sliding. Transforming mechanisms without auto-reversal: screw-nut, pinion-rack. Cutting schemes. Fields of use. Classification. The normal lathe. Revolver lathe (horizontal and vertical). The vertical lathe. Milling machines. Cutting schemes. Fields of use. Classification. Milling machine with console. Planar milling machine. Longitudinal milling machine. Drilling machines. Cutting schemes. Fields of use. Classification. Banjo drilling machine. Column Drilling Machine. Drilling machine with pillar. Radial drilling machine. Planing machines. Boring and milling machine. Planing machines: cutting schemes, fields of use, classification. Shaper. Slotting machine. Boring and milling machine: fields of use, classification, construction. Pickups. Grinding machines. Spinning machine: use, classification, construction. Grinding machines: areas of use, classification, cutting schemes, abrasive bodies. External grinding machine. Inner grinding machine. **The content of the seminar or practical works:** 1. Introductory work; the general	

					presentation of the laboratory, the machine-tool room, the scope and content of the practical works. 2. Kinematic analysis of the normal lathe. 3. Kinematic analysis of the milling machine - 2 hours. 4. Kinematic analysis of the drilling machine. 5. Kinematic analysis of septicemia. 6. Kinematic analysis of the grinding machine. 7. Machine control systems.	
			2-nd Year	1	**Mechanics** **Course content:** Recapitulative notions about vector operations, principles and the axioms of mechanics. Moments theory: Moment of force in relation to a point and an axis; Central Axis Reduction Cases; Reducing particular systems of forces; Center of Parallel Forces. Static moments and centers of gravity, Guldin's theorems. Equilibrium of rigid subject to ideal bonds, types of bonds. Methods and theorems in statics of material systems: Element isolation method; Method of solidification; Method of isolating parts. Beam beams. Rubbing in the technique: Rubbing; Rolling friction; Pivoting rubbing; Rubbing in joints and bearings. Static of yarns: General equation of yarns; Wire rubbing. Applications in static technique: Parga and inclined plane; Scrapers and pulley systems; Even the screw; Brake band brake and sabot brake. Point Cinematic: Coordinate Systems; Speed and acceleration; Particular moves of the point. **The content of the seminar or practical works:**	5

					S1 - Introduction - vector operations. Applications. S2 - Moment of force relative to a point and an axis. Applications. S3 - Reduction of force systems, center axis, reduction cases. Applications. S4 - Table Centers. Applications. S5 - Equilibrium of the rigid subject to ideal bonds. Applications. S6 - Statics of material systems. Applications. S7 - Friction systems. Applications.	
			2-nd Year	1	**Mechanisms** **Course content:** Introduction. Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain (definition, classification, degree of freedom, kinematic group). Mechanisms (definition, classification, degree of mobility). Configuration analysis and kinematics of mechanisms. Vector connection equations for configuration, speeds and accelerations. Polygonal vector outline method for solving. configuration and kinematics of the mechanisms. Examples. Spatial Mechanisms. The cardan coupling mechanism. RRSC spatial patroller. RSSR spatial patroller. White mechanism - spatial crank. Force analysis of mechanisms. Engine loads, resistant, exterior, interior, variable, inertia. Determination of the reactions of the kinematic couplers of the mechanisms. The dynamics of the mechanisms. The phases of the movement. Motion equations. Energy Balance. Uniformize the angular speed with the flywheel. Calculation of the moment of inertia of the	4

					mass and weight of the steering wheel. Adjusting non-periodic variations of machine movement. **The content of the seminar or practical works:** Labor protection rules in the laboratory; Structural analysis of kinematic couplings. Structural analysis of fundamental planar mechanisms. Kinematic analysis of bar mechanisms - bar method. Kinematic analysis of bar mechanisms - the method of projection of polygonal contour of vectors. Determination of reactions to bar mechanisms - method of kinematic group isolation; Determination of Reactions to Bar Mechanisms - Method of isolating kinematic elements (matrix method). Cinematic analysis of spatial mechanisms..	
			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 INTERPOLATION. Introduction. Lagrange interpolation formula. Newton interpolation formulas by	5

					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	**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.	5

					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	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	3

					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 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	**Applied Informatics** **Course content:** 1. Introduction. Overview of the software application. Opening the session. File types and applications. Projects. Ribbon appearance. Show panel. Tools. Customize user commands. 3DModel panel (Sketch, Create, Modify, Work features, Pattern, Surfaces). Sketch panel (Constraints, Insert, Format). Inspect panel (Measure, Analysis). Tools panel (Materials, Options, Clipboard, Find).	3

					Manage panel (UpDate, Parameters, Styles, Layout, Author, iLogic, Content). View panel (Visibility, Appearance, Windows, Navigate). Environments panel (Begin, Convert, Manage). Get Started Panel (Launch, My Home, New Features, Videos & Tutorials). Vault panel. Autodesk 360 Panel Application (3D Model and 2D Representation). 2. 3D modeling of molded parts. Work strategy. Effective application and use of work tools. Applications. 3. 3D modeling of the board elements. Table development strategy. Specific working tools. Application. 4. 3D modeling of assemblies. Working principles. Application. 5. Develop 3D models of welded parts. Procedures and tools. Application. 6. 3D design of the mechanical structures in the profiles. Tools and work strategy. Applications. 7. Specific procedures for 3D modeling of plastic parts. Dedicated tools and applications. 8. Assisted Design of Mechanical Transmission I. Trees, grooves, bearings, feathers, sealing elements, constructive-functional details. Applications. 9. Assisted design of mechanical transmissions II. Automatic calculation and design of cylindrical, conical and worm gears. 10. Assisted Design of Mechanical Transmissions III. Automatic calculation and design of belts and chains. **The content of the seminar or practical works:** 1. 3D modeling of simple landmarks. Learning how to work. 2. Applications of molded parts, of complexity	

					Different. Applications for sheet metal parts. 4. Developing applications for assemblies of different difficulty parts.5. Elaboration of various applications of welded parts. 6. Applications for 3D design of the mechanical structures in the profiles. 7. Solid modeling of plastic parts. 8. Applications for automatic tree design. Modeling of auxiliary elements (bearings, grooves, feathers, seals). 9. Applications for automatic design of cylindrical, conical and worm gears. 10. Applications to belt and chain transmissions.	
			2-nd Year	2	**English** **The content of the seminar or practical works:** Semester I - Electrical. Specialized vocabulary and discourse situations. Grammar in focus: Scale of likelihood. Electronics. Specialized vocabulary and discourse situations. Grammar in focus: Subordinate clauses of result and purpose. Civil Engineering. Specialized vocabulary and discourse Situations. Grammar in focus: Comparison of adjectives. Assessment test. Semester II - Energy. Specialized vocabulary and discourse situations. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Petroleum. Specialized vocabulary and discourse situations. Grammar in focus: Prepositions of place. Writing in focus: Description. Plastics. Specialized vocabulary and discourse situations. Grammar in Focus: Quantifiers. Writing in focus: Definition and exemplification. Telecoms. Specialized vocabulary and discourse situations.	2

					Writing in Focus: Comparing and Contrasting Ideas. 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. 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	2

					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	**Mechanisms** **Course content:** Introduction. Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain (definition, classification, degree of freedom, kinematic group). Mechanisms (definition, classification, degree of mobility). Configuration analysis and kinematics of mechanisms. Vector connection equations for configuration, speeds and accelerations. Polygonal vector outline method for solving. configuration and kinematics of the mechanisms. Examples. Spatial Mechanisms. The cardan coupling mechanism. RRSC spatial patroller. RSSR spatial patroller. White mechanism - spatial crank. Force analysis of mechanisms. Engine loads, resistant, exterior, interior, variable, inertia. Determination of the reactions of the kinematic couplers of the mechanisms. The dynamics of the mechanisms. The phases of the movement. Motion equations. Energy Balance. Uniformize the	3

					angular speed with the flywheel. Calculation of the moment of inertia of the mass and weight of the steering wheel. Adjusting non-periodic variations of machine movement. **The content of the seminar or practical works:** Labor protection rules in the laboratory; Structural analysis of kinematic couplings. Structural analysis of fundamental planar mechanisms. Kinematic analysis of bar mechanisms - bar method. Kinematic analysis of bar mechanisms - the method of projection of polygonal contour of vectors. Determination of reactions to bar mechanisms - method of kinematic group isolation; Determination of Reactions to Bar Mechanisms - Method of isolating kinematic elements (matrix method). Cinematic analysis of spatial mechanisms.	
			2-nd Year	2	**Machine Parts** General problems of machine building. 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. Non-demountable joints. Threaded joints. Welded joints. Joining by soldering. Joint joining. 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;	3

					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. Elastic assemblies. Springs with traction-compression voltages; Springs with torsional voltages; Springs with bending stresses.	
			2-nd Year	2	**Domain Practical Training** **Course content:** General training on occupational safety. General notions about metal cutting. Knowledge and interpretation of technological documentation. Measuring and control equipment. Operations, tools and tools used in locksmiths. Turning. Milling. Floating and mooring. Correction. Casting. The Cooperative Workshop. Casting. Workshop. Turning. The Workshop. Casting. Workshop for cleaning molded parts. Casting. Technology for obtaining cast iron with nodular graphite. Turning. Centrifugal casting technology of the cylinder shim. Casting. Coil Shooting Machines. Hot plastic deformation sectors. Thermal and thermo-chemical treatments. Galvanic coatings. Welding. Practice colloquy	4
			2-nd Year	2	**Materials Strength** **Course contents:** Chapter 1 Introduction: Definitions, structural concepts (bars), requests,	3

					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 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	2	**Thermotechnics** Objectives: Presenting some general aspects to establish minimal knowledge about the thermal phenomena encountered in the engineering, fundamental notions regarding thermodynamics of systems. Knowledge of the fundamental thermodynamic notions necessary for the understanding and deepening of the knowledge at the specialized courses of the later years. Course Content. Fundamentals of thermodynamics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic systems. Simple, reversible, open gas transformations. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isochoric, isobar, isotherm, 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 fuel	2

					combustion. Thermodynamics of thermal machine cycles.	
			2-nd Year	2	**Dimensional Control and Tolerances** **Course contents:** Introduction. Object and importance of discipline. The principle of interchangeability. Dimensional precision. Dimensions, deviations, tolerances. Fits. Adjustment systems. System of tolerances and ISO adjustments. Microgeometric precision. Surface corrugation and roughness; causes of their occurrence, characteristics, physical parameters and roughness statistics; enrollment on their drawing. Roughness evaluation techniques. Precision of geometric shape. Deviations of the macrogeometric form. Definition of deviations, graphical representations, marking tolerances of form on drawings. Techniques for assessing macroeconomic precision. Precision of orientation and reciprocal position. Deviations from orientation, deviations from the relative position of surfaces, radial beating and frontal beating: definition, cases, representations, drawing on the drawing. Techniques to control them. Chains of dimensions. Definition, classification and methods for resolving size chains. Methods and means of measurement and control. Classification of dimensional control methods. Metrological features. Measurement errors. Universal dimensional control means. Tolerances, adjustments and control of smooth tapered assemblies, bearings and feather assemblies. Tolerances, adjustments and control of	3

					threaded assemblies. Tolerances, adjustments and control of gears and gears. **The content of the seminar or practical works:** 1. Conducting work safety training, taking students into account, presenting the laboratory and laboratory work. Presentation of the universal measuring instruments used in laboratory work. 2. External and internal dimension control with vernier and micrometric tools. 3. Control of dimensions and deviations from the geometric shape by means of comparators. 4. Measurement of surface roughness. 5. Measure angles and conicities. 6. Thread measurement. 7. Toothed wheel control. 8. Using ISO standards for calculations with tolerances and adjustments. Identifying the elements that define a tolerated dimension, establishing limit deviations for a tree and a bore, plotting the limit deviations and tolerance fields for the shaft and bore, calculating their tolerances. Identifying the type of adjustment and the system of adjustments in which it is formed, graphical representation of the fitting, determining the boundary characteristics in an assembly, calculating the tolerance of a fit. Enumeration of dimensional tolerances on reference drawings and fittings on the overall drawings. 9. Solving the dimensional chains 10. Completing the reports on the laboratory works performed. Restoration of a laboratory work not performed. Verification of the papers and final mark of the students in the laboratory	

					activity.	
			3-rd Year	1	**Hydraulic and Pneumatic Drives** **Course content:** General elements of structure of hydropneumatic systems. Organism of hydrostatic systems. distribution equipment. Pressure regulating equipment. flow regulation equipment. Auxiliary equipment for hydraulic schemes. Hydraulic schemes for different cycles. General notions about penetrating actions. Compressed air leakage. Pneumatic discharge components. Pneumatic valves. compressed air filtration. Lubrication of compressed air. pneumatic schemes. **The content of the seminar or practical works:** The apparatus that is part of the hydrostatic drive systems and its symbolization. Hydraulic pumps (with gears, pallet, axial pistons) Construction-functional analysis and calculation of hydraulic cylinders. Functional analysis of drawers with drawers Constructional-functional analysis of the pressure and flow control equipment. Single acting pneumatic cylinder with direct control and indirect control. Functional pneumatic schemes.	4
			3-rd Year	1	**Elasticity** **Course content:** Generalities on Elasticity Theory. The theory of tensions. The theory deformed. Relationships between stresses and specific deformations. Mechanical work and potential deformation energy. Particular cases of voltage state. Flat	5

					problems in elasticity theory. **The content of the seminar or practical papers:** Applications to the state of tension at a point in a body. Main stresses and main directions of the voltage state. Applications to the deformation state at a point in a body. Relationships between stresses and specific deformations. Apply Hooke's generalized law. Applications to the flat state of stress and deformation.	
			3-rd Year	1	**Machine Parts II** **Course content:** Mechanical transmission through gearing. Classification of gears. Materials, thermal treatments for gears and teeth technologies. Causes of gear loss. Cylindrical gears with straight teeth: geometrical elements, calculation of the cylindrical gear with straight teeth at bending and contact. Cylindrical gears with inclined teeth: geometrical elements, equivalent gear, forks in cylindrical gear with inclined teeth, calculation of cylindrical gear with teeth inclined at bending and contact; Conical gears: types of conical teeth, reference plane wheel, geometric elements of the conical gear with straight teeth, conical gears calculation with straight teeth at bending and contact; Cross-axle gears: classification, worm gears: geometric and kinematic elements, materials, forces in the worm gear, worm gear calculation and contact; Heat calculation of gears; Mechanisms with gears. Friction wheel drive Classification; Calculation of cylindrical friction wheel transmissions;	2

					Calculation of transmissions with conical friction wheels; Variators with friction wheels. Belt transmissions Classification; Traction capability, Forces and main stresses in a belt, Calculation of wide belt transmissions, V-Belt transmission calculation, Belt drives. Chain transmissions Classification, Force in chain transmission, Chain transmission calculation. Axes and trees Classification, materials, tree pre-dimensioning, fatigue checking, rigidity check, critical speed check. Slip Bearings Construction, materials, calculation of friction bearings U, L, M, calculation of hydrodynamic bearings, hydrostatic bearings. Rolling bearings (bearings). Classification, Symbolisation, Calculation of durability of rotating bearings, calculation of non-rotating bearings, lubrication of bearings. Clutches. Fixed permanent couplings, Permanent compensating couplings, Intermittent couplings, Automatic intermittent couplings, Safety couplings. The organs of the white crank mechanism. Force in the crank mechanism, Pistons, Biela: the calculus. Crankshafts. **The content of the seminar or practical works:** Paper no. 1 - Generating teeth in evolution by the rolling method. Work no. 2 - Restoration of the geometric elements of a straight gear with straight teeth. Work Nr. 3 - Determination of the equivalent cylindrical gear elements for cylindrical and conical gears. Work no. 4 - Elastic sliding and traction characteristic of belts. Work no. 5 - Theoretical determination of	

					friction losses in bearings. Work no. 6 - Determination of the pressure distribution in the lubricating film in the hydrodynamic lubrication sliding bearings. Work Nr. 7 - Determination by calculation of the operating characteristic of elastic couplings.	
			3-rd Year	1	**Materials Strength III** **Course content:** Chapter 1 Composite requests. Chapter 2 Stability of the elastic balance .Cap.3 Energy methods in the calculation of the bar structures. 4 Static undetermined systems. 5 Dynamic Requests Seminar content or practical works: Seminar: 1. Oblique bending of straight bars: verification, sizing and calculation of resistance capacity. 2. Problems of checking and sizing of bending shafts + torsion. 3. Bending with axial force of straight bars: verification, sizing and calculation of resistance capacity (eccentric stretching / compression). 5. Straight beam buckling (to be carried out in the laboratory, where it is determined experimentally, using the resistive electric tensometry method, the critical buckling force). Calculation of punctual elastic displacements with formula Maxwell-Mohr. 6. Solving unspecified static systems with effort method. Systems with external indeterminacy. Systems with internal undetermination. 7. Problems of dynamic stresses: through inertial and shock forces (it will take place in the laboratory, where the maximum dynamic shock voltage is determined experimentally by the resistive electric tensometry method). **Laboratory**:	4

					1. Testing for traction and compression of steels (at ambient temperature) .2. Determining the stiffness of a helical spring. 3. Resistive electrical tensometry method. 4. Determination of the critical buckling force by the resistive electric tensometry method. 5. Verification of the Navier formula using the resistive electrical tensometry method. 6. Measure the stresses and deformations at the torsion of the ring bars by the resistive electric tensometry method. 7. Experimental testing of stresses for compound requests.	
			3-rd Year	1	**Thermotechnics II** Thermodynamics of thermal agents: Real gases. The real gas properties of the gas. Van der Waals equation. Other real gas equations. Adiabatic reversible and irreversible disintegration. The effect of Joule-Thomson. Thermodynamics of vapor. Saturation vapor state vaporizes. Constant title curves. Relationship between vapor liquid state sizes. Vapor tables and diagrams. Capeyron-Clausius equation. Vapor state transformations: tr. isochora, isobar, isotherm, reversible and irreversible adiab, vapor lamination. Thermodynamics of wet air. Physical properties of wet air. Diagram i-x for wet air. Graphical determination of wet air status. Simple wet air transformations: tr. to constant moisture	5
			3-rd Year	1	**Tribology** **Course content:** Tribology - introduction. Definitions, short history. Objectives of tribology, interdisciplinarity of tribology. Tribology	2

					and global environment, requirements and perspectives. Head. 1. Basic notions and concepts in tribology. Tribosystems: structure, functions, demands, systemic analysis in tribology. Methods for tribological testing: classification, tribological test chain. Test systems. Modeling and simulation of tribological phenomena and processes. Head. 2 Interactions between triboelements. Contact processes. The mechanic of hertzian contact. Friction processes: theories of friction and wear; friction modes, slip-slip peculiarities (stick-slip effect) and rolling friction. Wearing processes: adhesion wear, abrasion wear, superficial fatigue wear, corrosion wear and fretting wear, cavitation wear, particular or combined wear, wear and tear. Head. 3. Triboelement properties. Materials used in tribological applications. The superficial layer and its tribological parameters. Changing the superficial layer properties. Head. 4. Lubricants. Classifications. Physical and chemical properties of oils; viscosity, additives. Mineral oils. Synthetic oils.Unsori. Vegetable and animal oils and greases. Solid lubricants. Unconventional lubricants. Self-lubricating composites. Chapter 5. Lubrication regimes (limit, mixed, fluid: hydrodynamic, hydrostatic, gas-dynamic). The elastohydrodynamic regimen (EHD). Chapter 6. Seals. Technical and environmental requirements imposed on seals. Materials for sealing. Types of seals. Sealing systems. Chapter 7. Machine and machine lubrication,	

					engine lubrication. Processes and lubricating devices. Lubrication Schemes and Installations. Organizing the lubrication activity. **The content of the seminar or practical works:** Laboratory: 1. Lubricants: recognition, operation with product catalogs, national and international, environmental legislation on fresh and used lubricants. 2. Determination of mineral oil properties: measurement of kinematic viscosity with capillary viscometers. 3. Study of the influence of load, body materials in contact and geometry on the characteristics of hertitian contact. 4. Friction and wear tests on the tribods of the pin / disc; determining the coefficient of friction for different materials. 5. Surface topography: realization of 2D and 3D digital profiles for new and used surfaces, interpretation of roughness parameters. 6. Friction study in threaded assemblies. 5. Identification and characterization of wear damage. 7. Case study: organizing the lubrication activity in a mechanical section. Domestic Themes: Identification, characterization and equivalence of lubricating oils (10 oils). Study of influence of load, body materials in contact and geometry on the characteristics of hertitian contact. The study loading influences, body materials in contact, and thread type on friction in threaded assemblies.	
			3-rd Year	1	**Mechanical Vibrations** **Course contents:** Cap. 1 Mechanical vibrations - general	4

					considerations. Introductory notions. Classification of vibrations. Characteristic dimensions. Measurement units. Elements of vibration kinematics. Representing vibrations using rotating vectors. Composition of harmonic vibrations. Head. 2 Vibrations of linear elastic systems with a degree of freedom. 1. Free unborn vibrations. Torsional vibrations. Elastic constants. 2. Free damp vibrations in viscous damping systems. Logarithmic Decrement. 3. Forced vibrations in systems with a degree of freedom. Forced vibrations without damping, excited by harmonic disturbing force. System behavior in resonance. System behavior near resonance. 4. Forced vibration damping in systems with a degree of freedom. Forced vibrations with damping, excited by harmonic disturbing force. Forced vibrations with damping, excited by disturbing force produced by unbalanced rotating mass. 5.Transmisibilitate. System excitement through the base. Isolation anti-vibration. Energy aspects of system vibrations with a degree of Freedom. Head. 3 Vibrations of linear elastic systems with finite number of degrees of Freedom. 1. Free vibrations of systems with finite number of degrees of freedom. Establishing motion equations using the D'Alembert Principle. Influence coefficient method. Using Lagrange equations. Own modes of vibration. The orthogonality of their own vibrational forms. 2. Forced vibrations without damping of systems with finite number of degrees of freedom. Determination of	

					Differential Equations with the D'Alembert Principle. The dynamic absorber. Use of influence coefficients for determination of differential equations. 3.Studious vibration study without damping using modal analysis. 4. Free damp vibration. Forced vibration damping. Study of vibration damped using the complex form of spinning vectors. Head. 4 Vibration of continuous systems. Longitudinal vibrations of straight bars. Turning vibrations of straight bars of circular cross section. Bending vibrations of straight beams. Head. 5 Approximate methods in the study of vibrations. The Holzer-Tolle method. Transfer matrix method. Matrix iteration method. The Rayleigh method. Head. 6 Vibration measurement. Measured sizes. Components of a measurement system. Vibration generators. Vibration caps. Measuring systems. The content of the seminar or practical works: 1. Introduction.Recapitulation of the necessary notions from previously studied subjects.Protectia muncii. 2. Free vibrations without damping in systems with a degree of freedom. 3. Free damping vibrations in systems with a degree of freedom. 4. Forced vibrations in systems with a degree of freedom. 5. Free vibrations without damping in systems with finite number of degrees of freedom. 6. Forced vibrations without damping in systems with finite number of degrees of freedom. Application work. 7. The dynamic absorber. 8. Vibrations in continuous systems. 9. Approximate methods in the	

					study of vibrations.	
			3-rd Year	2	**Finite Element Analysis I** **Course content:** 1. Generalities on Finite Element Analysis. 2. Shift method used at bars. 3. Finite element method. 4. Typical types of finite elements. 5. Applications in using the finite element method. **The content of the seminar or practical works:** 1. Initiation in the use of finished elements software and the COSMOS finite element package. 2. Study of bar-shaped structures. 3. Study of plate-shaped structures. 4. Study of molded structures with boards and bars.	5
			3-rd Year	2	**Biomechanics** **Course content:** Introduction to Biomechanics, object of study, terminology, aspects basic biomechanics; sagittal, frontal and transverse reference systems; kinematic aspects of the moving anatomical segments; static and dynamic balance. Basic Aspects of Anatomy and Physiology; cell, tissue. Presentation of programs for the transformation of the assembly of CT sections into 3D surfaces that delimit tissues according to their densities. Biomechanics of the osteo-articular system; bone; cartilage; ligament, joint. Biomechanics of the muscular system; locomotor movement; types bone lesions, muscle. Anthropometry; the proportion of human body segments, mass centers by percentages. **Seminar or Practical Content:**	3

					Using the lessons taught at the course and 3D scanning and finite element analysis, the stress states of the bone and articular system are analyzed. Making models with 3D finishes for bones and teeth. The calculation of strength and stability of long bones (femur, humerus) with a custom load for each student. Calculation	
			3-rd Year	2	**Applied Electronics** **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 SECVENTIAL LOGIC CIRCUITS. Elementary logical functions. Fundamental	3

					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.	
			3-rd Year	2	**Lifting and Conveying Machines** **Course content:** General theory and specific organs of lifting and transporting installations - Lifting equipment specific to various fields of activity. - Ancillary equipment. - Exploitation of transport equipment. - Norms S.S.M. **Content of the seminar or practical works:** Knowledge and assimilation of the specific parts of the lifting and transport equipment using documentation Specific Technical Consultations and Use of ISCIR Standards and Standards. Drawing up specific projects based on	1

					design themes specific to the course theme.	
			3-rd Year	2	**Internal-combustion engines** The course hours and papers undertake a theoretical and experimental study of the thermo-dynamic-mechanical and mechanical processes, in order to optimize them, the mechanical functioning characteristics, a study that allows the graduates to handle the design, testing, exploitation of the ICE with different destinations. **Course Content** Presentation, classification and composition of ICE. Power plants with ICE. Operation, actual operating patterns and operating regimes of the ICE. Ideal Thermodynamic Processes from ICE. Ideal cycles of ICE. The fluids used for the operation of ICE. The gas change processes at ICE. The compression process. Formation of fuel mixture and combustion. The process of relaxation. Characteristic parameters of ICE. Overcharging ICE. Static operating characteristics of ICE. Thermal balance sheet of ICE. The power plant of ICE. Ignition system of Spark ignition engine. The supply system of Compression ignition engine. **Application Content** Types of ICE and energy installations with ICE. Operation ICE of cars. Construction of mobile and fixed parts of the engine. Dismantling and mounting, determining the main dimensions of ICE. Construction of mechanisms and auxiliary installations of ICE (distribution, supply, ignition, lubrication, cooling, supercharging,	3

					starting). Experimental determination of the functional characteristics of supply: external characteristic, characteristic of propulsion, characteristic of mechanical loss.	
			3-rd Year	2	**Optimization in Mechanical Engineering** **Course content:** 1. Introduction. Formulation of optimization problems. Classification of optimization issues. Matrix differential calculus elements. Multiple convex, concave functions and convex functions. Optimal conditions. 2. Optimization algorithms for unrestricted issues. Calculate the length of the step. Determining search directions. 3.Transform optimization issues. Sign restrictions. Simple Edge Restrictions. Linear restrictions. 4. Problems with linear restrictions. Issues with equality restrictions. Allowable directions. Optimal conditions of order one. General procedure for solving. Problems with inequality restrictions. Optimal conditions. General procedure for solving. Updating the set of active restrictions. Criteria for assessing convergence. 5. Problems with nonlinear restrictions. Optimal conditions of order one. Low gradient methods. Generally reduced gradient methods. 6. Multicriteria optimization. Problem formulation. Using synthesis functions. Using Remote Functions. Effective solutions. Sorting criteria. Programming purpose. 7. Optimizing structures. Particularities of optimizing structures. Variables, objective functions and restrictions 8. Reanalysis methods. Direct methods. Using the reverse matrix. The	3

					substructure technique. Iterative methods. Approximate methods. Low Base Method. Serial development. 9. Methods for solving many variable problems. General presentation. Decomposition methods. Methods for optimizing structure reliability. **The content of the seminar or practical works:** 1. Optimize bar-based structures using spreadsheet programs. 2. Optimization of bar-shaped structures using finite element method 3. Optimization of plate structures using finite element method.	
			3-rd Year	2	**Plasticity** **Course content:** 1. Introduction Elastoplastic deformations. Perspectives of Nonlinear Calculus. Material models. Numerical approach to elasto-plasticity problems. Elasto-plastic constitutive equations. Generalized method of finite elements. Variational principles and integral forms. 2. Single-dimensional elastic-plastic request. Axial request. The elastic-perfect plastic pattern. Elastoplastic model with isotropic hardening. Elastoplastic model with mixed hardening. Expression of hardening parameters by stress or deformation. The principle of maximum plastic dissipation. Integration of elasto-plasticity equations. Using convex optimization. Solving elastoplastic problems by finite element method. 3. Elasto-plastic request of bars The elementary approach of the plastic design of the bars. Finished element of elastoplastic Timoshenko beam. Finished beam, cubic, Euler Bernoulli and Timoshenko. The RSBM bar element.	3

					Plastic node method (PNM). 4. Elasto-plastic plate request. Bending of plates. Finite elements of the board. Elastoplastic calculation of plate systems. 5. Three-dimensional plasticity. Notations. Mechanics of Continuous Environments. Elasto-plastic behavior. Plasticity J2. Variant formulations used in elasticity and plasticity. Potential thermodynamics and plastic dissipation. Using the finite element method. **The content of the seminar or practical works:** 1. The elasto-plastic one-dimensional application. Analytical problem solving. 2. Elasto-plastic request of bars. Analytical and numerical solving of problems. 3. Elastic-plastic plaque request. Numerical problem solving. 4. Three-dimensional elastoplastic request. Numerical problem solving.	
			3-rd Year	2	**Practical Training** **The content of the seminar or practical works:** 1.Models of complex structures and substructures with the finite element method using specialized programs (in modeling are used all types of finite elements studied at the disciplines, Analysis with finite elements I, Resistance of materials III, Statics, stability and dynamics Structures, Optimizations in Mechanical Engineering). 2. Estimation of stress state by the resistive electrical tensometry method (students learn how to choose the tensometric marks and tensometric rosettes, identify the areas where they can be glued, they effectively	3

					add soldering technology, learn how to handle the acquisition equipment). 3. Practice Colloquium - Ending the Activity and Granting the Qualification	
			3-rd Year	2	**Statics and structures stability** **Course content:** Statics of structures. Preliminary elements. The stiffness matrix for a structural element. Transforming loads from the structure element into loads at the nodes. Matrix of rotation. The global axle system. Assembling matrices to obtain equilibrium equations. Stability of bars. General. Computational hypotheses. Freedom degree. Critical force. Loss of stability modes. Aspects of stability of elastically embedded bars in the extremities. Continuous Beam Stability Analysis on Rigid Supports. Behavior of compressed paper in the post-critical field. Straight bar stability in the plastic field. Second order calculation by finite element method. The stiffness matrix of the finite element of the bar used in the second order calculation. The force-displacement relationship for structures. Methods for determining the solution in the second order calculation. Applications on the 2nd order calculation. Bar System Stability Study Using Finite Element Method. The stiffness matrix of the bar element in the stability calculation. Bars articulated at the ends for flat structures. Embedded bar at the ends for flat structures. The articulated bar at the ends of the space structures. The recessed bar at the ends for spatial structures. Practical solving of the stability equation. Generally stiffness matrices	4

					reduced. The symmetrical form of the stability equation. Applications for stability analysis of bar systems using ABAQUS / Cosmos finite element programs. **The content of the seminar or practical work:** Laboratory: Introduction, presentation, basics of Mathcad program Analysis of the stability of a plane structure using the Mathcad program Static analysis of the bar systems using the ABAQUS / Cosmos program Applications for the 2nd order calculation Analysis of the stability of a spatial structure using the program ABAQUS / Cosmos.	
			4-th Year	1	**Finite Element Analysis II** **Course content:** 1. Review. 2. Assembling the system of finite element method equations. Element stiffness matrix. The vectors of the forces on the element. Assembling the global stiffness matrix and the global external forces vector. Determination of the solution. 3. Linear-elastic calculation. 4. Non-linear geometric calculation. 5. Nonlinear physical calculation. 6. Dynamic calculation. 7. Flat and spatial bar systems: implementation on the Calculator. Planar and spatial plate systems: implementation on the Calculator. 9. Implementing on the computer three-dimensional finite elements. **The content of the seminar or practical works:** 1. The implementation on the computer of the finite element method of the articulated arrayed systems. 2. Implementation on the	4

					computer of the finite element method of flat bar systems. 3. The practice of calculating the structures made of bars. 4. The practice of calculating the structures made of boards. 5. Nonlinear geometry calculation practice. 6. Physical Nonlinear Practice. 7. Dynamic computing practice.	
			4-th Year	1	**Management and Marketing** **Course Content:** 1. Introductory Elements. 2. Presentation of the conceptual framework of project management. 3. Persons engaged in project management. 3.1. Categories of people involved in projects. 3.2. Selection of the project manager. Skills and abilities 3.3. Managing and managing the project team. 3.4. Methods of organizing project-oriented activities. 4. Pragmatic approach to project plans 4.1. Establishing the methods and tools required by the project. 4.2. Structure of decomposition work 4.3. Structured approach to project management. 5. Cost control and budgeting of projects 6. Methods of evaluation and analysis of investment projects. 6.1. The problem and the specificity of the investment project evaluation methods. 6.2. Specificity and role of financial assessment 6.3. The specificity and role of economic assessment. 7. Monitoring and control of projects. 7.1. Planning - monitoring - control cycle 7.2. Data collection and reporting. 8. Contracting and Acquisition 8.1. Purchasing system cycles 8.2. Specific, national and European legislation. 9. Project management in the information age. 9.1. Project management	3

					information system 9.2. Internet tools available to project managers. 10. Techniques of internal and external communication. **Content of seminar or practical works:** Laboratory: Critical road method and PERT diagrams. 2. Pay-back method 3. Method based on the rate of return (internal rate of return). 4. Tools used in project management: Work Breakdown Structures (WBS). 5. Tools used in project management: Gantt charts, SWOT analysis. 6. Designing and monitoring the project, the organizational chart and the budget with specialized software (MS Project Management, Primavera Project Planner, MS Excel)	
			4-th Year	1	**Contact Mechanics** **Course content:** 1. The normal contact of the elastic bodies as the problem of spatial elasticity. Resolving space elasticity issues with potential travel functions. 2. Problem of the elastic semisposition driven by a task normally concentrated. The problem of the elastic semisposition caused by a normal distributed load. The problem of the stiff punch pressed on a resilient semaphotic with a normal force. 3. The theory of contact of two elastic bodies - Hertz theory. Computational relations for the hertzian contact of solid bodies with simple geometry. 4. The contact state of two elastic bodies - Hertz theory. Computational relations for the hertzian contact of solid bodies with simple geometry. 5. Voltage state in the general case of the elliptical contact surface.	4

					Voltage status in case of initial contact on a line. Influence of tangential forces on the voltage state. 6. Numerical development in contact analysis using the finite element method: Lagrange multipliers method, penalty methods, combined methods, direct methods, mortar methods. 7. Numerical development in the analysis of the contact using the finite element method: comparisons between methods on simple systems. 8. Solving contact problems with company programs that have implemented the contact element. 9. Consider friction between bodies in contact. 10. Adherent contact. Influence of surface roughness in contact. 11. Contact Algorithms. 12. Difficulties in shaping the contact between the bodies: specific problems in the case of unilateral contact, problems in determining the shape and dimensions of the contact area, uneven contact (combined contact areas - adherent and slip), parts of the same body that come in contact, of "polygon" - numerical interpenetration of the bodies. 13. Elastoplastic contact problems. 14. Non-linear behavioral contact bodies. **The content of the seminar or practical works:** 1. Verification of the analytical expressions of stresses within the elastic semisposition driven by a normal concentrated load using the finite element method. 2. Bars in unilateral contact conditions (beams on discontinuous elastic medium and beams on offset supports). 3. Friction contact between plates (2D modeling). 4. Study of arched sheets with finite elements (2D	

					modeling). 5. Dynamic analysis of a Coulombian damping system. 6. Hertzian contact between a cylinder and a rigid plane. Contact hertzian between two spheres. 7. Rubber cylinder pressed between two plates. Project Themes: 1. The contact stress voltages in polygonal connections (PC3, PC4) based on the transmitted torque and the type of joint 2. The contact stress curve in the friction joints based on the transmitted torque and the imposed geometry	
			4-th Year	1	**Mechanics, Construction and Design of Structures II** **Content of the course:** 1. General principles regarding the introduction of structures. Introduction. Design Methodologies. Modern design methods. Specific design methods. Design systems (design software). 2. Mechanics of spaceframe engineering structures. 2.1 Modeling of structural elements: bars, frames, grids, slabs, planes, the additional slab used in the design of metallic structures composed of planes. Modeling links. 2.2 Design engineering based on assumed risk. 2.3 Probabilistic approach to tasks. 3. Construction, design and calculation of engineering frames of spatial frames (Marine drilling units). 3.1 Construction of marine structures. General. Classification of marine structures. Hydrocarbon extraction technologies. Fixed marine structures. Mobile marine structures: semisubmersible, submersible, UFM class. 3.2 Calculation of marine structures. Methods of calculation: static calculation,	1

					dynamic calculation (vibrations). Task modeling: waves, wind, sea currents, ice, earthquakes. 4. Specific rules and regulations for ISSC design (International Ship and Offshore Structures Congress) Organization and purpose of ISSC. Specific to ISSC's IV-Design Methods. ISSC Recommendations on Marine Structures Design. Use of Eurocodes, Romanian SR-EN standards and international rules and regulations. 5. Project management. **Content of the seminar or practical works:** Laboratory: 1. Determination of the dimensions of the marine structure according to the design theme. 2. Determination of calculation tasks. 3. Modeling the marine structure with finite elements. 4. Static and dynamic calculation of marine structure. 5. Interpretation of structure response. 6. Support the project.	
			4-th Year	1	**Modeling and Simulation of Mechanical Systems Dynamics** **Course content:** General theorems in mechanical systems dynamics: Theorems impulse and kinetic momentum (torsion theorem), kinetic energy theorem, preservation of mechanical energy. Particular movements of mechanical systems: Moving rigid with fixed axis, rigid point rigid and rigid in parallel plan motion. Application of Differential Principles in the Dynamics of Mechanical Systems Dynamics: D'Alembert Principle, Virtual Mechanical Work Principle and Virtual	4

					Speed Principles. Collisions and percussions: Elastic and plastic clashes, restitution coefficient, Carnot theorem. Gyroscope and gyroscopic effect. Dynamics of variable mechanical mechanical systems Vibration of systems with a finite number and infinite degrees of freedom: Free vibrations; Damaged vibrations; Forced vibration, resonance; Parametric and nonlinear vibrations, vibrating machines: Narrow bandwidth and bandwidth processes, dynamic response to forces non-harmonic excitation; Dynamics of vibratory machines support linear elastic elements; Vibratory machines support rigid joints. Modeling of torsional vibrations of mechanical systems for rotation movement. **Content of the seminar or practical works:** Recapitulation of fundamental notions in the dynamics of mechanical systems). Introduction to the Octave or Matlab programming language. Applications. Instructions and control functions. Numerical calculation. Functions for data analysis. Common mathematical functions. Applications. Graphics in Matlab. 2D and 3D elementary and special charts. Interactive graphical interfaces. Applications. Solving mechanical engineering problems using Octave or Matlab (low complexity). Applications. Solving mechanical engineering problems using Octave or Matlab (medium complexity). Applications. Mechanical engineering problems solved using Octave	

					or Matlab. Individual themes. Applications. Modeling system vibrations with a finite number of degrees of freedom, rigid systems; Applications. The project includes: - Numerical implementation in Octave or Matlab of some Mechanical problems solved in the Mechanics course: - Applied work Nr. 1 - Applicative work Nr. 2 (variant 1, 2, 3) - Numerical solving and implementation of a material point dynamics problem	
			4-th Year	1	**Static and Dynamic Stability of Structures II** **Course content:** Introduction to building dynamics. Introductory notions. Object of Structure Dynamics. Dynamic action. Vibrations of elastic structures. Vibration damping. The opportunity of dynamic structure calculation. The dynamic response of a structure. The dynamic response of systems with a degree of freedom. Schematic of the structure. Determining the inertial and elastic characteristics of the calculation scheme. Mechanical model. The vibration equation produced by any disruptive force. Unstimulated free vibrations. Forced vibrations unabsorbed. Dynamic response of the structure to the action of a finite impulse. H. Dynamic response to the action of a disturbing force P (t). The dynamic response to the action of a harmonic force applied to the mass. The dynamic response to the action of forces that are not applied to the mass. The dynamic response to the action of a mobile force. The dynamic response to the	4

					shock. The influence of damping on the dynamic response of structures. Recapitulative observations. Dynamic response of systems with finite number of degrees of freedom Schematic of the structure. Determining the inertial and elastic characteristics of the calculation scheme. Matrix differential equation of elastic vibrations. Free unabsorbed vibrations. Normal modes of vibration. Determining normal vibration modes. Method of modal analysis. Determination of the dynamic response caused by the displacements and initial speeds. Determining the dynamic response produced by disturbing forces some. The influence of damping on the dynamic response produced by some forces. Dynamic response of systems with "n" degrees of freedom produced by periodic forces Dynamic response of distributed mass systems Structure diagram Dynamic response of the straight bar Differential equation of the transverse vibrations of a distributed beam bar Free vibrations of the bar with Distributed mass Differential equation of normal vibration modes and its integration Determination of normal vibration modes Transfer matrix Determination of the dynamic response caused by the initial displacements and velocities Determination of the dynamic response caused by the action of the disturbing forces The finite element method applied in the calculation dynamic structure of the structures Structure discretization Static case Dynamic case Differential equation of bar movement	

					Transformation relations from element to structure Compatibility relations Structure rigidity matrix Structure inertial matrix Differential matrix equation of the structurii. Succession of computational operations. **The content of the seminar or the practical work:** Laboratory: Dynamic analysis of bars using the ABAQUS / SolidWorks / Cosmos program Dynamic plane analysis using the ABAQUS / SolidWorks / Cosmos program Dynamic spatial analysis using the ABAQUS / SolidWorks / Cosmos program Dynamic plate analysis using the program ABAQUS / SolidWorks / Cosmos.	
			4-th Year	1	**Composite Structures** **Course content:** General information on composite materials. Definitions, advantages and disadvantages of composite materials, classifications, fields of use, raw materials used, fibrous composite materials, particle reinforced composite materials, composite layered materials, properties of composites according to the matrix. Levels of analysis, topological coding, engineering dimensions, general relationships between stresses and deformations. Analysis levels, determination of engineering constants by microstructural analysis, evaluation of physical and elastic properties of the lamine with the rule of the mixture, topological coding, relationships between stresses and deformations, Hooke's generalized law, variation of characteristics at axis rotation. General	1

					notions of breaking mechanics and theories on the boundary states of composite materials. Study of deterioration of composite materials, macromecanic resistance parameters, additional parameters of resistance, macromecanic breaking criteria, micro-mechanical breaking criteria. Elastic bonding of orthotropic lamina with continuous fibers Unidirectional. Computational equations in plane state of tension, Ortotropic lame resistance. General Theory of Layers. Elements from the theory of elasticity of the layers, specificities of the rogity matrix for several types of laminates. Methods of analysis of composite materials. Analytical methods, numerical methods, experimental methods **Content of the seminar or practical works:** Project - Levels of analysis, topological coding and determination of engineering sizes for different structures made of composite materials. Finite element analysis of a slab made of composite layered material. Numerical analysis of the static behavior of a complex structure made of composite materials. Presentation and evaluation	
			4-th Year	2	**Collapse of Mechanical Structures** **Course content:** Compressed bar buckling. Ultimate strength of compressed bars. Placing the flat plates. Ultimate Resistance of Flat Plates Enhanced unidirectional rigid flooring. Last resistance. Enhancement of two orthogonal rigidized sheets. Last resistance.	2

					The content of the seminar or practical works: Compressed bar buckling - analytical calculation. Modeling and finite element analysis of the buckling phenomenon of a compressed bar. Analytical calculation for the hinging of a board, simply supported, uniaxially requested. Modeling and finite element analysis in the case of plate plating, simply supported, uniaxial. Analytical calculation for the unilaxial rigidity of a rigid single-sided slab. Modeling and finite element analysis in the case of uniaxial rigid uniaxial rigging, uniaxial. Analytical calculation for the floating of a reinforced slab on two orthogonal directions, uniaxially requested. Modeling and finite element analysis in the case of the rigging of the reinforced slab in two orthogonal directions, uniaxially requested. The project includes: - Stability analysis of a spatial structure using the ABAQUS program. - Analyze possible measures to increase the stability of structures and to avoid specific failure phenomena. - Methods of solving, using the finite element method.	
			4-th Year	2	**Graduation project elaboration** **Content of the seminar or practical papers:** Bibliographic documentation. Identification and description of the materials and methods used for the license work. Experimental researches in the field of proposed topic Visits to industrial units for the purpose of collecting data and harmonizing them with the theme of the chosen research. Interpretation of results	2

					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 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	2

					model.	
			4-th Year	2	**Experimental Modeling in Mechanical Engineering** 1. Basic concepts on experimental methods. Terminology - The characteristics of measuring instruments. Calibration. Standards. The general structure of a measurement system. Basic basics for dynamic measurements. Systems Response. 2. Methods of pressure measurement Mechanical methods. Methods based on mechanical - size conversion. Methods based on thermal conductivity of gases. 3. Measurement of displacements and positions. Measuring displacements and positions. Analog transducers. Numeric transducers. 4. Methods of flow measurement Positive displacement method. Flow obstruction method. Method of "resistance to advance" measurement. Electrical methods for variable flow measurement. Optical methods. 5. Methods of temperature measurement Measuring of temperature by mechanical and electrical effects and by measurement of thermal radiation. Temperature measurement in high-velocity gas streams. 6. Methods of measuring movement and vibration. Speed, acceleration, displacement measurement. Measuring the vibration amplitude. Sound measurement. 7. Measurement of forces. General notions. Instrument for measuring of forces. 8. Thermal and nuclear radiation measurement methods. Thermal Radiation Detection. Measurement of emissivity, reflectivity and transmissivity of surfaces.	5

					Measuring solar radiation. Methods of detection and measurement of nuclear radiation. 9. Methods of measuring pollution. Standards on air pollution. Sampling techniques. Measurement of sulfur dioxide. Measurement of combustion products. **The content of the seminar or practical works:** 1. Planning the experiments. The role of uncertainty in experimental measurements. Drafting a report. Graphic presentation. Oral presentation. 2. Pressure measuring instruments / devices. Applications on calculation of dynamic response and pressure-measuring instrument specific parameters. 3. Flowmeters / instruments. Calculation of measurement uncertainty of flowmeters and Venturi tube .4. The effect of heat transfer on temperature measurement. Determination and correction of temperature reading errors 5. Seismic tools. Calculating the uncertainty of measuring seismic instruments. 6. Statistical methods for the evaluation of parameters specific to the measurement of nuclear radiation. 7. Calculation of parameters specific to the degree of measurement combustion gases.	
			4-th Year	2	**Modeling and Simulation of Mechanical Systems Dynamics II** **Course content:** Integral principles and their use in the dynamics of material systems: Variational calculus elements; Hamilton principle and notions of Hamiltonian mechanics,	2

					canonical transformations; Lagrange space and phase space; Equation of movement in Appel and Routh forms Elements of continuous medium mechanics: Study of stresses and deformations in Cartesian and curvilinear coordinates. Voltage vector, voltage tensor at one point, variance of voltage tensor components in the vicinity of a point, voltage ellipsoid and octahedral voltages. The fundamental equation of elastostatics; the fundamental equation of elastodynamics. Linear elastic medium in non-isothermal conditions: generalities; the effect of temperature variation; the effect of heat propagation. Modeling, simulation in the dynamics of nonlinear systems. The mathematical model in the kinematics of the free rigid. Dimensions that characterize the mass distribution of a rigid solid. Rigid systems, kinematic constraints. Modeling kinematics and dynamics of 2D mechanical systems - introducing kinematic constraints, modeling of cymetics, dynamics modeling - 2D motion rigid motion equations. Introduction to modeling, simulation in robot mechanics, 3D mechanical systems. **The content of the seminar or practical works:** Analysis of the methods that can be used in solving a complex problem of system dynamics, Convergence of methods from Hamiltonian mechanics to those in mechanics clássica; assessing the advantages and disadvantages of each method; Applications. Solving mechanical engineering problems using Octave sal	

					Matlab (high complexity). Applications. The use of software for modeling and simulation in the dynamics of mechanical systems The project includes: Solving a dynamics problem of rigid systems through the methods of classical dynamics and analytical mechanics - Studying the dynamics of a complex mechanical system - Using several methods in parallel and checking the convergence of methods - Implementation of an individual numerical modeling program of the dynamics problem - Graphical view of the results - Standalone application	
			4-th Year	2	**Numerical Modeling for Fluids Mechanics** **Course content:** I Fundamentals of Numerical Modeling of Fluids. Introduction to Numerical Modeling Techniques. Fluid Properties, Lagrange Method and Euler Method, Fundamental Fluid Movement Equations, Potential Movement, Continuity Equation. Differential equations with partial derivatives and their application in fluid mechanics: classification, examples of classical equations from math physics, initial value issues, and frontier values. Numerical Fluid Dynamics (CFD-Computational Fluid Dynamics): numerical mesh problem, mesh meshing, numerical schemes, numerical diffusion, border conditions, initial conditions, elementary numerical modeling techniques. Fluid theory with free surface. Differential Formulas and Hamiltonian Forms in the Study free surface fluid movement: Basic	5

					equations of the classical differential formulation of fluid with free surface. Hamiltonian formulation and decoupling of fluid problem with free surface. Differential functional equations describing fluid movement with the free surface and methods for their numerical meshing. Linear and nonlinear theories of free surface fluid: Airy linear fluid theory with free surface, computational hypothesis, dispersion types. Nonlinear Theories Stokes of the second order and higher order, Stokes speed. Cnoidal fluid theory with free surface. The wave and dissipation in fluids (refraction, diffraction, reflection and fluid dissipation). Spectral Theory of Fluid with Free Surface: Spectral Theory and Fourier analysis, spectrum derived parameters, common theoretical spectra. Rayleigh distribution and statistics in fluid mechanics. Equation of transport advection of a scalar size in a vector field and its application in spectral theory of fluid with the free surface, the Hasselmann equation. III Numerical models for fluids used in the technique. Numerical models for fluid flow modeling: FLUENT, CFX, WAMIT. Numerical models for surface-free fluids: Average phase models (WAM, SWAN), phase calculating models (REF / DIF, FUNWAVE) and circulation patterns (POM, SHORECIRC). **Content of the seminar or practical papers:** Recapitulation of fundamental notions of fluid mechanics. Interpolation and approximation of data. Integration and	

					derivation of functions. Applications. Numerical integration of differential equations. Applications. Time integration of ordinary differential equations. Applications. Solving differential equations with partial derivatives. Two-dimensional equation with advection and diffusion. Applications. Application of Finite Difference, Finite Element and Borderline Methods in Fluid Mechanics. Applications. Linear theory of fluid with free surface, fundamental notions, dispersion equation, simplifications. Applications. Simulations with the SWAN model. Evaluation of results. Elements of statistics in fluid mechanics (Rayleigh and Gauss probability distributions). Applications. Spectral theory and Fourier analysis, parameters derived from the spectrum. Applications. Basics of using models in CFDs. Applications with FLUENT / WAMIT models.	
			4-th Year	2	**Welded Structures** **Course content:** Chapter 1. Introduction to metal constructions. Fields of use of metallic structures. Head 2. Joining and clamping devices according to Eurocode 3 - Head 3. Welded joints. Components. Classification of welded joints. Welding joints and their choice. Chapter 4. The basic metal. The main factors influencing the properties of metals; Choosing the quality of steel for metal structures; Adding materials for welding Cap 5. Computational elements: static application calculation of welded joints in the head, in the corner by overlapping and in T statically required;	4

					calculus of nodes in constructions from laminated profiles and pipes; calculation of point welded joints; calculation to variable requests. Chapter 6. Effort distribution in welded joints. Chapter 7. Origins of residual stresses in welded structures; methods of determination; residual deformation-classification; methods of determination. Heart 8. Full Heart Beam: Composition, Sizing, Exhilaration, Stiffening. Head 9. Grab bar: shaping, sizing, gripping methods in knots, solidarization, supporting devices. Head 10. Metal posts: dimensioning, verification, solidarity; n frames for industrial halls; frames for cars. **The content of the seminar or practical works:** 1. Laboratory presentation. Labor protection. 2. Choosing materials for a metallic structure. 3. Composition of the full length beam section with variable length dimensions. 4. Check the deformations on the full-beam beam. 5. Check for deformations at the cheson beam. 6. Establishment of the constructive solution for the girder beams. 7. Check tensions and deformations in the beam bars. 8. Rigidization of metal building elements. 9. Check tensions and deformations in pole structures. 10. Check tensions and deformations in frames. 11. Construction and calculation of welded construction bearings. 12. Study of the behavior of welded joints at simple traction applications. 13. Study of the behavior of welded joints at Bending requests. 14. Study of the behavior of welded welded	

					joints to shear stress	
Mechanical Engineering	**bachelor, level 6 from NQF, EQF**	**Heating Systems and Equipment**	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	5

					Laws of Chemistry. Elements of structure of 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	5

					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 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	2

					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.	
			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.	1

			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 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	5

					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	5

					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 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** **Course contents:** 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;	2/5

					Ceramic materials. Plastic materials. Composite materials **The content of the seminar or practical works:** Metalographic Microscope. Research on the structure of materials. by optical microscopy. Sample preparation for exaggeration. to the optical microscope. Macroscopic analysis of metallic materials; Determination of non-metallic inclusions in steels. Quantitative structural determinations. Structural constituents in metallic materials; The Fe-Fe3C system. Carbon and white steel steels. Fe-graphite system. Gray fonts; Structure of plastic deformed steels. Structure of thermally treated steels. Structure of thermo-chemically treated steels. Structure and properties of welded joints. Structure of Allied Steels. Structure of non-ferrous alloys. Plastics, structure and properties. Structure of ceramic and composite materials.	
			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 when changing the base. Head. III. Linear Applications. Definition of a linear application, examples, properties, image	5

					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	**Drawings and Infographics I** **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 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	4

					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 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	5

					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. 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-	1

					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	5

					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	**Mechanics I** **Course content:** Recapitulative notions about vector operations, principles and the axioms of mechanics. Moments theory: Moment of force in relation to a point and an axis; Central Axis Reduction Cases; Reducing particular systems of forces; Center of Parallel Forces. Static moments and centers of gravity, Guldin's theorems. Equilibrium of rigid subject to ideal bonds, types of bonds. Methods and theorems in statics of material systems: Element isolation method; Method of solidification; Method of isolating parts. Beam beams. Rubbing in the technique: Rubbing; Rolling friction; Pivoting rubbing; Rubbing in joints	2/5

					and bearings. Static of yarns: General equation of yarns; Wire rubbing. Applications in static technique: Parga and inclined plane; Scrapers and pulley systems; Even the screw; Brake band brake and sabot brake. Point Cinematic: Coordinate Systems; Speed and acceleration; Particular moves of the point. **The content of the seminar or practical works:** S1 - Introduction - vector operations. Applications. S2 - Moment of force relative to a point and an axis. Applications. S3 - Reduction of force systems, center axis, reduction cases. Applications. S4 - Table Centers. Applications. S5 - Equilibrium of the rigid subject to ideal bonds. Applications. S6 - Statics of material systems. Applications. S7 - Friction systems. Applications.	
			1-st Year	2	**Computers Programming and Programming Languages** **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.	5

					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.	4

					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	**Drawings and Infographics II** **Course content:** AutoCAD - Overview. Basics for Drawing. Enter text into graphic files. Orders for multiplying objects. Tentative notions. Polylines. Editing commands Advanced Drawing commands. 3D drawing commands: nonprimitive. 3D drawing commands: primitive. 3D editing commands. Preparation of product technical documentation **The content of the seminar or practical works:** Using basic drawing commands in AutoCAD and editing completed drawings. Quotation of drawings executed in AutoCAD. Use advanced drawing	3

					commands in AutoCAD. 3D modeling: drawing, editing. Preparation of product technical documentation.	
			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 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	3

					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	**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
			2-nd Year	1	**Machine-Tools and Cutting Processing** **Course content:** Elementary notions about surface	3

					generation on machine tools. General considerations. The kinematics of generation. Generating curve: definition, materialized generators, kinematic generators resulting as a trajectory of a point or as a winding of a curved family, programmed generators. Directional curve: definition, materialized directories and kinematic directories. Basic notions of the theory of cutting and cutting tools. Construction of cutting tools. Geometry of cutting tools. Sharpening. Cutting forces. Heat sources and heat balance of the cutting process. Wear cutting tools; wear criteria. Durability of cutting tools. Cutting parameter parameters: speed, feed, depth of cut. The kinematic chain theory. Mechanism: definition, transfer ratio, linking the series. Kinematic chain: definition, classification, structure. Adjustment of kinematic chains. Links between kinematic chains. Closed kinematic chains. The main kinematic chain. Defining. Specific structures. The theory of speed. Mechanisms for speed adjustment of gears: ballad block mechanisms, with articulated, mixed wheels, with simple or complex intermediate. Mechanisms for continuously adjusting the speed: definition, structure, characteristics; constructive solutions of mechanical variators. The kinematic feed chain. Defining. Specific structures. Overlapped breasts. Specific regulation mechanisms. Kinematic chains and intermittent feeders. Kinematic threading chains, threading boxes. Special purpose mechanisms. Mechanisms for reversing the rotation	

					direction: generalities, classification, constructive solutions. Mechanisms for transformation of movement: generalities, classification. Transformation mechanisms with self-reversing: bell-crank, oscillating sliding, rotating sliding. Transforming mechanisms without auto-reversal: screw-nut, pinion-rack. Cutting schemes. Fields of use. Classification. The normal lathe. Revolver lathe (horizontal and vertical). The vertical lathe. Milling machines. Cutting schemes. Fields of use. Classification. Milling machine with console. Planar milling machine. Longitudinal milling machine. Drilling machines. Cutting schemes. Fields of use. Classification. Banjo drilling machine. Column Drilling Machine. Drilling machine with pillar. Radial drilling machine. Planing machines. Boring and milling machine. Planing machines: cutting schemes, fields of use, classification. Shaper. Slotting machine. Boring and milling machine: fields of use, classification, construction. Pickups. Grinding machines. Spinning machine: use, classification, construction. Grinding machines: areas of use, classification, cutting schemes, abrasive bodies. External grinding machine. Inner grinding machine. **The content of the seminar or practical works:** 1. Introductory work; the general presentation of the laboratory, the machine-tool room, the scope and content of the practical works. 2. Kinematic analysis of the normal lathe. 3. Kinematic analysis of the milling machine - 2 hours. 4. Kinematic analysis of the drilling machine.	

					5. Kinematic analysis of septicemia. 6. Kinematic analysis of the grinding machine. 7. Machine control systems.	
			2-nd Year	1	**Mechanics** **Course content:** Recapitulative notions about vector operations, principles and the axioms of mechanics. Moments theory: Moment of force in relation to a point and an axis; Central Axis Reduction Cases; Reducing particular systems of forces; Center of Parallel Forces. Static moments and centers of gravity, Guldin's theorems. Equilibrium of rigid subject to ideal bonds, types of bonds. Methods and theorems in statics of material systems: Element isolation method; Method of solidification; Method of isolating parts. Beam beams. Rubbing in the technique: Rubbing; Rolling friction; Pivoting rubbing; Rubbing in joints and bearings. Static of yarns: General equation of yarns; Wire rubbing. Applications in static technique: Parga and inclined plane; Scrapers and pulley systems; Even the screw; Brake band brake and sabot brake. Point Cinematic: Coordinate Systems; Speed and acceleration; Particular moves of the point. **The content of the seminar or practical works:** S1 - Introduction - vector operations. Applications. S2 - Moment of force relative to a point and an axis. Applications. S3 - Reduction of force systems, center axis, reduction cases. Applications. S4 - Table Centers. Applications. S5 - Equilibrium of the rigid subject to ideal bonds. Applications. S6 - Statics of material	5

					systems. Applications. S7 - Friction systems. Applications.	
			2-nd Year	1	**Mechanisms** **Course content:** Introduction. Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain (definition, classification, degree of freedom, kinematic group). Mechanisms (definition, classification, degree of mobility). Configuration analysis and kinematics of mechanisms. Vector connection equations for configuration, speeds and accelerations. Polygonal vector outline method for solving. configuration and kinematics of the mechanisms. Examples. Spatial Mechanisms. The cardan coupling mechanism. RRSC spatial patroller. RSSR spatial patroller. White mechanism - spatial crank. Force analysis of mechanisms. Engine loads, resistant, exterior, interior, variable, inertia. Determination of the reactions of the kinematic couplers of the mechanisms. The dynamics of the mechanisms. The phases of the movement. Motion equations. Energy Balance. Uniformize the angular speed with the flywheel. Calculation of the moment of inertia of the mass and weight of the steering wheel. Adjusting non-periodic variations of machine movement. **The content of the seminar or practical works:** Labor protection rules in the laboratory; Structural analysis of kinematic couplings. Structural analysis of fundamental planar mechanisms. Kinematic analysis of bar	4

					mechanisms - bar method. Kinematic analysis of bar mechanisms - the method of projection of polygonal contour of vectors. Determination of reactions to bar mechanisms - method of kinematic group isolation; Determination of Reactions to Bar Mechanisms - Method of isolating kinematic elements (matrix method). Cinematic analysis of spatial mechanisms..	
			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 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:	5

					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	**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 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	5

					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	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	3

					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	2	**Applied Informatics** **Course content:** 1. Introduction. Overview of the software application. Opening the session. File types and applications. Projects. Ribbon appearance. Show panel. Tools. Customize user commands. 3DModel panel (Sketch, Create, Modify, Work features, Pattern, Surfaces). Sketch panel (Constraints, Insert, Format). Inspect panel (Measure, Analysis). Tools panel (Materials, Options, Clipboard, Find). Manage panel (UpDate, Parameters, Styles, Layout, Author, iLogic, Content). View panel (Visibility, Appearance, Windows, Navigate). Environments panel (Begin, Convert, Manage). Get Started Panel (Launch, My Home, New Features, Videos & Tutorials). Vault panel. Autodesk 360 Panel Application (3D Model and 2D Representation). 2. 3D modeling of molded parts. Work strategy. Effective application	3

					and use of work tools. Applications. 3. 3D modeling of the board elements. Table development strategy. Specific working tools. Application. 4. 3D modeling of assemblies. Working principles. Application. 5. Develop 3D models of welded parts. Procedures and tools. Application. 6. 3D design of the mechanical structures in the profiles. Tools and work strategy. Applications. 7. Specific procedures for 3D modeling of plastic parts. Dedicated tools and applications. 8. Assisted Design of Mechanical Transmission I. Trees, grooves, bearings, feathers, sealing elements, constructive-functional details. Applications. 9. Assisted design of mechanical transmissions II. Automatic calculation and design of cylindrical, conical and worm gears. 10. Assisted Design of Mechanical Transmissions III. Automatic calculation and design of belts and chains. **The content of the seminar or practical works:** 1. 3D modeling of simple landmarks. Learning how to work. 2. Applications of molded parts, of complexity Different. Applications for sheet metal parts. 4. Developing applications for assemblies of different difficulty parts.5. Elaboration of various applications of welded parts. 6. Applications for 3D design of the mechanical structures in the profiles. 7. Solid modeling of plastic parts. 8. Applications for automatic tree design. Modeling of auxiliary elements (bearings, grooves, feathers, seals). 9. Applications for automatic design of cylindrical, conical	

					and worm gears. 10. Applications to belt and chain transmissions.	
			2-nd Year	2	**English** **The content of the seminar or practical works:** Semester I - Electrical. Specialized vocabulary and discourse situations. Grammar in focus: Scale of likelihood. Electronics. Specialized vocabulary and discourse situations. Grammar in focus: Subordinate clauses of result and purpose. Civil Engineering. Specialized vocabulary and discourse Situations. Grammar in focus: Comparison of adjectives. Assessment test. Semester II - Energy. Specialized vocabulary and discourse situations. Grammar in focus: Countable and uncountable nouns. Adjectives and adverbs. Petroleum. Specialized vocabulary and discourse situations. Grammar in focus: Prepositions of place. Writing in focus: Description. Plastics. Specialized vocabulary and discourse situations. Grammar in Focus: Quantifiers. Writing in focus: Definition and exemplification. Telecoms. Specialized vocabulary and discourse situations. Writing in Focus: Comparing and Contrasting Ideas. Assessment test.	2
			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	2

					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. 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	**Mechanisms**	3

					1. Balancing mechanisms and machines: **Course content:** Introduction. Definitions. Structure and configuration of planar mechanisms. Kinematic element. The kinematic coupling. Kinematic chain (definition, classification, degree of freedom, kinematic group). Mechanisms (definition, classification, degree of mobility). Configuration analysis and kinematics of mechanisms. Vector connection equations for configuration, speeds and accelerations. Polygonal vector outline method for solving. configuration and kinematics of the mechanisms. Examples. Spatial Mechanisms. The cardan coupling mechanism. RRSC spatial patroller. RSSR spatial patroller. White mechanism - spatial crank. Force analysis of mechanisms. Engine loads, resistant, exterior, interior, variable, inertia. Determination of the reactions of the kinematic couplers of the mechanisms. The dynamics of the mechanisms. The phases of the movement. Motion equations. Energy Balance. Uniformize the angular speed with the flywheel. Calculation of the moment of inertia of the mass and weight of the steering wheel. Adjusting non-periodic variations of machine movement. **The content of the seminar or practical works:** Labor protection rules in the laboratory; Structural analysis of kinematic couplings. Structural analysis of fundamental planar mechanisms. Kinematic analysis of bar mechanisms - bar method. Kinematic analysis of bar mechanisms - the method	

					of projection of polygonal contour of vectors. Determination of reactions to bar mechanisms - method of kinematic group isolation; Determination of Reactions to Bar Mechanisms - Method of isolating kinematic elements (matrix method). Cinematic analysis of spatial mechanisms.	
			2-nd Year	2	**Machine Parts** General problems of machine building. 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. Non-demountable joints. Threaded joints. Welded joints. Joining by soldering. Joint joining. 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. Elastic assemblies. Springs with traction-compression voltages; Springs with torsional voltages; Springs with bending stresses.	3

			2-nd Year	2	**Machine Parts** **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 bending stresses. **The content of the seminar or practical works:** Paper no. 1 - Experimental determination of fatigue resistance. Calculation of fatigue	1

					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** **Course content:** General training on occupational safety. General notions about metal cutting. Knowledge and interpretation of technological documentation. Measuring and control equipment. Operations, tools and tools used in locksmiths. Turning. Milling. Floating and mooring. Correction. Casting. The Cooperative Workshop. Casting. Workshop. Turning. The Workshop. Casting. Workshop for cleaning molded parts. Casting. Technology for obtaining cast iron with nodular graphite. Turning. Centrifugal casting technology of the cylinder shim. Casting. Coil Shooting Machines. Hot plastic deformation sectors. Thermal and thermo-chemical treatments. Galvanic coatings. Welding. Practice colloquy	4
			2-nd Year	2	**Materials Strength** **Course contents:**	3

					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 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	2	**Thermotechnics** Objectives: Presenting some general aspects to establish minimal knowledge about the thermal phenomena encountered in the engineering, fundamental notions regarding thermodynamics of systems. Knowledge of the fundamental thermodynamic notions necessary for the understanding and deepening of the knowledge at the specialized courses of the later years. Course Content. Fundamentals of thermodynamics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic systems. Simple, reversible, open gas transformations. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isochoric, isobar, isotherm, 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	2

					high speeds. Thermodynamics of fuel combustion. Thermodynamics of thermal machine cycles.	
			2-nd Year	2	**Dimensional Control and Tolerances** **Course contents:** Introduction. Object and importance of discipline. The principle of interchangeability. Dimensional precision. Dimensions, deviations, tolerances. Fits. Adjustment systems. System of tolerances and ISO adjustments. Microgeometric precision. Surface corrugation and roughness; causes of their occurrence, characteristics, physical parameters and roughness statistics; enrollment on their drawing. Roughness evaluation techniques. Precision of geometric shape. Deviations of the macrogeometric form. Definition of deviations, graphical representations, marking tolerances of form on drawings. Techniques for assessing macroeconomic precision. Precision of orientation and reciprocal position. Deviations from orientation, deviations from the relative position of surfaces, radial beating and frontal beating: definition, cases, representations, drawing on the drawing. Techniques to control them. Chains of dimensions. Definition, classification and methods for resolving size chains. Methods and means of measurement and control. Classification of dimensional control methods. Metrological features. Measurement errors. Universal dimensional control means. Tolerances, adjustments and control of smooth tapered assemblies, bearings and feather assemblies. Tolerances, adjustments and	3

					control of threaded assemblies. Tolerances, adjustments and control of gears and gears. **The content of the seminar or practical works:** 1. Conducting work safety training, taking students into account, presenting the laboratory and laboratory work. Presentation of the universal measuring instruments used in laboratory work. 2. External and internal dimension control with vernier and micrometric tools. 3. Control of dimensions and deviations from the geometric shape by means of comparators. 4. Measurement of surface roughness. 5. Measure angles and conicities. 6. Thread measurement. 7. Toothed wheel control. 8. Using ISO standards for calculations with tolerances and adjustments. Identifying the elements that define a tolerated dimension, establishing limit deviations for a tree and a bore, plotting the limit deviations and tolerance fields for the shaft and bore, calculating their tolerances. Identifying the type of adjustment and the system of adjustments in which it is formed, graphical representation of the fitting, determining the boundary characteristics in an assembly, calculating the tolerance of a fit. Enumeration of dimensional tolerances on reference drawings and fittings on the overall drawings. 9. Solving the dimensional chains 10. Completing the reports on the laboratory works performed. Restoration of a laboratory work not performed. Verification of the papers and final mark of the students in the laboratory	

					activity.	
			2-nd Year	2	**Dimensional Control and Tolerances** **Course contents:** Introduction. Object and importance of discipline. The principle of interchangeability. Dimensional precision. Dimensions, deviations, tolerances. Fits. Adjustment systems. System of tolerances and ISO adjustments. Microgeometric precision. Surface corrugation and roughness; causes of their occurrence, characteristics, physical parameters and roughness statistics; enrollment on their drawing. Roughness evaluation techniques. Precision of geometric shape. Deviations of the macrogeometric form. Definition of deviations, graphical representations, marking tolerances of form on drawings. Techniques for assessing macroeconomic precision. Precision of orientation and reciprocal position. Deviations from orientation, deviations from the relative position of surfaces, radial beating and frontal beating: definition, cases, representations, drawing on the drawing. Techniques to control them. Chains of dimensions. Definition, classification and methods for resolving size chains. Methods and means of measurement and control. Classification of dimensional control methods. Metrological features. Measurement errors. Universal dimensional control means. Tolerances, adjustments and control of smooth tapered assemblies, bearings and feather assemblies. Tolerances, adjustments and control of threaded assemblies. Tolerances, adjustments and control of	3

					gears and gears. **The content of the seminar or practical works:** 1. Conducting work safety training, taking students into account, presenting the laboratory and laboratory work. Presentation of the universal measuring instruments used in laboratory work. 2. External and internal dimension control with vernier and micrometric tools. 3. Control of dimensions and deviations from the geometric shape by means of comparators. 4. Measurement of surface roughness. 5. Measure angles and conicities. 6. Thread measurement. 7. Toothed wheel control. 8. Using ISO standards for calculations with tolerances and adjustments. Identifying the elements that define a tolerated dimension, establishing limit deviations for a tree and a bore, plotting the limit deviations and tolerance fields for the shaft and bore, calculating their tolerances. Identifying the type of adjustment and the system of adjustments in which it is formed, graphical representation of the fitting, determining the boundary characteristics in an assembly, calculating the tolerance of a fit. Enumeration of dimensional tolerances on reference drawings and fittings on the overall drawings. 9. Solving the dimensional chains 10. Completing the reports on the laboratory works performed. Restoration of a laboratory work not performed. Verification of the papers and final mark of the students in the laboratory activity.	
			3-rd Year	1	**Hydraulic and Pneumatic Drives**	4

					Course content: General elements of structure of hydropneumatic systems. Organism of hydrostatic systems. distribution equipment. Pressure regulating equipment. flow regulation equipment. Auxiliary equipment for hydraulic schemes. Hydraulic schemes for different cycles. General notions about penetrating actions. Compressed air leakage. Pneumatic discharge components. Pneumatic valves. compressed air filtration. Lubrication of compressed air. pneumatic schemes. **The content of the seminar or practical works:** The apparatus that is part of the hydrostatic drive systems and its symbolization. Hydraulic pumps (with gears, pallet, axial pistons) Construction-functional analysis and calculation of hydraulic cylinders. Functional analysis of drawers with drawers Constructional-functional analysis of the pressure and flow control equipment. Single acting pneumatic cylinder with direct control and indirect control. Functional pneumatic schemes.	
			3-rd Year	1	**Elasticity** **Course content:** Generalities on Elasticity Theory. The theory of tensions. The theory deformed. Relationships between stresses and specific deformations. Mechanical work and potential deformation energy. Particular cases of voltage state. Flat problems in elasticity theory. **The content of the seminar or practical papers:** Applications to the state of tension at a	5

					point in a body. Main stresses and main directions of the voltage state. Applications to the deformation state at a point in a body. Relationships between stresses and specific deformations. Apply Hooke's generalized law. Applications to the flat state of stress and deformation.	
			3-rd Year	1	**Machine Parts II** **Course content:** Mechanical transmission through gearing. Classification of gears. Materials, thermal treatments for gears and teeth technologies. Causes of gear loss. Cylindrical gears with straight teeth: geometrical elements, calculation of the cylindrical gear with straight teeth at bending and contact. Cylindrical gears with inclined teeth: geometrical elements, equivalent gear, forks in cylindrical gear with inclined teeth, calculation of cylindrical gear with teeth inclined at bending and contact; Conical gears: types of conical teeth, reference plane wheel, geometric elements of the conical gear with straight teeth, conical gears calculation with straight teeth at bending and contact; Cross-axle gears: classification, worm gears: geometric and kinematic elements, materials, forces in the worm gear, worm gear calculation and contact; Heat calculation of gears; Mechanisms with gears. Friction wheel drive Classification; Calculation of cylindrical friction wheel transmissions; Calculation of transmissions with conical friction wheels; Variators with friction wheels. Belt transmissions Classification; Traction capability, Forces and main stresses in a belt, Calculation of	2

					wide belt transmissions, V-Belt transmission calculation, Belt drives. Chain transmissions Classification, Force in chain transmission, Chain transmission calculation. Axes and trees Classification, materials, tree pre-dimensioning, fatigue checking, rigidity check, critical speed check. Slip Bearings Construction, materials, calculation of friction bearings U, L, M, calculation of hydrodynamic bearings, hydrostatic bearings. Rolling bearings (bearings). Classification, Symbolisation, Calculation of durability of rotating bearings, calculation of non-rotating bearings, lubrication of bearings. Clutches. Fixed permanent couplings, Permanent compensating couplings, Intermittent couplings, Automatic intermittent couplings, Safety couplings. The organs of the white crank mechanism. Force in the crank mechanism, Pistons, Biela: the calculus. Crankshafts. **The content of the seminar or practical works:** Paper no. 1 - Generating teeth in evolution by the rolling method. Work no. 2 - Restoration of the geometric elements of a straight gear with straight teeth. Work Nr. 3 - Determination of the equivalent cylindrical gear elements for cylindrical and conical gears. Work no. 4 - Elastic sliding and traction characteristic of belts. Work no. 5 - Theoretical determination of friction losses in bearings. Work no. 6 - Determination of the pressure distribution in the lubricating film in the hydrodynamic lubrication sliding bearings. Work Nr. 7 - Determination by calculation of the operating characteristic of	

					elastic couplings.	
			3-rd Year	1	**Materials Strength III** **Course content:** Calculation of helical spring resistance; stiffness of the helical spring. Bars of equal resistance to bending; calculating the resistance of the arch arch. Overview of the finite element method. Thin wall rotating containers. Tubes with thick walls; tube milling; discs in rotation motion. Flat plate plates equations. Plate in flat voltage state. Flat plates with small arrows. **The content of the seminar or practical works:** 1. Use of elastic elements in supporting the bar systems. 2. Dimensioning of a cylindrical tank and a spherical tank (analytical and using the finite element method). 3. Calculation of voltage boards. 4. Calculate rectangular plates with small arrows. 5.Dimensioning of pipelines (analytical - thick wall tubes and finite-axis modeling). 6. Applying hydrostatic pressure to a plate.	4
			3-rd Year	1	**Thermotechnics II** **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	5

					(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.	

			3-rd Year	1	**Tribology** **Course content:** Tribology - introduction. Definitions, short history. Objectives of tribology, interdisciplinarity of tribology. Tribology and global environment, requirements and perspectives. Head. 1. Basic notions and concepts in tribology. Tribosystems: structure, functions, demands, systemic analysis in tribology. Methods for tribological testing: classification, tribological test chain. Test systems. Modeling and simulation of tribological phenomena and processes. Head. 2 Interactions between triboelements. Contact processes. The mechanic of hertzian contact. Friction processes: theories of friction and wear; friction modes, slip-slip peculiarities (stick-slip effect) and rolling friction. Wearing processes: adhesion wear, abrasion wear, superficial fatigue wear, corrosion wear and fretting wear, cavitation wear, particular or combined wear, wear and tear. Head. 3. Triboelement properties. Materials used in tribological applications. The superficial layer and its tribological parameters. Changing the superficial layer properties. Head. 4. Lubricants. Classifications. Physical and chemical properties of oils; viscosity, additives. Mineral oils. Synthetic oils.Unsori. Vegetable and animal oils and greases. Solid lubricants. Unconventional lubricants. Self-lubricating composites. Chapter 5. Lubrication regimes (limit, mixed, fluid: hydrodynamic, hydrostatic, gas-dynamic). The elastohydrodynamic regimen (EHD).	2

					Chapter 6. Seals. Technical and environmental requirements imposed on seals. Materials for sealing. Types of seals. Sealing systems. Chapter 7. Machine and machine lubrication, engine lubrication. Processes and lubricating devices. Lubrication Schemes and Installations. Organizing the lubrication activity. **The content of the seminar or practical works:** Laboratory: 1. Lubricants: recognition, operation with product catalogs, national and international, environmental legislation on fresh and used lubricants. 2. Determination of mineral oil properties: measurement of kinematic viscosity with capillary viscometers. 3. Study of the influence of load, body materials in contact and geometry on the characteristics of hertitian contact. 4. Friction and wear tests on the tribods of the pin / disc; determining the coefficient of friction for different materials. 5. Surface topography: realization of 2D and 3D digital profiles for new and used surfaces, interpretation of roughness parameters. 6. Friction study in threaded assemblies. 5. Identification and characterization of wear damage. 7. Case study: organizing the lubrication activity in a mechanical section. Domestic Themes: Identification, characterization and equivalence of lubricating oils (10 oils). Study of influence of load, body materials in contact and geometry on the characteristics of hertitian contact. The study loading influences, body materials in contact, and thread type on friction in	

					threaded assemblies.	
			3-rd Year	1	**Mechanical Vibrations** **Course contents:** Cap. 1 Mechanical vibrations - general considerations. Introductory notions. Classification of vibrations. Characteristic dimensions. Measurement units. Elements of vibration kinematics. Representing vibrations using rotating vectors. Composition of harmonic vibrations. Head. 2 Vibrations of linear elastic systems with a degree of freedom. 1. Free unborn vibrations. Torsional vibrations. Elastic constants. 2. Free damp vibrations in viscous damping systems. Logarithmic Decrement. 3. Forced vibrations in systems with a degree of freedom. Forced vibrations without damping, excited by harmonic disturbing force. System behavior in resonance. System behavior near resonance. 4. Forced vibration damping in systems with a degree of freedom. Forced vibrations with damping, excited by harmonic disturbing force. Forced vibrations with damping, excited by disturbing force produced by unbalanced rotating mass. 5.Transmisibilitate. System excitement through the base. Isolation anti-vibration. Energy aspects of system vibrations with a degree of Freedom. Head. 3 Vibrations of linear elastic systems with finite number of degrees of Freedom. 1. Free vibrations of systems with finite number of degrees of freedom. Establishing motion equations using the D'Alembert Principle. Influence coefficient method. Using Lagrange equations. Own modes of vibration. The	4

					orthogonality of their own vibrational forms. 2. Forced vibrations without damping of systems with finite number of degrees of freedom. Determination of Differential Equations with the D'Alembert Principle. The dynamic absorber. Use of influence coefficients for determination of differential equations. 3.Studious vibration study without damping using modal analysis. 4. Free damp vibration. Forced vibration damping. Study of vibration damped using the complex form of spinning vectors. Head. 4 Vibration of continuous systems. Longitudinal vibrations of straight bars. Turning vibrations of straight bars of circular cross section. Bending vibrations of straight beams. Head. 5 Approximate methods in the study of vibrations. The Holzer-Tolle method. Transfer matrix method. Matrix iteration method. The Rayleigh method. Head. 6 Vibration measurement. Measured sizes. Components of a measurement system. Vibration generators. Vibration caps. Measuring systems. The content of the seminar or practical works: 1. Introduction.Recapitulation of the necessary notions from previously studied subjects.Protectia muncii. 2. Free vibrations without damping in systems with a degree of freedom. 3. Free damping vibrations in systems with a degree of freedom. 4. Forced vibrations in systems with a degree of freedom. 5. Free vibrations without damping in systems with finite number of degrees of freedom. 6. Forced vibrations without damping in systems with finite number of degrees of	

					freedom. Application work. 7. The dynamic absorber. 8. Vibrations in continuous systems. 9. Approximate methods in the study of vibrations.	
			3-rd Year	2	**Finite Element Analysis I** **Course content:** 1. Generalities on Finite Element Analysis. 2. Shift method used at bars. 3. Finite element method. 4. Typical types of finite elements. 5. Applications in using the finite element method. **The content of the seminar or practical works:** 1. Initiation in the use of finished elements software and the COSMOS finite element package. 2. Study of bar-shaped structures. 3. Study of plate-shaped structures. 4. Study of molded structures with boards and bars.	5
			3-rd Year	2	**Biomechanics** **Course content:** Introduction to Biomechanics, object of study, terminology, aspects basic biomechanics; sagittal, frontal and transverse reference systems; kinematic aspects of the moving anatomical segments; static and dynamic balance. Basic Aspects of Anatomy and Physiology; cell, tissue. Presentation of programs for the transformation of the assembly of CT sections into 3D surfaces that delimit tissues according to their densities. Biomechanics of the osteo-articular system; bone; cartilage; ligament, joint. Biomechanics of the muscular system; locomotor movement; types bone lesions, muscle. Anthropometry; the proportion of human body segments, mass centers by	3

					percentages. **Seminar or Practical Content:** Using the lessons taught at the course and 3D scanning and finite element analysis, the stress states of the bone and articular system are analyzed. Making models with 3D finishes for bones and teeth. The calculation of strength and stability of long bones (femur, humerus) with a custom load for each student. Calculation	
			3-rd Year	2	**Applied Electronics** **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.	
			3-rd Year	2	**Lifting and Conveying Machines** **Course content:** General theory and specific organs of lifting and transporting installations - Lifting equipment specific to various fields of activity. - Ancillary equipment. - Exploitation of transport equipment. - Norms S.S.M. **Content of the seminar or practical works:** Knowledge and assimilation of the specific parts of the lifting and transport equipment using documentation Specific Technical Consultations and Use	1

					of ISCIR Standards and Standards. Drawing up specific projects based on design themes specific to the course theme.	
			3-rd Year	2	**Internal-combustion engines** The course hours and papers undertake a theoretical and experimental study of the thermo-dynamic-mechanical and mechanical processes, in order to optimize them, the mechanical functioning characteristics, a study that allows the graduates to handle the design, testing, exploitation of the ICE with different destinations. **Course Content** Presentation, classification and composition of ICE. Power plants with ICE. Operation, actual operating patterns and operating regimes of the ICE. Ideal Thermodynamic Processes from ICE. Ideal cycles of ICE. The fluids used for the operation of ICE. The gas change processes at ICE. The compression process. Formation of fuel mixture and combustion. The process of relaxation. Characteristic parameters of ICE. Overcharging ICE. Static operating characteristics of ICE. Thermal balance sheet of ICE. The power plant of ICE. Ignition system of Spark ignition engine. The supply system of Compression ignition engine. **Application Content** Types of ICE and energy installations with ICE. Operation ICE of cars. Construction of mobile and fixed parts of the engine. Dismantling and mounting, determining the main dimensions of ICE. Construction of mechanisms and auxiliary installations of ICE (distribution, supply,	3

					ignition, lubrication, cooling, supercharging, starting). Experimental determination of the functional characteristics of supply: external characteristic, characteristic of propulsion, characteristic of mechanical loss.	
			3-rd Year	2	**Optimization in Mechanical Engineering** **Course content:** 1. Introduction. Formulation of optimization problems. Classification of optimization issues. Matrix differential calculus elements. Multiple convex, concave functions and convex functions. Optimal conditions. 2. Optimization algorithms for unrestricted issues. Calculate the length of the step. Determining search directions. 3.Transform optimization issues. Sign restrictions. Simple Edge Restrictions. Linear restrictions. 4. Problems with linear restrictions. Issues with equality restrictions. Allowable directions. Optimal conditions of order one. General procedure for solving. Problems with inequality restrictions. Optimal conditions. General procedure for solving. Updating the set of active restrictions. Criteria for assessing convergence. 5. Problems with nonlinear restrictions. Optimal conditions of order one. Low gradient methods. Generally reduced gradient methods. 6. Multicriteria optimization. Problem formulation. Using synthesis functions. Using Remote Functions. Effective solutions. Sorting criteria. Programming purpose. 7. Optimizing structures. Particularities of optimizing structures. Variables, objective functions and restrictions 8. Reanalysis methods. Direct methods. Using the reverse matrix. The substructure	3

					technique. Iterative methods. Approximate methods. Low Base Method. Serial development. 9. Methods for solving many variable problems. General presentation. Decomposition methods. Methods for optimizing structure reliability. **The content of the seminar or practical works:** 1. Optimize bar-based structures using spreadsheet programs. 2. Optimization of bar-shaped structures using finite element method 3. Optimization of plate structures using finite element method.	
			3-rd Year	2	**Plasticity** **Course content:** 1. Introduction Elastoplastic deformations. Perspectives of Nonlinear Calculus. Material models. Numerical approach to elasto-plasticity problems. Elasto-plastic constitutive equations. Generalized method of finite elements. Variational principles and integral forms. 2. Single-dimensional elastic-plastic request. Axial request. The elastic-perfect plastic pattern. Elastoplastic model with isotropic hardening. Elastoplastic model with mixed hardening. Expression of hardening parameters by stress or deformation. The principle of maximum plastic dissipation. Integration of elasto-plasticity equations. Using convex optimization. Solving elastoplastic problems by finite element method. 3. Elasto-plastic request of bars The elementary approach of the plastic design of the bars. Finished element of elastoplastic Timoshenko beam. Finished beam, cubic, Euler Bernoulli and Timoshenko. The RSBM bar element.	3

					Plastic node method (PNM). 4. Elasto-plastic plate request. Bending of plates. Finite elements of the board. Elastoplastic calculation of plate systems. 5. Three-dimensional plasticity. Notations. Mechanics of Continuous Environments. Elasto-plastic behavior. Plasticity J2. Variant formulations used in elasticity and plasticity. Potential thermodynamics and plastic dissipation. Using the finite element method. **The content of the seminar or practical works:** 1. The elasto-plastic one-dimensional application. Analytical problem solving. 2. Elasto-plastic request of bars. Analytical and numerical solving of problems. 3. Elastic-plastic plaque request. Numerical problem solving. 4. Three-dimensional elastoplastic request. Numerical problem solving.	
			3-rd Year	2	**Practical Training** General training on occupational safety. General notions about metal cutting. Knowledge and interpretation of technological documentation. Measuring and control equipment. Operations, tools and tools used in locksmiths. Turning. Milling. Floating and mooring. Correction. Casting. The Cooperative Workshop. Casting. Workshop. Turning. The Workshop. Casting. Workshop for cleaning molded parts. Casting. Technology for obtaining cast iron with nodular graphite. Turning. Centrifugal casting technology of the cylinder shim. Casting. Coil Shooting Machines. Hot plastic deformation sectors. Thermal and thermo-chemical treatments.	3

					Galvanic coatings. Welding. Practice colloquy	
			3-rd Year	2	**Statics and structures stability** **Course content:** Statics of structures. Preliminary elements. The stiffness matrix for a structural element. Transforming loads from the structure element into loads at the nodes. Matrix of rotation. The global axle system. Assembling matrices to obtain equilibrium equations. Stability of bars. General. Computational hypotheses. Freedom degree. Critical force. Loss of stability modes. Aspects of stability of elastically embedded bars in the extremities. Continuous Beam Stability Analysis on Rigid Supports. Behavior of compressed paper in the post-critical field. Straight bar stability in the plastic field. Second order calculation by finite element method. The stiffness matrix of the finite element of the bar used in the second order calculation. The force-displacement relationship for structures. Methods for determining the solution in the second order calculation. Applications on the 2nd order calculation. Bar System Stability Study Using Finite Element Method. The stiffness matrix of the bar element in the stability calculation. Bars articulated at the ends for flat structures. Embedded bar at the ends for flat structures. The articulated bar at the ends of the space structures. The recessed bar at the ends for spatial structures. Practical solving of the stability equation. Generally stiffness matrices reduced. The symmetrical form of the stability equation. Applications for stability analysis of bar	4

					systems using ABAQUS / Cosmos finite element programs. **The content of the seminar or practical work:** 1.Models of complex structures and substructures with the finite element method using specialized programs (in modeling are used all types of finite elements studied at the disciplines, Analysis with finite elements I, Resistance of materials III, Statics, stability and dynamics Structures, Optimizations in Mechanical Engineering). 2. Estimation of stress state by the resistive electrical tensometry method (students learn how to choose the tensometric marks and tensometric rosettes, identify the areas where they can be glued, they effectively add soldering technology, learn how to handle the acquisition equipment). 3. Practice Colloquium - Ending the Activity and Granting the Qualification	
			4-th Year	1	**Thermal Energy Audit** Objectives of the discipline: Collection, analysis and interpretation of quantitative and qualitative data and information, from various alternative sources, from professional contexts and literature, for the formulation of concrete arguments, decisions and approaches **Course content:** Thermal comfort. Thermo-physiological conditions. Relationship between thermal comfort parameters. Heat demand for heating. Transmitting heat to the outside environment. The room's overall heat check. The annual heat and fuel needs. Optimization of thermal protection. Global	2

					optimization of closure solutions. Heating systems. General problems of heating installations. Categories of thermal agents. Features of heating systems. Criteria for choosing heating systems. Scheme for the distribution of heat. The general scheme of the thermal water installation. Hot and hot water distribution schemes. Heating with heaters. Constructive and functional features of heating bodies. Warm air heating. The specificity of the hot air heating system. Ensuring thermal comfort in warm air space. Variants of the hot air heating system.	
			4-th Year	1	**Thermal-Electrical Plants** Objectives of the discipline: Acquiring knowledge in the field of electric and thermal energy production in the thermoelectric and nuclear power plants; Knowledge of processes that take place in the thermoelectric power plants; Identifying the factors that influence the thermodynamic efficiency of the thermoelectric power plants **Course content:** General principles of electrical and thermal energy production; Centralized thermoelectric steam generators; Solutions to increase the performance of steam thermoelectric power plants. Pumps in the thermoelectric power plant thermal circuit. Cooling plant in thermoelectric power plants; Water treatment in thermoelectric power plants; General considerations regarding the sizing of the thermoelectric power plants; Gas turbine thermo-electric installations; Nuclear power stations **Practical work contents:**	4

					Energy balance for steam boilers; Energy balance for the cooling system in power plants. Heat and mass balances for gas turbine installations; Energy balance for the classical area in a nuclear power plant.	
			4-th Year	1	**Methods for Controlling Pollution Generated by Internal Combustion Engines** The influences of various factors on the processes of the internal combustion engine. The main polluting products resulting from the burning of fossil fuels. Physico-chemical properties and action of the main pollutants. The formation of polluting products in the spark ignition engine. The formation of polluting products in the compression ignition engine. Neutralization of pollutant emissions from the internal combustion engine. Filters. Oxidation catalysts. Legislation on pollutant emissions.	4
			4-th Year	1	**Refrigerating Systems and Heat Pumps II** **Objectives of the discipline**. Deepen the processes in refrigeration plants and heat pumps. Analysis, thermal calculation, process optimization. Performance criteria and ways to improve. Areas of use of the cold. The relationship between the cold user and the type of installation. Utilization of secondary energy resources. **Course content:** Original thermal calculation method. Processes in refrigeration plants, heat pumps and mechanical vapor compression couplings: one step, two and three stage cascade. Particulars for ammonia and	2

					freons. Thermal calculation elements, optimization of performance criteria. Processes specific to absorption systems. One- and two-stage absorption and absorption plants with lithium-water and ammonia water, fields of use. Ejection systems: the theoretical and real process, maintaining the vacuum. The main fields of use of artificial cold: food industry (refrigeration and freezing of products, insulation calculation, setting of cold requirements), artificial ice rinks, ice generators, construction works (soil freezing, precoating of concrete components), chemical industry. Choice of heat exchangers, auxiliary equipment and machine selection (compressors, pumps), piping dimensioning.	
			4-th Year	1	**Management and Marketing** **Course Content:** 1. Introductory Elements. 2. Presentation of the conceptual framework of project management. 3. Persons engaged in project management. 3.1. Categories of people involved in projects. 3.2. Selection of the project manager. Skills and abilities 3.3. Managing and managing the project team. 3.4. Methods of organizing project-oriented activities. 4. Pragmatic approach to project plans 4.1. Establishing the methods and tools required by the project. 4.2. Structure of decomposition work 4.3. Structured approach to project management. 5. Cost control and budgeting of projects 6. Methods of evaluation and analysis of investment projects. 6.1. The problem and the specificity of the investment project	3

					evaluation methods. 6.2. Specificity and role of financial assessment 6.3. The specificity and role of economic assessment. 7. Monitoring and control of projects. 7.1. Planning - monitoring - control cycle 7.2. Data collection and reporting. 8. Contracting and Acquisition 8.1. Purchasing system cycles 8.2. Specific, national and European legislation. 9. Project management in the information age. 9.1. Project management information system 9.2. Internet tools available to project managers. 10. Techniques of internal and external communication. **Content of seminar or practical works:** Laboratory: Critical road method and PERT diagrams. 2. Pay-back method 3. Method based on the rate of return (internal rate of return). 4. Tools used in project management: Work Breakdown Structures (WBS). 5. Tools used in project management: Gantt charts, SWOT analysis. 6. Designing and monitoring the project, the organizational chart and the budget with specialized software (MS Project Management, Primavera Project Planner, MS Excel)	
			4-th Year	1	**Techniques of Using Artificial Cold** **Objectives of the discipline:** To provide the necessary knowledge regarding the use of artificial cold in industry and other fields (medicine, electronics, space industry, etc.), how to calculate the thermal load of cooling an enclosure or equipment, the calculation of a thermal insulation . **Course content:** Theoretical basis of body cooling. Use of artificial cold in the food industry: refrigeration and freezing of	1

					foodstuffs, speed and freezing time, calculating the thickness of refrigerated insulation and condensing check, establishing the need for cold. Ice making: types of ice generators, ice accumulation by ice formation. Artificial skates: track structure, cooling systems, cold needs. Use of cold in construction works: methods of premixing of concrete components, freezing of soil, types of wells and their location. Use of artificial cold in the chemical industry. Refrigerated transport: means of transport, rail transport, shipping.	
			4-th Year	1	**Steam and Gas Turbines** Thermodynamic study of steam and gas turbine installations and study of the work processes carried out in the turbine stage and on the entire turbine. Emphasis is placed on the study of energy transformations, highlighting the optimal design conditions. **Course contents:** Overview of steam and gas turbine installations. Fields of use. Thermodynamic study of steam and gas turbine installations. Theoretical and real cycles. Binary installations with turbines. Classification and presentation of types of steam and gas turbines. Thermodynamic study of the flow of compressible fluids through the turbine stage. The energetic and gas-dynamic study of fluid depletion in nozzles. Mobile Energy Energy Study. The forces and moments that act on the mobile blades. Sizing the turbine step. Twisting long blades. Energy losses in the stairs and over the entire turbine. Optimization of turbine stage parameters. Multi-stage	4

					turbines. The distribution of the adiabatic fall on the steps of the steam turbines. Breakdown of the fall	
			4-th Year	2	**Drives for Internal Combustion Engines** **Objectives of the discipline:** The course hours and works carry out a theoretical and experimental study of the thermo-dynamic-mechanical and mechanical processes, in order to optimize them, the mechanical functioning characteristics, study allowing the graduates to handle the design, testing, exploitation of M.A.I. with different destinations. **Course contents:** Presentation, classification and composition of M.A.I. Power plants with M.A.I. Operation, actual operating patterns and operating regimes of the M.A.I. Ideal Thermodynamic Processes from M.A.I. Ideal cycles of M.A.I. The fluids used for the operation of M.A.I. The gas change processes at M.A.I. The compression process. Formation of fuel mixture and combustion. The process of relaxation. Characteristic parameters of M.A.I. Overcharging M.A.I. Static operating characteristics of M.A.I. Thermal balance sheet of M.A.I. The power plant of M.A.I. Ignition system **at M.A.S. The power plant at m.c.**	3
			4-th Year	2	**Essentials of Experimental Research on Thermal Machines** **Objective of the discipline:** Studying the most modern techniques used in thermal processes in the process of investigating the physical characteristics of a case of some thermal phenomena and developing the skills needed to study an experimental thermal phenomenon.	4

					Course content: Introduction to experimental research techniques. General characteristics of the measurement systems. Measuring displacements and speeds. Measurement of pressure and force. Methods of measurement applied to flow of fluids. Principles of measuring and controlling temperature. Experimental modeling. Processing of experimental data. Principles of construction, use and scope of application of transducers. Operational characteristics of the caps for measuring the mechanical quantities and ways of choosing according to the requirements of the measurement process. Methods and techniques for verification and statistical processing of data collected from an experiment. Techniques for the realization and planning of experiments. Organization of research activity.	
			4-th Year	2	**Cryogenic Engineering** **Objectives of the discipline:** Provide knowledge on deep-freezing techniques. It has as objective the study of methods of obtaining low temperatures, as well as the study of cryogenic systems for cooling, liquefaction and separation of gaseous mixtures. **Course content:** Real gas properties. Processes for obtaining low temperatures. Cycles for producing low temperatures. Cryogenic liquefaction systems: the Linde-Hampson system with a lamination, pre-cooled, with two rolls; Claude liquefaction systems (Claude cycle, Kapitza cycle, Heylandt cycle); other liquefaction systems using detents; Liquefaction systems for natural gas. Cryogenic Cooling Systems.	4

					Separation of air by cryogenic methods. Cryogenic fluid storage and transfer systems.	
			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	2
			4-th Year	2	**Renewable Energy** **Objectives of the discipline:** Awareness of the nature and causes of energy crises; Knowledge of renewable energy resources and existing technologies for their exploitation; Developing the capacity to design, install and operate different renewable energy systems. **Course content:** Solar energy: Characteristics of solar energy; Thermal analysis of solar collectors; Applications of solar collectors; Economic analysis. Biomass: biomass resources; Potential and availability; Conversion of biomass into fuels and energy. Wind Energy: Theoretical Potential. Capture systems (installations). Design and execution of wind turbines with horizontal and vertical axis. Uses of wind energy. Hydraulic Energy: The Hydro Power Potential. Types of turbines (impulse, reactive). Technological solutions for micro-hydropower plants. Economic,	4

					social and environmental issues. Geothermal Energy: Types of geothermal resources. Exploitation of geothermal resources. Use of geothermal resources. Hydrogen energy.	
			4-th Year	2	**Manufacturing and Operating Thermal Machines** **Objectives of the discipline:** The discipline contributes to the knowledge of the technologies used in the production of the main components of the thermal machines, with a strong formative character of the engineer profile of the future engineer in the field of machine building. **Course contents:** Introduction. Getting Started with the Technological Process of Manufacturing. Technological process of manufacturing (technological methods and processes used in the production of semi-finished products, technological processes of chip cutting). Manufacture of piston compressors (machining of carpets, blocks, chutes of various types of piston compressors, cylinder bushings, cylinders and cold-roller compressor cylinders, manufacture of cylinders, crankshafts, pistons and distributor valves for refrigeration compressors). Manufacture of heat exchangers and heat exchangers (general notions for apparatus and containers of thermal installations, materials and semi-finished products used, assembling of heat exchangers and containers of thermal installations)	3
			4-th Year	2	**Adjustment and Automatic Control of Heat Machines** Objectives of the discipline: Study of	4

					automatic systems related to thermal machines, considering the objectives of optimization of some parameters: temperature, pressure, fluid mass flow, cooling power, speed, mechanical power, level of fluids in containers, fuel consumption, thermal flow. Course content: General concepts of automated systems: functions, classification, autonomous regulation systems (SRA). Automation of refrigeration units (IF): automation equipment used in IF (regulators, electroventile, pressure switches, thermostats, rolling valves), adjustment of some parameters of the IF (temperature, pressure, flow, defrosting, deaeration), typical automation schemes. 3. Internal combustion engine control systems (MAI): automatic speed regulators, automatic regulation of cooling and lubrication fluids, automatic fuel viscosity adjustment, automatic regulation of overfill air temperature, automation of MIA auxiliary installations. 4. Adjustment of turbine power systems: turbine power adjustment methods, automatic gas and steam turbine regulation systems, speed, fuel flow, steam generator load.	
			4-th Year	2	**Use and Management of Heat Energy** Objectives of the discipline: Collection, analysis and interpretation of quantitative and qualitative data and information, from various alternative sources, from professional contexts and literature, for the formulation of concrete arguments, decisions and approaches Course content: Thermal comfort. Thermo-physiological conditions. Relationship	4

					between thermal comfort parameters. Heat demand for heating. Transmitting heat to the outside environment. The room's overall heat check. The annual heat and fuel needs. Optimization of thermal protection. Global optimization of closure solutions. Heating systems. General problems of heating installations. Categories of thermal agents. Features of heating systems. Criteria for choosing heating systems. Scheme for the distribution of heat. The general scheme of the thermal water installation. Hot and hot water distribution schemes. Heating with heaters. Constructive and functional features of heating bodies. Warm air heating. The specificity of the hot air heating system. Ensuring thermal comfort in warm air space. Variants of the hot air heating system.	