***Dunarea de Jos* University of Galati**
Faculty of Engineering
Study programme – Road motor vehicles

Domain of study	Level (BA/MA)	Study programme	Year of study	Semester	Course title	Credit units
Motor vehicle engineering	**bachelor, level 6 from NQF, EQF**	**Road motor vehicles**	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.	
			1-st Year	1	**Communication** **Course content:** Communication, principles, units and	2

					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. **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	**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	1

					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 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.	5

					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-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,	5

					classification, representation of cylindrical-conical bodies. Flat sections with cylindrical conical bodies. Intersection of cylindrical-conical with right. Deploying the cylinder and cone. Head. 5. Sphere: Sphere representation, points on the sphere, plane tangent to the sphere, plane spheres through the sphere, intersection of a straight with a sphere, unfolded to the sphere. Head. 6. Intersections of geometrical bodies: Polyhedral intersections, intersections of cylindrical-conical bodies, cone and cone intersections with cone and cylinder **The content of the seminar or practical works:** 1.Applications to the representation of the point, the right and the plane: The representation of the point in space and in the purge, in the double and in the triple orthogonal projection; representation of straight and double private straight lines, determination of traces and crossings crossed by the right, intersections of planes and plates, visibility in the purge. 2. Applications in the Polyhedra chapter: The intersection of some particular planes with pyramid and prism, straight intersections with prism and pyramid, prism and pyramid deployments. 3. Applications in the chapter cylinder and cone: The intersection of any planes and particular planes with the cone and the cylinder, the intersections of straight with the cylinder and the cone, the rollers of the cylinder and the cone. 4. Sphere applications: Sphere intersection with particular plane and planar plane, the intersection of the	

					straight line with the sphere, unfolded to the sphere. 5. Applications in the intersection of geometric bodies: Intersections of polyhedres, intersections of cylindrical-conical bodies, intersections of sphere with cone and prism.	
			1-st Year	1	**English** **The content of the seminar or practical works:** Semester I - Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect, Research and Development, Specialized vocabulary and discourse situations.) Grammar in focus: Past tenses (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	2
			1-st Year	1	**Materials Science and Engineering** **Course contents:**	5

					Introduction. Types of materials. The link between chemical composition-processing conditions-property structure. Atomic architecture. Crystalline structure, crystalline imperfections. The amorphous structure. Diffusion. Diffusion laws. Solidification of metallic materials. Alloy systems. Diagram of phase equilibrium. Fe-C alloy system. Transformations of solid state phases. Thermal treatments; Non-ferrous alloys. Aluminum and copper; Ceramic materials. Plastic materials. Composite materials **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	4

					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 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	4

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

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

					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	2	**Electrotechnics and Electrical Machines/ 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	5

					(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-phase circuits. Connecting the receivers in three-phase electrical networks. Connect in star. connecting in the triangle. Electrical Measurement: Classification of Electrical Measurement Devices. General notions of metrology. Constructive Principles of Measuring Devices. Analogue measuring instruments. Measurement of current intensity. Measurement of voltages. Resistance measurement. Measurement of active and reactive DC and single-phase and three-phase powers. Measurement of active and reactive DC and single-phase and three-phase energies. Measurement of impedances (inductances and capacities). Measurement of power factor. Frequency measurement. 2. Electric Machines: Electric Transformers: Single-Phase Transformer. Constructive elements. Principle of operation. Operation of the single-phase transformer. Functioning in pregnancy. Single-phase transformer	

					yield. Three-phase transformers. Autotransformer. Welding transformers. Transformers for electric arc furnaces. Asynchronous machines: Construction elements of the three-phase asynchronous machine. Motor operation of the asynchronous machine. Electromagnetic torque of the asynchronous machine. Characteristics of three-phase asynchronous motor. Starting the three-phase asynchronous motor. Adjusting the speed and reversing the rotation direction. Single-phase asynchronous motor. Synchronous machine: Construction principles of the three-phase synchronous machine. Operation of the synchronous machine as a generator. Characteristics of the synchronous generator. Parallel operation of synchronous generators. Synchronous engine operation and characteristics. Starting the three-phase synchronous motor. DC machine: Construction of the c.c. Operation of the c.c. in generator mode. Characteristics of the c.c. with independent excitement and derivation. Characteristics of the c.c. with serial excitement. Characteristics of the c.c. with mixed excitement. Operation of the c.c. in engine mode. Speed and torque of the engine torque. Engine features of c.c. with separate excitation and derivation. Engine features of c.c. with serial excitement. Engine features of c.c. with mixed excitement. The losses and the efficiency of the c.c. **Content of the seminar or practical papers:**	

					Strength and power in DC. 2. Own inductivities, mutualities and capabilities. 3. Series circuits and current derivation Alternative. 4. Power in AC circuits. Improving power factor. 5. Single-phase transformer. Trace the transformer characteristics. 6. Asynchronous engine study. 7. Diesel engine study	
			1-st Year	2	**English** **The content of the seminar or practical works:** Semester I - Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect, Research and Development, Specialized vocabulary and discourse situations.) Grammar in focus: Past tenses (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	2

			1-st Year	2	**Mechanics I** **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 energy slope. Pipelines - pipes connected in series and	5

					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.	
			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. 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.	4

					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** Structure of materials. Crystalline structures. Types of metal-specific crystalline structures. Crystal imperfections Deformation in metallic crystals.Deformation of polycrystalline aggregates. Amorphous structures. Mechanical properties of materials. Resistance and plasticity. Variation of conventional voltage R with specific deformation e. Voltage variation s with deformation degree e. Rational curve. Elongation at break. Tackle at break. 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	5

					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.	
			2-nd Year	1	**Fundamentals of Vehicle Engineering** 1. General composition and main parameters of motor vehicles: 1.1. Organization of all vehicles on wheels. 1.2. Construction parameters and technical qualities of motor vehicles. 2. Internal combustion engines for motor vehicles: 2.1. Construction and operation of motor vehicles. 2.2. Characteristics of motor vehicles. 3. Mechanical clutches used in motor vehicles: 3.1. Construction	3

					of mechanical clutches. 3.2. Construction of clutch drive mechanisms. 4. Mechanical gearboxes used in motor vehicles: 4.1. Requirements for gearboxes, their classification; 4.2. Gearbox construction. 5. Longitudinal transmissions: 5.1. Component parts, longitudinal transmission schemes. 5.2. Principles of operation. 6. Front deck. Rear axle: 6.1. Destination, classification, components, constructive types. 6.2. Principles of operation. 7. Steering systems: 7.1. Destination, classification, imposed conditions; 7.2. Component parts, operating principles; 7.3. Directional servomechanisms. 8. Braking systems of motor vehicles: 8.1. Destination, classification, imposed conditions; 8.2. Component parts, operating principles; 8.3. Brake control system. 9. Suspension of motor vehicles. Bodies, frames and rolling stock of motor vehicles: 9.1. Destination, component parts, suspension construction; 9.2. Bodies, frames and rolling stock of motor vehicles.	
			2-nd Year	1	**Drawings and Infographics II** **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;	4

					Slot assemblies SR EN ISO 6413-1997; elastic fittings SR EN ISO 2162 / 1,2-1997. C6 - tree representation; drawing the execution drawing for a tree; C7 - Representation of sliding bearings and rolling bearings STAS 8953-85; SR EN ISO 8826 / 1.2-2002; C8- Representation of elements and sealing devices SR ISO 9222 / 1,2-1994; C9-C10-Representation of non-demountable assemblies: welded assemblies SR EN 22553-1995 and riveting assemblies; C11- Rules for the drawing of metal constructions STAS 11634-83; C12- Drawing rules for civil construction SR EN ISO7518-2002; C13 - Drawings of installation drawings; Symbols SR EN ISO 6412 / 1,2,3-2002; C14- Representation of kinematic schemes; symbology. **Content of seminar or practical works:** L1 - 4 hours Representation of flanges and threads. Threaded threads and threads SR ISO6410 / 1,2,3-1995. (Teaching + planing) - / LP1L2 - 4 hours - Drawings of some parts by means of revealing (cap, gear pump body); tolerances and roughness SR RN ISO 1302-2002 .- / LP2 / 1,2, L3 - 4ore - finishing LP2 L4 -4 hours- Execution drawings for sprockets in a toothed wheel assembly (cylindrical gear pump) representation of centering holes SR EN ISO 6411: 2001. Applications to STAS 5013 / 1,2, -82, SR EN ISO 2203-2002. LP3 / 1.2 L5, 6 - 8 hours Gear shapes: cylindrical, conical, worm gears.LP4 / 1,2,3; L7-4 hours Compact gear pump design; LP5; L8-4 hours Overall design for	

					a conical gearbox; the design drawing of a conical wheel STAS 5013 / 3-82 and the marking of heat treatment stas 7650-89. LP6 / 1.2; L9-4 hours Readings: Overall drawing for a cylindrical, worm gear reducer; Extraction of details and representation of: assembled assemblies - threaded assemblies, feathers STAS 1004-81, 1007-81, 1012-77, grooves and elastic, SR EN ISO 6413-1997; SR EN ISO 2162 / 1,2-1997 - LP7;	
			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	3

					and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			2-nd Year	1	**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	2

					in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	1	**Mechanics II** **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,	4

					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 I, II** **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**	4

					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	**Finite Element Method** General description of the method. Creating the model. Preparing the model for analysis. The solution to the problem. View results. Pre-processing, post-processing. The problem of flat elasticity. The principle of the method. Mesh. Types of finite elements. Interpolation functions. Equations of the finite element. Total potential. The matrix form of potential deformation energy. Triangular finite elements. Mesh. Interpolation functions. The stiffness matrix. Assembling equations. The computation algorithm. Calculation of parts using tetrahedron finite elements. Mesh. Interpolation functions. Properties. Total potential. Calculation of parts using tetrahedron finishes. The general matrix form of the finite element equations. Assembling equations. The computation algorithm.	3
			2-nd Year	1	**Numerical Methods** Algorithms and calculation errors:	3

					computational algorithms; numerical instability of algorithms; calculation errors; error propagation. Functional approximation criteria: by interpolation; with minimal square deviation; with minimal deviation - Cebashev. Approximation of interpolation functions: Lagrange interpolation polynomial. Finite differences; Newton's polynomial; divided divisions; the interpolation polynomial based on the divisive differences. Approximate functions with minimal mean square deviation: continuous case and discreet case. Approximate functions with minimal deviation: Continuous case and discreet case. Numerical methods of solving equations (bisection method, iterative method, Newton-Raphson method, fixed tangent method): application conditions; the principle of the method; geometrical interpretation; convergence; algorithm. Numerical methods for solving systems of linear equations: exact methods (Gauss) and approximate methods (Jacobi, Gauss-Seidel); conditions of application; the principle of the method; convergence; algorithm. Methods for numerical derivation. Methods for numerical integration: trapezoid method; the Cavalieri-Simpson method; the Romberg method and the Richardson procedure; method of undetermined coefficients; the method of serial development of the integral function. Linear programming elements; the simplex algorithm. Finite element method: two-dimensional and three-dimensional variant - generalities.	

			2-nd Year	1	**Materials Strength I, II** **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 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	4

					of the circular (or ring) section bars required at free torsion.	
			2-nd Year	2	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports 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	3

					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 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	2

					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** Revision of Adjective Clauses. Constructing Defining Adjective Clauses. Selecting the Main Clause and the Subordinate Clause. Adjective Clause with Prepositions. Defining Adjective Clauses with WHOSE, WHERE, WHEN. Equivalents of Whose, Where, When.	2

					Writing an Amplified Definition. Construction of a Formal Definition; Components. Removing the General Class Word in a Formal Definition. Amplification Devices. General Revision.	
			2-nd Year	2	**Fluid Mechanics** The general properties of fluids. Statics of fluids (equations of fluid statics, hydro and aerostatic forces, Arhimede's theorem, floating of bodies, relative rest). Fluid kinematics (kinematic representation methods, current lines and current tube, liquid current, flow, continuity equation, circulation, velocity movement). Equations and theories of ideal fluid dynamics (Euler's equations, Bernoulli's equation, impulse theorem and impulse momentum). Dynamics of real fluids (Navier-Stokes equations, Bernoulli equation for a wire and for a real fluid flow, fluid movement regimes, laminar flows, tubular flows). Calculation of pipes under pressure.	3
			2-nd Year	2	**Mechanisms I, II** **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.	2

					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 I** 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	3

					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.	
			2-nd Year	2	**Domain Practical Training** **Objectives:** Acquiring knowledge, skills and competencies regarding the construction, maintenance, diagnosis and repair of road vehicles. - Using the basic knowledge to explain the different maintenance technologies for road vehicles. **Application Content** 1. General overview of the construction and operation of the transmission and of the auxiliary installations of the vehicle, such as the braking, steering, electrical,	4

					air conditioning, etc. 2 Practical operations for checking, adjusting and repairing transmission elements such as clutch, gearbox, cardanic transmissions, conical clutch, motors etc. Checking and adjusting the ASR system. We will analyze the main devices used, which are included in the practical project. 3 Practical operations for checking, adjusting and repairing the brake components. Check, and adjust the ABS, EBV, EDS. The devices used will be included in the project. 4 Practical operations for checking, adjusting and repairing steering elements. The devices used will be included in the project. 5 Practical operations for verifying the adjustment and repair of electrical and air conditioning elements. The main devices used will be analyzed. 6 Practical operations for verifying the adjustment and repair of suspension elements of motor vehicles. The devices used will be included in the project. 7 Practical checks and repair of bodywork. The devices, materials and methods used will be included in the project. 8 Organization of workshops for the diagnosis, repair and maintenance of road vehicles. The organizational structure of the unit, highlighting the main attributions of all employees; The main indicators of the company and the way of organizing the activities (in flux, work stations); The technical level of endowment of the company by elaborating the principles of operation of the specific stands and devices used; Supply system with spare	

					parts and materials; The technological flow, the way of programming the activity and the relations with the clients. Normalization of activities; How to receive-diagnose-repair-hand over the vehicle, the customer.	
			2-nd Year	2	**Materials Strength I, II** **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 load systems with temperature variations and displacements due to errors found during assembly. 5. Verification,	3

					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	**Thermo-Technics I** Fundamentals of thermotechnics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic system. Simple, reversible, open gas transformations. Periodic open thermodynamic study. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Potential thermodynamics: thermodynamics methods; the exergy of a fluid in continuous flow and permanent regime; the exergy of a fluid in a closed volume; chemical exergy. Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isocratic, isobar, isothermal, reversible and irreversible adiabatic). Wet air thermodynamics: the physical properties of wet air; i-x wet air diagram; graphical determination of wet	4

					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.	
			2-nd Year	2	**Dimensional Control and Tolerances** 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.	2

					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 gears and gears.	
			3-rd Year	1	**Hydraulic and Pneumatic Drives** Analysis of hydrostatic equipment. Analysis and calculation of pumps and hydromotors. Distribution equipment (construction, operation, calculation elements). Pressure regulating equipment, locking valves, pressure valves (construction, operation, calculation elements). Devices for flow control, droplets, flow regulators (construction, operation, calculation elements). Auxiliary equipment, reservoirs, accumulators, filters, connection elements and sealing elements (construction, operation, calculation elements); Hydrostatic drive systems. Structural analysis of hydrostatic drive systems: Differentiated systems based on effort parameter adjustment mode, Differentiated systems according to the hydraulic environment, Differentiated systems by number of sources or number of motors, Differentiated systems according to engine coupling and systems differentiated by the way information is circulated. Principles of calculation of hydrostatic systems; Analysis of pneumatic equipment. Generators and pneumatic motors (construction, operation, calculation elements).	4

					Distribution equipment (construction, operation, calculation elements). Valves and flow controllers (construction, operation, calculation elements). Compressed air preparation equipment, filters, grinders, separators. Pipes and accumulators; Pneumatic actuation systems. Structure of pneumatic drive systems. Logical Functions. Single and multiple engine systems. Calculation of pneumatic drive systems.	
			3-rd Year	1	**Motor Vehicles Dynamics I, II** 1. General organization and main parameters of motor vehicles: 1.1. Destination and classification of cars; 1.2. General composition and organization of motor vehicles; General composition of motor vehicles on wheels. Drawings of traction equipment. 1.3. Constructive parameters and load capacity of motor vehicles; Main dimensions and vehicle passage capability. Vehicle weight and load capacity. 1.4. Car Wheels: Tire Construction. The rays of the car wheels. 2. The process of self-propulsion and running of motor vehicles: 2.1. Main features of engines used in motor vehicles; The external speed of the internal combustion piston engine. Comparative analysis of engine characteristics used in motor vehicles. 2.2. The process of self-propulsion of motor vehicles; Transmission efficiency. The engine torque on the prop wheel. The process of rolling the car wheel (balance of the drive wheel, steering wheel balance (non-motor), braked wheel balance, influence of adhesion on the wheel wheel	4

					balance). 2.3. The behavior of tires under the external loads. Deformation of the tire under the action of internal air pressure. Deformation of the tire under the action of the normal load in rest. Deformation of the tire under the action of tangential forces. Deformation of the tire under the action of transverse forces. 2.4. Study the processes that take place between the tire and the tread. Surface of contact between the tire and the track. Distribution of stresses on the contact surface between the tire and the tread (normal pressure on the contact surface, tangential stresses in the contact surface). Study of adhesion between the tire and the tread (sliding of the tire on the tread, specific tangential force - rolling characteristic, adhesion coefficient, slipping rate). 3. Resistance to propulsion of vehicles: 3.1. Rolling resistance. Generating rolling resistance. Factors of influence on rolling resistance. Calculation of rolling resistance. 3.2. Air resistance: Aerodynamics of motor vehicles. Influence of the shape of the vehicle on its aerodynamics. Calculation of air resistance. 3.3. Slope resistance. 3.4. Resistance to starting. 3.5. Tire resistance. 4. Reaction of the rolling path on the wheels of motor vehicles: 4.1. Normal reactions in the longitudinal plane. Motor vehicles with two decks. Motor vehicles with three axles (motor with rear axles, motor with all engine axles). Road trains (tractor trailer motor vehicle, articulated road train with semi-trailer). 4.2. Normal transverse reactions. 5. Performance of motor vehicles: 5.1.	

					Traction and power balance of motor vehicles; 5.2. Wheel power characteristic; 5.3. General motion equation; 5.4. The dynamic feature of motor vehicles; 5.5. Vehicle speed feature; 5.6. Starting the cars. Acceleration of cars. Start time and space. 5.7. Influence of constructive parameters on the dynamic qualities of motor vehicles; 5.8. Vehicle braking and brake capacity parameters. Braking force and its distribution on decks. Parameters of braking capacity (brake time and space, ABS). Brake with unburned engine. 6. Calculation of vehicle traction: 6.1. Choosing the vehicle's constructive parameters; 6.2. Calculation of engine power and determination of its external characteristic; 6.3. Determination of transmission ratio of the main transmission; 6.4. Determination of transmission ratios from the gearbox; 6.5. Determination of dynamic performance of motor vehicles. 7. Stability of vehicles: 7.1. Longitudinal stability of vehicles - Longitudinal stability when overturned. Longitudinal stability when slipping or slipping. 7.2. Transverse stability of motor vehicles. Movement of turn-by-turn vehicles (producing the turn in correct steering conditions, determining the reactions to the wheels of the vehicles in turns). Crosswise stability to skidding. Transverse overturning stability. 7.3. Stability of the rectilinear motion of the vehicles. Tire deviation. Conditions of motion stability and critical speed. Influence of wheel tangential forces on the stability of the rectilinear motion of motor	

					vehicles. 8. Vehicle maneuverability: 8.1. The Influence of Tire Deviation on Bumper Movement. Circular motion with constant speed (plan of the vehicle, vehicle roll model, suspension influence on the circular movement). Steady speed movement on any trajectory. 8.2. Vehicle maneuverability when driving straight ahead. 9. Fuel consumption of the vehicle: 10.1. Fuel consumption parameters; 10.2. Fuel consumption by speed mode; 10.3. Influence of constructive and exploitation parameters on fuel consumption of motor vehicles - Influence of engine parameters. Influence of transmission. Influence of weight. Influence of the aerodynamic factor. Influence of tires. Influence of methods and driving style on fuel consumption.	
			3-rd Year	1	**Internal Combustion Engine I, II** 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.	4
			3-rd Year	1	**Internal Combustion Engine I, II**	1

					Objectives: 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, starting). Experimental determination of	

					the functional characteristics of supply: external characteristic, characteristic of propulsion, characteristic of mechanical loss.	
			3-rd Year	1	**Machine Parts Design II and Tribology** **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 wide belt transmissions, V-Belt transmission calculation, Belt drives. Chain	4

					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	**Thermo-Technics II** Fundamentals of thermotechnics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic system. Simple, reversible, open gas transformations. Periodic open thermodynamic study. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Potential thermodynamics: thermodynamics methods; the exergy of a fluid in continuous flow and permanent regime; the exergy of a fluid in a closed volume; chemical exergy. Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isocratic, isobar, isothermal, reversible and irreversible adiabatic). Wet air thermodynamics: the physical properties of wet air; i-x wet air diagram; graphical determination of wet air status; Simple wet air conversions (constant humidity content, constant temperature, constant enthalpy and mixing of two wet air flows with different states). Thermodynamics of compressible fluids at high speeds. Thermodynamics of combustion of fuels. Thermodynamics of thermal machine cycles.	4
			3-rd Year	1	**Road Traffic and Traffic Safety** Introduction (traffic and road traffic,	4

					general characteristics of road traffic, components of the road traffic system, traffic engineering: study discipline). Basic characteristics of road traffic (characteristics, characteristics and responsiveness of drivers, characteristics of motor vehicles, traffic characteristic: intensity, traffic characteristic: speed). Geometrical characteristics of roadways (road classification, road geometry, infrastructure and road superstructure, roadway and profile road). Road traffic capacity (traffic capacity, traffic capacity in ideal traffic conditions and geometric elements, practical capacity). Circulation of motor vehicles at intersections (traffic characteristics at junctions, intersections at level, uneven intersections). Dynamics of traffic accidents and traffic safety (dynamics of traffic accidents, reconstruction of traffic accidents, traffic safety).	
			3-rd Year	1	**Mechanical Vibrations** Mechanical vibrations-general considerations, Vibrations of linear elastic systems with a degree of freedom Vibrations of linear elastic systems with finite number of degrees of freedom. Free vibrations with damping. Forced vibration damping. Continuous vibrations Continuous longitudinal vibrations of the straight bars. The twist vibrations of the straight bars of circular cross section. Bending vibrations of straight beams. Approximate methods in the study of vibrations. The Holzer-Tolle method. Transfer matrix method. Matrix iteration method. The Rayleigh method.	3

					Measurement of vibrations Measured quantities. Components of a measurement system. Vibration generators. Vibration caps. Measuring systems.	
			3-rd Year	2	**Essentials of Automation Systems** **Objectives:** Discipline has as a general objective the formation of a set of knowledge and skills on automated systems. The concrete objectives refer to the formation of the following basic knowledge and skills: - Mathematical modeling of input-output of continuous systems; - Time and Frequency Analysis of Automatic Adjustment Systems; - Stability Studies of Automatic Regulation Systems (ARS); - Design of linear and monovariable automatic adjustment systems. **Course Content** Chapter 1 Fundamental concepts of automated systems; Head. 2 Mathematical modeling of signals; Chapter 3 Functional mathematical models of structural smooth systems; Chapter 4. Temporal analysis of SRA in functional representation; Chapter 5 ARS Stability; Chapter 6 Analysis of the Stable Scheme of the ARS; Chapter 7 Analysis of the ARS dynamic regime; Chapter 8. Linear, monovariable, smooth ARS design. **Application Content** Qualitative study of an automatic level control system. The integrator element and the aperiodic element. Derived Causal and Causal Factors. Oscillating element and dynamic elements with	3

					advance and phase delay. Continuous PI and PID controllers. Module Criterion and Symmetry Criterion. Cascade control systems.	
			3-rd Year	2	**Fuels, Lubricants, Special Materials and Maintenance** Head. 1 Fluids used in internal combustion engines (ICE). Composition of petrol and diesel fuels. Physico-chemical properties of fuels. The octane rating for petrol, the cetane figure and the diesel index for diesel. Coolants, role, properties. Chapter 2. Fuel quality and properties of spark ignition engines. The quality and properties of fuels for compression ignition engines. Additives. Deposits in ICE. Correlations of fuel characteristics with functional features of ICE. The fuel economy of road vehicles. Chapter 3. Unconventional fuels. Types, classifications. The role and importance of conventional fuels in reducing pollution produced by ICE. Adaptation of current ICE for operation with unconventional fuels. Chapter 4 The role and importance of oils (mineral, semisynthetic, synthetic) for lubricating ICE and transmissions of motor vehicles. Properties of lubricating oils and methods for their determination. Influence of lubricant quality on engine wear and transmission. Methods applied to improve the lubrication characteristics of oils and reduce their oxidation, additives. Reduce the consumption of lubricating oil for motor vehicles. Establish lubricating oils for ICE charged / supercharged. Establish lubricating oils for transmission. Recycling of used oils. Head	3

					5. Fluids used in braking, steering, air conditioning and in the nitrogen oxide pollution reduction facility. Greasy lubricants. Types, properties, factors that influence their properties. Materials for the maintenance of body elements, plastic elements, textile and rubber materials.	
			3-rd Year	2	**Construction and Calculation of Motor Vehicles I** Introduction: 1.1. Power balance and load of road vehicle assemblies. Traction equipment layout schemes and overall balance sheet of road vehicles. Power balance and load of road vehicle assemblies. 1.2. Calculation modes of components of road vehicles: Calculation of resistance to static stresses and dynamic dynamic stresses. Calculation of resistance to periodic variable stresses. Calculation of resistance to random variable loads. Determination of equivalent tasks for calculating parts and mechanisms of automobiles. 2. Clutches: 2.1. Functional role, requirements, classification; 2.2. Construction and calculation of friction mechanical clutches; Construction of friction mechanical clutches. Main parameters of frictional mechanical clutches. Calculation of friction mechanical clutches. 2.3. Construction and calculation of mechanisms for actuating mechanical clutches. Mechanical drive mechanisms. Hydraulic actuators. Automatic actuators. 2.4. Hydraulic and electromagnetic clutches: Operation, construction and calculation of hydraulic clutches. Operation, construction and calculation of	6

					electromagnetic clutches. 3. Gearboxes: 3.1. Functional role, requirements, classification. 3.2. Static mechanical gearboxes with fixed axle shafts. General organization of the gear reducer. Stable coupling solutions. Construction of the components of the reducer. Types of mechanical gearboxes in stairs with fixed shafts. Calculation of mechanical gearboxes in stairs with fixed shafts. Drive system for mechanical gearboxes in stairs with fixed shafts. 3.3. Continuous gearboxes; Gearboxes with belt drive. Hydrostatic gearboxes. Hydrodynamic gearboxes. 3.4. The reducer-distributor. 4. Longitudinal transmission: 4.1. Functional role, requirements, classification. 4.2. Cinematic of longitudinal transmission. Cardiac joint kinematics. Bicardial longitudinal transmission kinematics. 4.3. Construction and calculation of longitudinal transmission. Construction and calculation of cardan shafts. Construction and calculation of longitudinal shafts. Construction and calculation of intermediate supports. 5. Rear axle: 5.1. Functional role, requirements, classification, 5.2. Main transmission; Role and classification of main transmissions. Construction of the main transmission. Components of the main transmission. 5.3. Differential. The role of the differential. Differential kinematics. Differential construction. Differential calculation elements. 5.4. Planetary trees. Plant types of planetary shafts. Calculation of planetary shafts. 5.5. Wheel hub and wheel guiding	

					mechanism. Wheel hub. Guiding the wheels of rigid engine axles. Guiding the wheels of rigid bridges. Guiding the articulated axle wheels. Front axle (functional role, requirements, classification, front deck construction, front deck calculation); Steering system (functional role, requirements, classification, transmission ratios of steering systems, construction and calculation of the steering mechanism, construction and calculation of steering transmission); Braking system (functional role, requirements, classification, construction of brakes for motor vehicles, braking systems for passenger cars and light commercial vehicles, braking systems for heavy vehicles and tractors, calculation of braking system); Suspension of motor vehicles (functional role, requirements, classification, construction and suspension calculation, suspension dampers); Bodywork, frames and rolling systems (functional role, requirements, classification, car bodies, vehicle framework, car running system).	
			3-rd Year	2	**Motor Vehicles Dynamics I, II** General organization and main parameters of motor vehicles: 1.1. Destination and classification of cars; 1.2. General composition and organization of motor vehicles; General composition of motor vehicles on wheels. Drawings of traction equipment. 1.3. Constructive parameters and load capacity of motor vehicles; Main dimensions and vehicle passage capability. Vehicle weight and load capacity. 1.4. Car Wheels: Tire	4

					Construction. The rays of the car wheels. 2. The process of self-propulsion and running of motor vehicles: 2.1. Main features of engines used in motor vehicles; The external speed of the internal combustion piston engine. Comparative analysis of engine characteristics used in motor vehicles. 2.2. The process of self-propulsion of motor vehicles; Transmission efficiency. The engine torque on the prop wheel. The process of rolling the car wheel (balance of the drive wheel, steering wheel balance (non-motor), braked wheel balance, influence of adhesion on the wheel wheel balance). 2.3. The behavior of tires under the external loads. Deformation of the tire under the action of internal air pressure. Deformation of the tire under the action of the normal load in rest. Deformation of the tire under the action of tangential forces. Deformation of the tire under the action of transverse forces. 2.4. Study the processes that take place between the tire and the tread. Surface of contact between the tire and the track. Distribution of stresses on the contact surface between the tire and the tread (normal pressure on the contact surface, tangential stresses in the contact surface). Study of adhesion between the tire and the tread (sliding of the tire on the tread, specific tangential force - rolling characteristic, adhesion coefficient, slipping rate). 3. Resistance to propulsion of vehicles: 3.1. Rolling resistance. Generating rolling resistance. Factors of influence on rolling resistance. Calculation of rolling resistance. 3.2. Air	

					resistance: Aerodynamics of motor vehicles. Influence of the shape of the vehicle on its aerodynamics. Calculation of air resistance. 3.3. Slope resistance. 3.4. Resistance to starting. 3.5. Tire resistance. 4. Reaction of the rolling path on the wheels of motor vehicles: 4.1. Normal reactions in the longitudinal plane. Motor vehicles with two decks. Motor vehicles with three axles (motor with rear axles, motor with all engine axles). Road trains (tractor trailer motor vehicle, articulated road train with semi-trailer). 4.2. Normal transverse reactions. 5. Performance of motor vehicles: 5.1. Traction and power balance of motor vehicles; 5.2. Wheel power characteristic; 5.3. General motion equation; 5.4. The dynamic feature of motor vehicles; 5.5. Vehicle speed feature; 5.6. Starting the cars. Acceleration of cars. Start time and space. 5.7. Influence of constructive parameters on the dynamic qualities of motor vehicles; 5.8. Vehicle braking and brake capacity parameters. Braking force and its distribution on decks. Parameters of braking capacity (brake time and space, ABS). Brake with unburned engine. 6. Calculation of vehicle traction: 6.1. Choosing the vehicle's constructive parameters; 6.2. Calculation of engine power and determination of its external characteristic; 6.3. Determination of transmission ratio of the main transmission; 6.4. Determination of transmission ratios from the gearbox; 6.5. Determination of dynamic performance of motor vehicles. 7. Stability of vehicles:	

					7.1. Longitudinal stability of vehicles - Longitudinal stability when overturned. Longitudinal stability when slipping or slipping. 7.2. Transverse stability of motor vehicles. Movement of turn-by-turn vehicles (producing the turn in correct steering conditions, determining the reactions to the wheels of the vehicles in turns). Crosswise stability to skidding. Transverse overturning stability. 7.3. Stability of the rectilinear motion of the vehicles. Tire deviation. Conditions of motion stability and critical speed. Influence of wheel tangential forces on the stability of the rectilinear motion of motor vehicles. 8. Vehicle maneuverability: 8.1. The Influence of Tire Deviation on Bumper Movement. Circular motion with constant speed (plan of the vehicle, vehicle roll model, suspension influence on the circular movement). Steady speed movement on any trajectory. 8.2. Vehicle maneuverability when driving straight ahead. 9. Fuel consumption of the vehicle: 10.1. Fuel consumption parameters; 10.2. Fuel consumption by speed mode; 10.3. Influence of constructive and exploitation parameters on fuel consumption of motor vehicles - Influence of engine parameters. Influence of transmission. Influence of weight. Influence of the aerodynamic factor. Influence of tires. Influence of methods and driving style on fuel consumption.	
			3-rd Year	2	**Applied Electronics** Electronic circuit devices. Amplifiers and oscillators. Unassembled low power rectifiers. Electronic stabilizers. Rectifiers	4

					ordered by low power. Combined and sequential logic circuits. Applications of combinational and sequential logic circuits. Embedded systems for measuring and processing signals. Characterization and programming of microcontrollers and component subsystems: digital input / output ports, serial communications, analogue-to-digital converters, timers.	
			3-rd Year	2	**Internal Combustion Engine I, II** 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.	4
			3-rd Year	2	**Practical Training** **Objectives:** Acquiring knowledge, skills and competencies regarding the construction, maintenance, diagnosis and repair of road vehicles. - Using the basic knowledge to explain the different maintenance technologies for road vehicles. **Application Content** 1. General overview of the construction	3

					and operation of the transmission and of the auxiliary installations of the vehicle, such as the braking, steering, electrical, air conditioning, etc. 2 Practical operations for checking, adjusting and repairing transmission elements such as clutch, gearbox, cardanic transmissions, conical clutch, motors etc. Checking and adjusting the ASR system. We will analyze the main devices used, which are included in the practical project. 3 Practical operations for checking, adjusting and repairing the brake components. Check, and adjust the ABS, EBV, EDS. The devices used will be included in the project. 4 Practical operations for checking, adjusting and repairing steering elements. The devices used will be included in the project. 5 Practical operations for verifying the adjustment and repair of electrical and air conditioning elements. The main devices used will be analyzed. 6 Practical operations for verifying the adjustment and repair of suspension elements of motor vehicles. The devices used will be included in the project. 7 Practical checks and repair of bodywork. The devices, materials and methods used will be included in the project. 8 Organization of workshops for the diagnosis, repair and maintenance of road vehicles. The organizational structure of the unit, highlighting the main attributions of all employees; The main indicators of the company and the way of organizing the activities (in flux, work stations); The technical level of endowment of the	

					company by elaborating the principles of operation of the specific stands and devices used; Supply system with spare parts and materials; The technological flow, the way of programming the activity and the relations with the clients. Normalization of activities; How to receive-diagnose-repair-hand over the vehicle, the customer.	
			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	**Construction and Calculation of Motor Vehicles II** **Objectives:** Knowledge and understanding of the general and specific issues regarding the role, the functional conditions, the construction and calculation of the main assemblies of the road vehicles in the sense of constructive solutions, the calculation of sizing and checking of the component parts; Developing a systemic view of how the construction and calculation of the main road vehicle	4

					assemblies ensures the dynamic performance of road vehicles to optimize their performance. **Course Content** Introduction: 1.1. Power balance and load of road vehicle assemblies. Traction equipment layout schemes and overall balance sheet of road vehicles. Power balance and load of road vehicle assemblies. 1.2. Calculation modes of components of road vehicles: Calculation of resistance to static stresses and dynamic dynamic stresses. Calculation of resistance to periodic variable stresses. Calculation of resistance to random variable loads. Determination of equivalent tasks for calculating parts and mechanisms of automobiles. 2. Clutches: 2.1. Functional role, requirements, classification; 2.2. Construction and calculation of friction mechanical clutches; Construction of friction mechanical clutches. Main parameters of frictional mechanical clutches. Calculation of friction mechanical clutches. 2.3. Construction and calculation of mechanisms for actuating mechanical clutches. Mechanical drive mechanisms. Hydraulic actuators. Automatic actuators. 2.4. Hydraulic and electromagnetic clutches: Operation, construction and calculation of hydraulic clutches. Operation, construction and calculation of electromagnetic clutches. 3. Gearboxes: 3.1. Functional role, requirements, classification. 3.2. Static mechanical gearboxes with fixed axle shafts. General organization of the gear reducer. Stable	

					coupling solutions. Construction of the components of the reducer. Types of mechanical gearboxes in stairs with fixed shafts. Calculation of mechanical gearboxes in stairs with fixed shafts. Drive system for mechanical gearboxes in stairs with fixed shafts. 3.3. Continuous gearboxes; Gearboxes with belt drive. Hydrostatic gearboxes. Hydrodynamic gearboxes. 3.4. The reducer-distributor. 4. Longitudinal transmission: 4.1. Functional role, requirements, classification. 4.2. Cinematic of longitudinal transmission. Cardiac joint kinematics. Bicardial longitudinal transmission kinematics. 4.3. Construction and calculation of longitudinal transmission. Construction and calculation of cardan shafts. Construction and calculation of longitudinal shafts. Construction and calculation of intermediate supports. 5. Rear axle: 5.1. Functional role, requirements, classification, 5.2. Main transmission; Role and classification of main transmissions. Construction of the main transmission. Components of the main transmission. 5.3. Differential. The role of the differential. Differential kinematics. Differential construction. Differential calculation elements. 5.4. Planetary trees. Plant types of planetary shafts. Calculation of planetary shafts. 5.5. Wheel hub and wheel guiding mechanism. Wheel hub. Guiding the wheels of rigid engine axles. Guiding the wheels of rigid bridges. Guiding the articulated axle wheels. Front axle (functional role, requirements,	

					classification, front deck construction, front deck calculation); Steering system (functional role, requirements, classification, transmission ratios of steering systems, construction and calculation of the steering mechanism, construction and calculation of steering transmission); Braking system (functional role, requirements, classification, construction of brakes for motor vehicles, braking systems for passenger cars and light commercial vehicles, braking systems for heavy vehicles and tractors, calculation of braking system); Suspension of motor vehicles (functional role, requirements, classification, construction and suspension calculation, suspension dampers); Bodywork, frames and rolling systems (functional role, requirements, classification, car bodies, vehicle framework, car running system). **Application Content** 1. The arrangement of traction equipment on road vehicles; 2. Monodisc mechanical clutches; 3. Mechanical gearboxes (general arrangement of the gearing mechanism, construction of the parts of the editor mechanism, static mechanical gearbox types with fixed shafts); 4. Mechanical gearboxes (static coupling solutions, gearboxes with fixed axles); 5. Distributor reducer. Longitudinal transmission; 6. Rear axle (main transmission, differential); 7. Rear axle (planetary shafts, wheel hub and wheel guiding mechanism).	
			4-th Year	1	**Motor Vehicle Diagnosis** Chapter 1: Auto Diagnosis, Generalities	4

					and Approach. Smart diagnosis and its significance. Diagnostic parameters, necessary equipment. OBD (On Board Diagnosis) diagnostic systems of road vehicles. Interpretation of the most common OBD II error codes. The meaning of the error codes. Chapter 2: Diagnosis of the engine and its auxiliaries. General. Diagnosing the injection system. Diagnosis of the ignition system. Diagnosing the distribution system. Diagnosis of startup system. Diagnosis of the cooling and lubrication system. Diagnosing the overcharging system. Diagnosing EGR. Diagnosis of depollution equipment. Chapter 3: Diagnosis of transmission. Diagnostic methodology. Specific equipment and diagnostic methods. Chapter 4: Diagnostics of the direction. Diagnostic methodology. Specific equipment and diagnostic methods. Chapter 5: Diagnosis of Suspension. General considerations. Diagnostic methodology. Specific equipment and diagnostic methods. Chapter 6: Diagnosing ABS, EBV, ASR, ESP. Diagnostic methodology. Specific equipment and diagnostic methods. Chapter 7: Diagnosing vehicles using dynamic stands. Diagnostic methodology. Specific equipment and methods.	
			4-th Year	1	**Electrical and Electronic Equipment for Motor Vehicles** Power Supply System: features, components, electrical layout. Battery, alternator and voltage regulator relay. Classical and electronic ignition systems: components, classification, features,	4

					operation. Classic Ignition System: Spark Plug, Breaker-Distributor, Induction Coil, Operation. Electronic ignition systems with inductive and capacitive storage. Startup system: classification, components, startup conditions, starter types, starter auxiliary systems. Lighting and signaling system: general scheme, components, operation. Electronic control systems: automatic illumination, automatic headlight positioning, automatic curve headlight adjustment, sudden brake light warning. Active electronic control systems: ABS, EBD, ESP. Passive safety electronic control systems: airbag, seat belt pretensioner. Embedded monitoring and control systems: acquisition of signals from sensors and transducers; command the execution elements.	
			4-th Year	1	**Manufacture and Repair of Motor Vehicles** Chapter 1. Maintenance and repair. 1.1.Importancy of maintenance and repairs.1.2.Movies related to the reliability and maintenance of machinery and equipment (reliability, maintainability, availability). 1.3. Overall reliability indicators. Chapter 2. Systems for organizing and conducting maintenance and repair activities in the automotive field. 2.1. Main functions of maintenance and repair. 2.2. Systems of organization and management (maintenance as needed, preventive maintenance, functional maintenance). 2.3. Technical repair standards (content of repair norms, repair cycle structure, revision and repair specifications: technical revision, current	4

					repairs, capital repairs, service life, repairs duration, repairs). Graphic representation of repair activity. Chapter 3. General notions of motor vehicle wear. 3.1. Physical wear. 3.2. Obsolescence. 3.3. Types of friction - classification. 3.4. Types of wear (adhesion, abrasive, cavitation, thermal, fatigue, corrosion). 3.5. Indicators for wear evaluation. 3.6. Measures to reduce wear. Chapter 4. Preparing vehicles for repair. 4.1. Systems for organizing repairs (centralized system, decentralized system). 4.2. Preparatory technical and administrative work for repairs. 4.3. Dismantling for repair (preparation for dismantling, sorting of parts, checking and defect finding). Chapter 5. Reconditioning of vehicle specific parts. 5.1. Reconditioning shaft pieces. 5.2. Reconditioning toothed wheels. 5.3. Reconditioning the sliding bearings. 5.4. Reconditioning bush pieces. 5.5.Reconditioning of other types of specific parts. 5.6. Reconditioning of parts by mechanical machining. 5.4.1. Machining. Chapter 6. Operation and maintenance of machinery and equipment in motor vehicle repair shops. Chapter 7. Getting the work safety technique during maintenance and repair works in auto repair shops.	
			4-th Year	1	**Management and Marketing** Management issues: principles and management system. Enterprise as an economic agent. Enterprise sizing and place of small and medium sized enterprises in market economy.	3

					Organizational structure of industrial enterprises. Managerial functions and functions of the enterprise. Information system. Business decision-making system. The production process and its organization. Production capacity. Operational management of production. Organization of service processes: maintenance and repair of equipment and organization of Tools, Devices and Verifiers sections.	
			4-th Year	1	**Motor Vehicles Mechatronics** 1. Mechatronic systems of modern motor vehicles. 2. Structure of automotive mechatronic systems, microcontrollers, CAN BUS, computerized interfacing, OBD system integration. 3. Smart Sensors Used in "Mechatronic Vehicles". 4. Drive systems using electric, hydraulic and pneumatic actuators. 5. Intelligent control systems developed using artificial intelligence techniques (fuzzy logic, neural networks). 6. Programs for the analysis and simulation of the operation of the mechatronic subsystems in automobiles: Simulink, dSpace, Carsim, Fluidsim, Modelica. 7. Analyzing and simulating the operation of modern injection engines. 8. Analysis and simulation of automatic gearbox operation. 9. Analysis and simulation of safety systems (ABS, ESP, etc.). 10. Analysis and simulation of the suspension system operation. 11. Mechatronics of comfort and safety systems. 12. GPS-based intelligent navigation systems.	4
			4-th Year	2	**Motor Vehicle Chassis and Driving Structures**	4

					1. Advanced metallic materials used in the manufacture of automobiles. 2. Frame and chassis of motor vehicles. Frame construction. Build special. 3. Bodywork of cars. Bus bodies. Caravan bodies. 4. Elements of design and calculation for bodywork. 3D modelling has been structured. 5. Elements and constructive solutions of the body structure. 6. Matrices for the construction and protection of the bodywork against corrosion. 7. Modern procedures for body and cabin assembly. 8. Modern cabin and bodywork technologists. 9. Behaviour of the bodywork.	
			4-th Year	2	**Construction and Calculation of Motor Vehicle Auxiliary Installations** Chapter 1: Subject of discipline. General notions about the installations and auxiliary systems of motor vehicles. Structure of an ancillary installation (scheme, functional requirements, way of organizing and responding to required requirements). Exemption for ABS. Chapter 2: Auxiliary systems of the car engine. Direct injection injection systems at m.c. and at m.a.s., overload system, cooling and lubrication system, EGR system, antipollution system, schemes, operation, calculation elements. Chapter 3: Auxiliary Vehicle Systems. The "X by wire" concept, the extension of electrical servosystems to some car systems. Active safety systems: Mechanical drive automation, stop and go solutions, ASR traction control system. ABS and EBV braking systems. ESP stability systems. Electronic assisted steering. Active and	4

					semi-active suspensions. Passive safety systems: Electronic airbag and seat belt control system. Chapter 4: Solutions for increasing the comfort of cars. Suspension system with electronic control. Air conditioning system. Chapter 5: Vehicle Lighting System.	
			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	**Motor Vehicle Reliability and Termotechnics** Technical systems. Machine, Functional Criteria for Technical Systems. Component defects of motor vehicles. The failure process; Design faults failures due to technological and execution conception; wear-related defects; disturbances due to deformations and shocks, environmental failures, human factor defects. Probability theory elements with application in reliability issues. Events, Probability, Conditional Probability, Random Variables. Reliability and reliability indicators. Reliability function; Intensity of failures; Average running time; Dispersion of distribution. Types of reliability; The durability	3

					correlation - reliability. Reliability distribution laws. Exponential, Poisson, Binomial, Uniform, Normal, Log-normal, Gamma, Weibul, Alpha, Power. Determination and Verification of Reliability Indicators. Estimates of Reliability Indicators, Estimation of theoretical distributions, Elimination of Aberrant Values, Censored Tests, Truncated Tests, Accelerated Tests. Calculating the reliability of complex systems. Complex systems with series or series structure; Complex systems with "parallel" structure; Complex systems with "series-type" structure; Complex systems with composite structure. Complex systems with "arbitrary" structure; Modeling of system operation by steady-state Markov stochastic processes with continuous time. The probability of status on systems with high reliability components. Calculation of reliability using the Monte Carl method. Model of the failure shaft. Predictable reliability.	
			4-th Year	2	**Management of Health and Safety at Workplace** General notions. Subject of discipline. The scope of Management of Health and Safety at Workplace (SSM). Historical. The evolution of OSH concerns. Definitions. Classifications. Organization of labor protection. The legal bases of SSM. Aspects of SSM Legislation in Romania, (laws, HGs, Minister's orders, standards, norms, instructions.) Accidents Theoretical basis of accident prevention. The genesis of occupational accidents and diseases. Risk factors for injury and	3

					professional illness. Measures to prevent accidents at work and occupational diseases. Significance of SSM. Method of assessing the risks of injury and occupational disease at workplaces. Theoretical premise. Risk-Safety Relationship. Elements of occupational diseases. Definition of professional disease. Research, Recognition and Evidence of Occupational Diseases. Elements of fire prevention and extinguishing. Fire trigger mechanism. Propagation of fire in different situations. Firefighting equipment. Intervention for firefighting and saving lives. Providing first aid in case of cardio-respiratory arrest, fainting, burns, animal bites, drowning, fractures. Behavior in emergency situations: earthquake, flood, storm, terrorist attacks. Ergonomics in Workplace Safety and Health. The human body in the design of the workplace. Scope of work. Anthropometry. Workspace dimensioning by user limit. Work areas for the arms. Limits of use of the field of vision. Head Rotation Limits. The height of the work plan. The ergonomic chair.	
			4-th Year	2	**Maintenance of Motor Vehicles** Chapter 1. Defining the maintenance concept. Impact of maintenance. Methods of managing and organizing maintenance activities. Optimization of predictive maintenance. Chapter 2. Justification and Implications of Financial Costs. Justification of predictive maintenance. Chapter 3. The role of organizing maintenance. The mission of maintenance. Assessment of organization	4

					of maintenance activities. Planning and design of maintenance activities. Benefits of predictive maintenance. Chapter 4. Clutch maintenance. Chapter 5. Gearbox maintenance. Chapter 6. Maintenance of longitudinal and rear axle transmission. Chapter 7. Maintenance of the front axle. Chapter 8. Steering system maintenance. Chapter 9. Maintenance of the braking system. Chapter 10. Suspension, body, frame and tread maintenance.	
			4-th Year	2	**Organization and operation of a car service shop** 1. Organization of services. Introduction. Organizational chart. Service regulation. 2. Organization of services. Conditions for ensuring compliance. 3. Organization of services. Procedural rules for the assessment of technical capability and authorization of economic operators. 4. Service operation. Supply of spare parts, materials and lubricants. 5. Service operation. Identification of road vehicles and their components. 6. Trademark Technical Representation. General notions. The organizational framework. 7. Trademark Technical Representation. Revisions. Guarantees. Accommodating.	2
			4-th Year	2	**Computer-Aided Design** 1. User Interface; 2D procedures; 3D procedures; Design of landmarks; 2. Parametric design; Derivatives; Highlights from the board; Repetitive features; 3. Design of assemblies; Adaptive design; Standard benchmarks libraries; 4. Functional design of assemblies; 5. Generating structures; Welded landings; Generating drawings; 6. Rendering and	4

					animation; Dynamic simulation 7. Tension analysis.	
			4-th Year	2	**Electric and Hybrid Propulsion Systems** Chapter 1 Introduction: Electric vehicles and hybrids, the solution for reducing pollution and fuel consumption. Electric propulsion machinery for use on motor vehicles. Technical, thermo-economic and exploitation indexes. Hybrid propulsion systems used on motor vehicles. Technical, thermo-economic and operating indexes of hybrid vehicles. Chapter 2. Hybrid propulsion vehicles. Operation of parallel, parallel and serial / parallel hybrid drives. Function and characteristics of hybrid propulsion elements: internal combustion engine, electric propulsion engine, electric generator, power splitter, electronic control and control block, accumulators, etc. Automatic control and regulation of automotive propulsion systems. Hybrid propulsion transmissions calculation elements. Chapter 3. Electric powered vehicles. Operation of electric propulsion transmissions. Methods of obtaining and storing electricity used for propulsion: fuel cells, photovoltaic conversion, batteries. Function and features of electric propulsion elements: electric propulsion engine, electric generator, electronic control and control block, accumulators, etc. Automatic control and regulation of electric propulsion systems applied to motor vehicles. Components of electric propulsion transmissions. Chapter 4. The operating characteristics of electric and	4

					hybrid vehicles. Propulsion characteristics of power-driven vehicles. Propulsion features of Hybrid Propulsion Vehicles. Consumer characteristics. Chapter 5. Operating modes of electric and hybrid road vehicles. Static and quasi-stationary modes. Non-stationary operating modes of electric vehicles and hybrids. Economic exploitation of hybrid vehicles. Economic exploitation of electric vehicles.	