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

Domain of study	Level (BA/MA)	Study programme	Year of study	Semester	Course title	Credit units
Environmental Engineering and Protection in Industry	**bachelor, level 6 from NQF, EQF**	**Environmental Engineering**	1-st Year	1	**Mathematical Analysis** **Course content:** Chapter I. Strings and series of real numbers. Convergence of strings and real number series. Convergence criteria. Head. II. Differential calculus. Real variability of real variable function. Taylor's form. Series of powers. Functions of several variables. Limit, continuity, derivability, and differentiability for multi-variable functions. Partial derivatives of superior order. Extremes free and with links. Elements of field theory (gradient, divergence, rotor). Head. III. Full calculation. Primitive. Methods for determining primitives. Integrala definita. Incorrect integrations. Integral curves of spheres I and II. Integrates the curves independent of the road. Multiple integrations (double, triple, surface). Integer formulas. Chapter IV. Differential Equations. Differential equations of order I: differential equations with separable, homogeneous, linear variables, Bernoulli, Riccati, Lagrange, Clairaut. Problem of Cauchy. Higher linear differential equations. **The content of the seminar or practical papers:** Applications to the coursework topics.	4
			1-st Year	1	**Chemistry I, II** **Course content:** 1. The History of Chemistry Development. Fundamental notions. Classification of chemicals. Aggregation states of matter.	5

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

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

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

			1-st Year	1	**Communication** Communication, principles, units and characteristics of communication; the effects of communication, the intelligibility of the message; levels of human communication. The principles of effective communication: clear, complete, concise, concrete, fair, receptive, courteous message. Nonverbal communication. Communication networks. Communication in conflict management. Communication and listening. Presentation of techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Data integration. Media elements. Structure of technical-scientific works: papers, studies completion, papers and scientific papers, projects. Human-to-human interaction mediated by web and audio-video technologies.	3
			1-st Year	1	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on	1

					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. 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	5

					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, 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,	5

					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**	2

					Course content: Communication, principles, units and characteristics of communication; the effects of communication, the intelligibility of the message; levels of human communication. The principles of effective communication: clear, complete, concise, concrete, fair, receptive, courteous message. Nonverbal communication. Communication networks. Communication in conflict management. Communication and listening. Presentation of techniques for making oral and written scientific presentations. Formats for presentations. Organization of the presentation. Data integration. Media elements. Structure of technical-scientific works: papers, studies completion, papers and scientific papers, projects. Human-to-human interaction mediated by web and audio-video technologies. **The content of the seminar or practical works:** Technical and business correspondence. Design and drafting CV (European format). Letter of intent. Interview selection, employment, promotion on the job. Oral and written presentations. Technical and scientific works: papers, studies completion, papers and scientific papers, projects.	
			1-st Year	1	**Materials Science and Engineering** **Course contents:** Introduction. Types of materials. The link between chemical composition-processing conditions-property structure. Atomic architecture. Crystalline structure, crystalline imperfections. The amorphous	5

					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 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	4

					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	**Chemistry I, II** **Course content:** 1. The History of Chemistry Development. Fundamental notions. Classification of chemicals. Aggregation states of matter. Status Transformations. 2. Fundamental Laws of Chemistry. Elements of structure of atoms. 3. Atomic models. Orbital atomic. Quantum numbers. Electronic layers. Electronic substrates. Periodic system of elements. 4. Law of periodicity and properties of elements. Rules for	5

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

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

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

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

					orthogonal projection; representation of straight and double private straight lines, determination of traces and crossings crossed by the right, intersections of planes and plates, visibility in the purge. 2. Applications in the Polyhedra chapter: The intersection of some particular planes with pyramid and prism, straight intersections with prism and pyramid, prism and pyramid deployments. 3. Applications in the chapter cylinder and cone: The intersection of any planes and particular planes with the cone and the cylinder, the intersections of straight with the cylinder and the cone, the rollers of the cylinder and the cone. 4. Sphere applications: Sphere intersection with particular plane and planar plane, the intersection of the straight line with the sphere, unfolded to the sphere. 5. Applications in the intersection of geometric bodies: Intersections of polyhedres, intersections of cylindrical-conical bodies, intersections of sphere with cone and prism.	
			1-st Year	2	**Ecology** The content of the discipline. Biosphere. Physico-chemical characters of the biosphere. Geography biosphere. Components of the biosphere. Quantitative and mineralogical characteristics. Biogenic organic matter. Biotope - abiotic environment of the living beings. Geogasic factors. Mechanical factors. Physical Factors. Chemical Factors. Limiting factors. Ecology of populations. Statics of populations. Population dynamics. Causes of the	4

					emergence and worsening of ecological imbalances. Ecosystem as a formation in space and time. The spatial structure of the ecosystem. The composition of the ecosystem. Types and delimitation of ecosystems in space. Internal spatial structure of the ecosystem. The main ecosystems in Romania. Biome. The biocenotic order in the ecosystem. Trophic chains. Successes of ecosystems	
			1-st Year	2	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to	1

					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	**Hydrology and Hydrogeology** Hydrologic cycle. Hydrologic systems. Hydrographic basin. Sub-basins. Surface of hydrographic basin. Hypsographic Curve. Relation of channel slope and length of stream. Hydrological Network. Morphological parameters. Water-course. The Long profile. River cross profile. Lakes hydrography. Lake morphology and morphometry. Rocks and water. Underground water. Hydrologic cycle. Aquifers and confining beds. Porosity. Specific yield and specific retention. Hydraulic conductivity. Capillarity and unsaturated flow. Stratification and unsaturated flow. Saturated flow and dispersion. Ground water movement and topography. Ground water flow nets. Ground water movement and stratification. Ground water velocity. Transmissivity. Storage coefficient. Cone of dispersion. Pollution of ground water.	5
			1-st Year	2	**English** **The content of the seminar or practical works:**	2

					Semester I - Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect, Research and Development, Specialized vocabulary and discourse situations.) Grammar in focus: Past tenses (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			1-st Year	2	**Computers Programming and Programming Languages** **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**	4

					Representation of information in numerical computers, numbering systems, alphanumeric codes, numeric codes. Algorithms and logic schemes, pseudocode language. Fundamental algorithms. Language C, introduction. Instructions. Types Input / Output Functions. Operators and phrases. Panels. **Application Content** Numerical systems: binary, octal, hexadecimal. Convert numbers from one counting system to another. Numeric codes. Representation of numbers in complement to 2. Sorting and intercalating algorithms. Fast search algorithms. Application for displaying integer values with words. Application for graphic representation of trigonometric functions over a certain range. Representing surfaces in space. Application for adding and subtracting numbers as large as possible. Show contents of whole variables in binary format. Duplicate elimination application in a text. Define some exceptions. Remove a specific word from a text. Sorting and fast search applications.	
			2-nd Year	1	**Environmental quality, epidemiology and public health** Environment and environmental quality. Environmental pollution. Air quality and protection. Quality and soil protection. Quality and protection of aquatic ecosystems. Monitoring the quality of environmental factors. General notions in epidemiology. Introduction to public health: definitions, purpose, objectives.	5

					Health inequities and inequalities	
			2-nd Year	1	**Sports** **The content of the seminar or practical works:** 1. Presentation of minimal theoretical content regarding the activity of physical education, training for labor protection, presentation of the objectives and requirements of the discipline, support of the initial tests. 2. Repeat the main methods of football - girls and volleyball girls, known from previous cycles. Positioning in attack and defense systems. Bilateral games. Developing the rectifying rate to auditory and visual stimuli. Repeat kick start and launch from start, development of the speed of movement through accelerators on variable distances 20-60m. Educating dynamic strength in upper, lower limbs, abdomen and trunk by working in the circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and	2

					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	**Electrotechnics** **Course content:** 1. General Electrotechnics: DC Electric Circuits: Printed Electrical Fields. Electricity. The Law of Electric Driving. Law of energy transformation into conductors. Kirchhoff's theorems. Resolving DC circuits. The balance of powers. Maximum power transfer. Theorem of power conservation in DC. Electromagnetism: The magnetic field. Magnetic induction. Magnetic Field Intensity. The magnetic flux. Magnetisation of bodies. The hysteresis phenomenon. The fundamental law of the magnetic circuit. The phenomenon of electromagnetic induction. Autoinducer. Mutual induction. Eddy currents (Foucault). The magnetic field energy. Electromagnets. Single-phase alternating current circuits: Single-phase alternating current generation. Characteristic dimensions of the single-phase alternating current. Symbolic representation of sinusoidal sizes. Laws and theorems in c.a. AC Circuit Elements. Series circuits and alternating current. Power in c.a. phase. Improving the power factor. Resonance in electrical circuits. Three-phase electric circuits: Polyphase systems. Three-phase systems. Star connection. Triangle connection. Electrical powers in three-phase circuits. Connecting the receivers in three-phase	3

					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	
			2-nd Year	1	**Computer Aided Graphics** **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	4

					applications. **Course Content** Representation of information in numerical computers, numbering systems, alphanumeric codes, numeric codes. Algorithms and logic schemes, pseudocode language. Fundamental algorithms. Language C, introduction. Instructions. Types Input / Output Functions. Operators and phrases. Panels. **Application Content** Numerical systems: binary, octal, hexadecimal. Convert numbers from one counting system to another. Numeric codes. Representation of numbers in complement to 2. Sorting and intercalating algorithms. Fast search algorithms. Application for displaying integer values with words. Application for graphic representation of trigonometric functions over a certain range. Representing surfaces in space. Application for adding and subtracting numbers as large as possible. Show contents of whole variables in binary format. Duplicate elimination application in a text. Define some exceptions. Remove a specific word from a text. Sorting and fast search applications.	
			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	2

					Development, Specialized vocabulary and discourse situations.) Grammar in focus: Past tenses (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	1	**Numerical Methods** **Course content:** 1. ERRORS IN NUMERICAL METHODS. Introduction. Truncation Errors. Representing numbers in your computer. Errors by rounding. LINING EQUIPMENT SYSTEMS DIRECT METHODS. Introduction. Gauss removal and elimination Gauss-Jordan. Pitching and elimination Gauss-standard. Matrix operations. Inversion of a matrix Determinant of a matrix. Private Matrices. ITERATIVE METHODS. Introduction. Vector and matrix rules. The Jacobi method uses the Gauss - Seidel method. Relaxation	5

					methods. NUMERICAL INTERPOLATION. Introduction. Lagrange interpolation formula. Newton interpolation formulas by equidistant nodes. Analysis of polynomial interpolation. Cubic spline functions. NUMERICAL CUADRATURE. Introduction Rule of rectangle and trapezoid rule. Simpson's rules. Quantum Formulas Newton - Cotes. Gauss quadrature. **The content of the seminar or practical papers:** Review of programming knowledge in C ++ .. Errors in numerical methods: CONVERSIA FROM ZECIMAL IN BINAR. Gauss removal with pivoting. The reverse of a matrix. LU decomposition. Unspecified M systems. The Jacobi method. Gauss-Seidel iterative method. Lagrange interpolation. Cubic spline interpolation. Numerical quadrature: Rectangle method and trapezoid method. Quantum formula Newton-Cotes. VERIFICATION OF KNOWLEDGE.	
			2-nd Year	1	**Materials Strength** **Course contents:** Chapter 1 Introduction: Definitions, structural concepts (bars), requests, approaches. Chapter 2 Cutting forces and bending moments. Chapter 3 Behavior of Materials. Chapter 4 Expansion / Compression of bars. Chapter 5 Straight section cross sections. Chapter 6 Bending of bars. Chapter 7 Bars with circular or annular section; torsion of rectangular cross-section bars. Chapter 8 Sizing / Verification Methodology of Bars. **Seminar content or practical works:**	4

					Seminar 1. Efforts diagrams on plain beams and console beams. Efforts diagrams at simple beams with consoles and inclined beams. 2. Efforts diagrams of Gerber beams and plain frames. Effort diagrams for bar systems. 3. Calculation of the main center inertia moments of the composite sections with a symmetry axis. Calculation of main center inertia moments of sections without axis of symmetry. 4. Straight bars required for stretching or compression: verification, sizing and resistance calculation. Calculation of unstable static simple axial load systems with temperature variations and displacements due to errors found during assembly. 5. Verification, sizing and calculation of resistance strength of bars required at bending. 6. Calculation of the beams displacements required at bending with the initial parameter method. 7. Verification, sizing and calculation of the resistance strength of the circular (or ring) section bars required at free torsion. Laboratory Learning to work with programs for Straight Bar Resistance and Flat and Bar Systems efforts).	
			2-nd Year	1	**Sources, processes and polluting products** This course is designed to present the different types and sources of pollution and the various human activities that can cause pollution. . The course also describe the ways pollution can affect different sectors of the environment: water, air and soil. It also describes some	5

					of the significant effects of pollution on the environment and on human health and discusses options for preventing and controlling pollution.	
			2-nd Year	2	**Analysis and Synthesis of Technological Processes** This course provides an overview of: energy resources, resource management from extraction and processing to recycling and final disposal of wastes, the fundamentals of combustion phenomena and the intrinsic chemistry of combustion processes, the impacts and implications that combustion has locally and globally on the environment; knowledge of raw materials or materials, and how they are processed into final products in industrial technological processes.	3
			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	2

					circuit and by working on workshops. 3. Evaluation with specific scores, the level of movement speed development and segmental muscle strength. 4. Presentation of the topic approached in semester 2. Readiness to effort. Sports Games. 5. Strengthen the main elements and technical procedures specific to sports games. Their repetition in adversity, in a bilateral game. Developing the elements of coordinating capacity - rhythm, precision, static and dynamic balance, spatio-temporal orientation, combination of movements, kinesthetic discrimination, ambidextructure, agility. Education of aerobic and mixed resistance by the method of uniform and variable efforts. 6. Evaluation with specific evidence, the level of development of resistance and the degree of mastery of a sports game.	
			2-nd Year	2	**Electronics** Electronic Circuit Devices Notions regarding conduction in semiconductors. Electronic components: Diodes, Bipolar transistors, Unipolar transistors, Special semiconductor devices. The course is lectured, using examples in PowerPoint using the video projector. Amplifiers and oscillators General properties and characteristics of amplifiers. AC Amplifiers (voltage amplifiers, power amplifiers). DC power amplifiers. Negative reaction to amplifiers and its consequences. Operational Amplifiers. Oscillators. Unassigned low rectifiers Unassembled one-phase rectifiers. Single-phase single-phase rectifiers with resistive load. Single-	3

					phase single-phase rectifiers with resistive load. Re-straining the filtered voltage. Three phase rectifiers. Electronic Stabilizers Stabilizer Parameters. Parametric stabilizers. Reacting stabilizers. Integrated voltage stabilizers. Low power rectifiers The principle of vertical and horizontal control. Specialized guns for grid control of thyristors. Combined and sequential logic circuits. Elementary logical functions. Fundamental relationships in logic algebra. Logical circuits. Integrated logic circuits. Combined logic circuits. Sequential sequential logic circuits. Applications of combinational and sequential logic circuits. Encoders and decoders. Electronic counters. Numeric-Analog Converters. Analog-Numeric Converters. Memory circuits. Structure of a microprocessor and a microcomputer.	
			2-nd Year	2	**Elements of Electrochemistry and Corrosion** Definition and classification of material corrosion. Forms and visual aspects of corrosion. Chemical corrosion. Electrochemical corrosion (wet). Passivation of metals and metal alloys. Corrosion under special conditions. Localized corrosion. Methods for measuring and determining the corrosion resistance of materials. Protection against corrosion. Methods of corrosion prevention by surface treatment of materials - surface engineering.	4
			2-nd Year	2	**English** **The content of the seminar or practical works:**	2

					Semester I - Production. Specialized vocabulary and discourse situations. Grammar in focus: Present tenses (present simple, present continuous, present perfect, Research and Development, Specialized vocabulary and discourse situations.) Grammar in focus: Past tenses (past simple, past continuous, past perfect). Grammar in focus: Future forms, Logistics, Specialized vocabulary and discourse situations, Grammar in focus: Conditionals, Quality, Specialized vocabulary and discourse situations, Grammar in focus: Verb phrases. Focus: Verb phrases - Assessment test - Semester II - Engineering - Specialized vocabulary and discourse situations - Grammar in focus: Active versus Passive - Relative clauses - Automotive - Specialized vocabulary and discourse situations. discourse situations. Grammar in focus: Obligation and requirements vocabulary and discourse situations. Grammar in focus: Cause and effect. Construction. Specialized vocabulary and discourse situations. Grammar in focus: Ability and inability. Assessment test.	
			2-nd Year	2	**Fluid Mechanics** **Course contents:** Chapter 1. Measurement units. Fluid properties. The notion of continuous environment. Chapter 2. Fluid statics: Pressure and pressure measurement. Hydrostatic forces on flat surfaces. Relative equilibrium of fluids with free surface in rectilinear motion or rotation. Forces that act on immersed bodies - the principle of	4

					Archimedes. Chapter 3. Basic equations of fluid mechanics: Notions of fluid kinematics. Total Derivative. The gearbox. Acceleration field. Line current equation. The infinitesimal fluid element method. Bernoulli's equation. The laws fundamental preservation of mass, impulse and energy. Equation of continuity. Chapter 4. Navier-Stokes Equations: Deduction of the Navier-Stokes equations. Applications in case of laminar flow. Turbulent flow. Chapter 5. Dimensional Analysis and Similarity Theory. Fundamental and derived physical quantities. The principle of dimensional homogeneity. The Rayleigh method. Pi Theorem. Definition of similarity. Analysis of similarity criteria Re, Fr, Sh, Eu, Ma. Model Law. Chapter 6 Limit layer theory. Limit turbulent limit. Applications to flow around bodies.Cap 7 Flow through pipes: Laminar flow and turbulence. Effect of viscosity. The motion equation. Friction coefficient and pipe roughness. Local pressure losses. Hydraulic slope and energy slope. Pipelines - pipes connected in series and parallel. Hit of a ram. **The content of the seminar or practical papers:** Measurement of pressure. Measuring viscosity. Measure the impulse. Reynolds's experience. Flow through pipes: Calculation of friction pressure losses and calculation of local pressure losses. Flow through pipelines: Flow measurement methods. Hit of a ram.	

			2-nd Year	2	**Machine Parts** 1. General problems of machine building. 2. Mechanical engineering calculation principles. Mechanical characteristics of materials used in machine building. Form and dimensional accuracy of car bodies. Calculation at simple and compound queries. Calculation at variable requests. Safety criteria for car bodies. Reliability of car bodies. 3. Non-demountable joints. Threaded joints. Welded joints. Joining by soldering. Joint joining. 4. Removable assemblies. Threaded assemblies: thread classification; geometrical elements; screw and nut materials; the friction moment in the thread; auto-fatigue condition; the moment of friction between the nut and the bearing surface; thread calculation; calculation of assemblies with bolts without initial clamping; calculation of assemblies with initial clamping screws; fatigue calculation of assemblies with initial clamping screws; calculation of assemblies with eccentric eccentric screws; calculating the screws required at the shock. Joining of hubs and shafts: feather assemblies; chisel assemblies; pressed assemblies, polygonal assemblies. Chapter 5. Elastic assemblies Springs with traction-compression voltages; Springs with torsional voltages; Springs with bending stresses.	3
			2-nd Year	2	**Domain Practical Training** General Labor Safety Training The technological flow in the agglomeration sector. Dehumidifiers (dry, damp, electric). Technological flow in the furnace sector. Waste water circuit. The	4

					technological flux of a LD plant with a converter. Sewage treatment of converters The technological flow in the rolling sectors. The flow of technology in the cold strip mill. Waste water treatment for pickling. Process flow in the galvanizing sector. Treatment of waste water from zinc coating Equipment specific to the storage and preparation of the raw materials from the waste. Stacking machines. Homogenizing machines. Waste collection facilities. Waste shredders and equipment. Jaw crushing. Roundabout crushing. Crushers. Machinery and equipment for separation, extraction and classification of waste. Mechanical and electromagnetic separators. Centrifugal centrifuges. Gravity Clasps. Waste sorting equipment and installations. Oscillating screens Vibratory screens with inertia. Rotary screens. Mechanized installations for compaction, packing and briquetting of waste Compacting machines. Packaging machines. Briquetting machines. Documentation on Mittal Steel Environmental Equipment Appliances and Equipment S: A: Acquiring methods for analyzing waste and environmental factors (air, water, soil) that are applied in these laboratories.	
			2-nd Year	2	**Thermotechnics** Objectives: Presenting some general aspects to establish minimal knowledge about the thermal phenomena encountered in the engineering, fundamental notions regarding thermodynamics of systems. Knowledge	4

					of the fundamental thermodynamic notions necessary for the understanding and deepening of the knowledge at the specialized courses of the later years. Course Content. Fundamentals of thermodynamics: energy, sources and energy receptors. Energy systems, thermodynamic systems. Thermodynamics Postulates. Study of closed, homogeneous, unitary thermodynamic systems. Simple, reversible, open gas transformations. Study of thermodynamic system in stabilized flow. Homogeneous and non-uniform thermodynamic system (perfect gas mixtures). Thermodynamics of thermal agents: vapor thermodynamics; moisture saturated vapor states; constant title curves; relationships between vapor state sizes; Capeyron-Clausius equation; vapor state transformations (isochoric, isobar, isotherm, reversible and irreversible adiabatic). Wet air thermodynamics: the physical properties of wet air; i-x wet air diagram; graphical determination of wet air status; Simple wet air conversions (constant humidity content, constant temperature, constant enthalpy and mixing of two wet air flows with different states). Thermodynamics of compressible fluids at high speeds. Thermodynamics of fuel combustion. Thermodynamics of thermal machine cycles.	
			3-rd Year	1	**Essentials of processing and recovery of waste** The main problems in the field of waste management. Sources of solid waste.	5

					Types of waste. Solid waste composition. Physical, chemical and biological properties of municipal solid waste. Technologies for the basic processing of solid waste. Biological waste treatment procedures. Waste composting. Waste methanisation. Thermal waste treatment procedures. Waste incineration. Waste pyrolysis. Waste thermolysis. Waste gasification.	
			3-rd Year	1	**Environmental management** Factors that have stimulated the emergence of eco-management. The purpose, objectives and functions of ecological management. Environmental management tools (action, verification, analysis, economic and financial). Environmental management systems. Implementation of an Environmental Management System (EMS) according to ISO14001. EU Eco - Management and Audit Scheme (EMAS). Environmental risk management. Industrial waste management.	4
			3-rd Year	1	**Nanotechnologies** Nanomaterials: A revolution in 21st century. Zero-Dimensional nanostructures: nanoparticles. One-Dimensional nanostructures: nanowires and nanorods. Spontaneous growth. Electrochemical deposition. Electrophoretic deposition. Electrospinning. Two-Dimensional nanostructures: thin films. Physical vapor deposition (PVD). Chemical vapor deposition (CVD). Atomic layer deposition (ALD). Sol-Gel films. Self-Assembly. Carbon fullerenes and nanotubes.	4

					Nanostructures fabricated by physical techniques: Lithography. Potential applications of nanomaterials. Toxicity of nanomaterials	
			3-rd Year	1	**Air Pollution** This course provides an introduction to major aspects of air quality science and its control technology, including an overview of many current air pollution problems, from local to continental scales; a discussion of air pollutant characteristics, natural and anthropogenic sources, transport and transformations in the atmosphere; a presentation of the models that are used to predict dispersion and air pollutant concentrations; and finally a review of the strategies and key technologies for controlling emissions of gaseous pollutants and particulate matter. Participants will also learn to design air pollution control systems and to calculate treatment system efficiencies from design parameters. This course also examines the complex regulatory and institutional framework controlling air quality management in Europe and explains current air quality management concepts.	5
			3-rd Year	1	**Sensors and Actuators** Contemporary sensors and actuators, mathematical models and related microprocessor systems, and ultimately to increase the share of their use. Over the last half century, computers have evolved at a very fast pace, which has made them today part of our existence through PC (Personal Computer) and DA & C (Data Aquisition and Control).	3

					Sensors, actuators and microprocessors have evolved continuously and today data acquisition and automation of local processes is feasible at low cost. The main sensors (for electrical, mechanical, magnetic, etc.) and the most important actuators (servomotor, stepper motor, relay etc.) The Arduino "open source" environment and Atmel 328U microprocessors are used.	
			3-rd Year	1	**Technologies and Equipment for Used-Water Treatment** By content and subject matter, the discipline provides students with knowledge and skills in the course, project and laboratory classes such as: knowledge and understanding of the concept of waste water treatment in the context of environmental concerns; which are the main pollutants present in domestic and industrial wastewater, their sources of origin, their effects on aquatic life; methods and schemes of sewage treatment plants; how it is built and how a sewage treatment plant works; calculating the appliances and installations that are part of a water treatment plant; use of lessons learned at the course hours in the design of a water treatment plant; Applying knowledge gained during classroom classes to practical applications; developing skills in the complex and complete valorization of energy resources from wastewater treatment; developing skills to take effective measures to protect the environment by preventing and combating	5

					water pollution. Course content: Self-cleaning of watercourses - Definition, factors influencing self-treatment, thermal pollution, thermal diffusion. Methods and schemes of treatment plants, mechanical treatment, mechanical-chemical treatment, mechanical-biological treatment, efficiency of treatment processes and criteria for the choice of method and purification scheme. Processes and technologies for phase separation: grates, site, disintegrants, separation of fat in the film, scrapers, grease separating equipment, decanters, flotation. Centrifugal separation processes and installations - Theoretical bases of centrifugation, centrifuge with helical conveyor, centrifuge with trays (discs), hydro cyclone - calculation and construction. Filtration - theoretical basis of the filtration process, types of filters. Processes and equipment for biological treatment - general principles of biological treatment, biofilters, biological treatment with active sludge. Equipment for water oxygenation: considerations of the airborne oxygen transfer phenomenon, mechanical and pneumatic aeration devices - porous plates, mechanical aerators. Procedures and reactions for chemical treatment: neutralization, precipitation, coagulation, flocculation, chemical precipitation, coagulation-flocculation reaction. Processes and equipment for sludge processing - natural dehydration, processes and installations for anaerobic stabilization of sludges,	

					processes and installations for aerobic stabilization, processes and installations for final sludge treatment, preliminary treatment, sludge incineration, flat-bottomed furnace, incineration furnace in fluidized bed, removal and recovery of sludge.	
			3-rd Year	1	**Heat and Mass Transfer** General notions. Criteria for classification of furnaces. State and energy quantities used in thermoelectric furnaces. Heat exchange in thermal units. Transmission of heat through conduction. Heat transfer by convection. Heat transmission by radiation. Global Heat Exchange. Energy fuels and their burning. Classification, properties (physical, chemical, thermal).The calorific value of fuels. Solid fuels. Liquid fuels. Gaseous fuels. Calculation of combustion of fuels. Theoretical and actual combustion temperature. Determination of fuel consumption. Overview. Thermal balance The quantities of heat entering the balance sheet. The amount of heat emitted from the balance sheet. Determination of fuel consumption Gazodynamics of metallurgical furnaces and exhaust systems. Overview. Fluid flow regime and nature. General laws of fluid movement. Flow of fluids through channels and pipes. Circulation of gases through holes and nozzles. The gas pressure in the working space of the thermal aggregates. Circulation of gases in the working space of the thermal aggregates. Sizing of flue and ducts. Installations for the discharge of flue	4

					gases from the working space of the thermal aggregates. Natural draft installations .Artificial draft installations	
			3-rd Year	2	**Atmospheric Physics and Hydrology** Composition and structure of the atmosphere. Static and thermodynamics of the atmosphere. Humidity. Fog and clouds. Atmospheric stability and pollution. Dynamics of the atmosphere. Atmospheric circulation. Radiation Budget of Earth. Atmospheric aerosol physics. Climatic variability. Elements of hydrology.	4
			3-rd Year	2	**Air Pollution** This course provides an introduction to major aspects of air quality science and its control technology, including an overview of many current air pollution problems, from local to continental scales; a discussion of air pollutant characteristics, natural and anthropogenic sources, transport and transformations in the atmosphere; a presentation of the models that are used to predict dispersion and air pollutant concentrations; and finally a review of the strategies and key technologies for controlling emissions of gaseous pollutants and particulate matter. Participants will also learn to design air pollution control systems and to calculate treatment system efficiencies from design parameters. This course also examines the complex regulatory and institutional framework controlling air quality management in Europe and explains current air quality management concepts.	3
			3-rd Year	2	**Practical Training** General Labor Safety Training The technological flow in the agglomeration	2

					sector. Dehumidifiers (dry, damp, electric). Technological flow in the furnace sector. Waste water circuit. The technological flux of a LD plant with a converter. Sewage treatment of converters The technological flow in the rolling sectors. The flow of technology in the cold strip mill. Waste water treatment for pickling. Process flow in the galvanizing sector. Treatment of waste water from zinc coating Equipment specific to the storage and preparation of the raw materials from the waste. Stacking machines. Homogenizing machines. Waste collection facilities. Waste shredders and equipment. Jaw crushing. Roundabout crushing. Crushers. Machinery and equipment for separation, extraction and classification of waste. Mechanical and electromagnetic separators. Centrifugal centrifuges. Gravity Clasps. Waste sorting equipment and installations. Oscillating screens Vibratory screens with inertia. Rotary screens. Mechanized installations for compaction, packing and briquetting of waste Compacting machines. Packaging machines. Briquetting machines. Documentation on Mittal Steel Environmental Equipment Appliances and Equipment S: A: Acquiring methods for analyzing waste and environmental factors (air, water, soil) that are applied in these laboratories.	
			3-rd Year	2	**Sources of Radiation and Protective Techniques** This course prepares students to survey, monitor and control exposure to radiation	4

					in the nuclear industry and the natural environment and to implement preventive measures that are essential to ensure the safety of employees, the population and the environment. Students gain theoretical and practical understanding of the fundamental principles of nuclear operations and develop significant skills in the field of radiation protection, radioactivity of the environment, instruments and techniques, such as the use of radiation detection equipment, waste management and contamination and decontamination procedures. Students focus on the Canadian Deuterium Uranium (CANDU) plant systems and its components, the safety features in reactor design and the science applied to radiation and nuclear facilities.	
			3-rd Year	2	**Technology of acquisition, monitoring and diagnosis of environmental quality** The course provides the basic knowledge necessary for the design and formulation of data collection and management systems. The discipline addresses the cognitive tools needed to identify the needs of the measure, applying advanced approaches to the acquisition, manipulation and processing of complex data sets and preparing the tools in order to: • acquire, manage and represent of the physical characteristics of the territory through advanced technological tools; •design, construction and maintenance of the chain of observation of environmental phenomena through	4

					monitoring systems and networks; • monitor the evolution of environmental processes through in-situ and remote surveys; • formulate of methodologies to control, diagnose and observe environmental components at different spatial and temporal scales.	
			3-rd Year	2	**Treatment of Toxic and Hazardous Waste** Introduction. European waste policy and legislation. The notion of toxic and dangerous waste and substances. The internal legal regime of toxic and dangerous products and substances. National Strategy for Toxic and Dangerous Waste Management. General strategic objectives. Specific strategic objectives for hazardous waste streams. Tools and stakeholders involved in achieving the strategic objectives of hazardous waste management. Classification and characterization of hazardous waste (European Waste Catalog / Waste List, including hazardous waste). Labeling and packaging of dangerous chemicals and preparations. Storage, incineration and final disposal of toxic and hazardous waste. Transport of toxic and dangerous waste and products. Control of shipments of waste on the territory of Romania. Cross-border control of hazardous waste and their disposal. Technologies and techniques for treatment and recovery of toxic and hazardous waste. Organic technologies and biotechnologies to reduce the risk of environmental pollution. Techniques to	3

					prevent and reduce emissions of volatile organic compounds in the environment. Radioactive pollution and radiation protection. Principles and conditions of the nuclear activity in Romania. Safe management of radioactive waste and spent nuclear fuel.	
			3-rd Year	2	**Devices Specific to Environmental Engineering** The overall objective of the course is the acquisition by students of the constructive and technological aspects and calculation for machinery used in the transportation, the collection, processing and recovery of waste. The aim is to the formation of the future specialists in the processing, recycling and recovery of waste in accordance with practical problems arising. The content of the course take in account the equipment specific to the problems of environmental protection. Is also an extensive study on modern environmentally-friendly devices, the total processing of urban and industrial waste.	3
			3-rd Year	2	**Devices Specific to Environmental Engineering** The overall objective of the course is the acquisition by students of the constructive and technological aspects and calculation for machinery used in the transportation, the collection, processing and recovery of waste. The aim is to the formation of the future specialists in the processing, recycling and recovery of waste in accordance with practical problems arising. The content of the course take in account the equipment specific to the problems of environmental protection. Is	1

					also an extensive study on modern environmentally-friendly devices, the total processing of urban and industrial waste.	
			4-th Year	1	**Biotechnology** General notions on the role of biotechnology in environmental protection and practical applications; the economic impact and the quality of life. Description of the main groups of microorganisms with implications in biotechnology for environmental protection (bacteriophages, bacteria, yeasts, molds, algae). Study of physicochemical and biological factors that influence the development and metabolic behavior of microorganisms. Conditions and systems of cultivation of microorganisms in biotechnologies with applications in environmental protection (types of cultures, culture media, cultivation systems). Biochemical processes with implications in waste biovalorification and bio-epipharm. Waste composting. Waste water treatment (steps, biotechnological conditions, biodegradation of active sludge). Biosorption of metals and bioremediation of polluted media with recalcitrant xenobiotic compounds.	4
			4-th Year	1	**Ecological deposits** Constructive requirements. Requirements imposed on foundation ground and waterproofing of the deposit base. Construction requirements for barrier, waterproofing and drainage system for leachate. Collection of leachates. Treatment of leachate. Gas collection system. Treating, controlled combustion, utilization of storage gas. Exploitation of	4

					landfills. Requirements for the closure of hazardous waste landfills. Requirements for the closure of non-hazardous waste landfills. Collection of water on covered surfaces. Weighing equipment. Post-closure monitoring and re-conservation of the affected area.	
			4-th Year	1	**Renewable Energy** The main objective of the discipline is to educate students in the spirit of understanding the renewable energies, their mathematical and technological models of converting them into useful energies and ultimately increasing the share of their use. At the scale of our planet there are some major phenomena that have arisen with the industrial revolution: the continuous population growth, the continuing increase in food and energy demand, increased pollution and global warming. Energy demand has grown both intensively and extensively, leading to a slow but safe exhaustion of fossil resources and an increase in the global warming phenomenon. These two global phenomena are directly linked to each other and have led to the development of sets of measures, continuously perfected to reduce their effects. One of the important directions is to develop renewable energy sources and increase the efficiency of their conversion. In the context of the continuous evolution of materials and processing technologies and their shaping, the course presents dynamic dynamics, correlated with national and international realities.	5
			4-th Year	1	**Environmental Impact Assessment**	4

					The content of the discipline. Introduction to the environmental impact assessment process. Lecture, explanation, debate, problem. Legislative and institutional framework. Stage of project framing - Screening. Definition phase of the evaluation scope - Scope. Impact analysis stage. Analysis and assessment of the impact on soil and groundwater. Analysis and assessment of impact on surface waters. Analysis and assessment of the impact on the biological environment. Analysis and assessment of the impact on the atmosphere. Analysis and assessment of the impact of environmental noise. Analysis and assessment of the socio-economic impact and on human health. Measures to reduce the impact on the environment. Stage of management and impact monitoring. Environmental audit. Preparing a report on the impact. Impact assessment quality review stage. Consultation and involvement of the public. Making decisions based on the impact study. Implementation and supervision.	
			4-th Year	1	**Environment Protection Legislation** Curent environnemental pollution dimensions. European Union environmental legislation. General framework of European environmental legislation. European legislation on water quality, air quality, soil and European legislation on habitats, ecosystems and wild birds. Environmental legislation in Romania. Basic principles of Romanian environmental legislation. Romanian	3

					environmental legislation on water, marine environment, soil and subsoil protection, natural resources, biodiversity conservation and protected areas. International conventions and agreements. Criminal liability.	
			4-th Year	1	**Regularization of Rivers and Dams** The content of the discipline. The importance and necessity of land improvement works. The current and prospective development of land improvement works. Examples. Floods and river channel. Types of river channel restoration works. Regularization of the river channel. Defending the shores. Elements of construction used to regularize the river channel. Watering of watercourses. Fighting against floods. Route corrections and reprofilations. Dredging of the dykes. Sizing dikes. Consolidation, execution and maintenance of dikes. Water accumulations for flood mitigation. Achievements for agriculture. Sizing water drainage systems by draining the bottom. Provisions of national and international legislation on the regulation and indigestion of rivers.	4
			4-th Year	1	**Waste Treatment and Recovery Technologies** Waste. Recycled Waste: notions, definitions, classifications, legislative framework. Recycle. Recovery. Treatment: definitions, responsibilities, effects. Ferrous waste: notions, definitions, classifications, advantages of recycling. The relationship between steel production and waste. Quality conditions	5

					for ferrous scrap used in steel production. Quality control of ferrous waste. Characterization of ferrous waste. Sources of waste. Ferrous materials from metallurgical, manufacturing, other industrial fields. Old ferrous materials of other uses. Technologies for the processing and capitalization of ferrous waste. Preparation of ferrous waste: primary processing operations (radioactive contamination detection, pyrotechnical control, physical and chemical screening, dimensional preparation) and secondary (chemical, thermal or other methods to reduce the content of materials and harmful elements) . Melting and refining. Non-ferrous waste: characterization, sources, generated quantities, yields. Technologies for the processing and capitalization of copper waste, and copper-based alloys: preparation, melting, refining. Technologies for the processing and capitalization of aluminum waste and alloys with aluminum base. Utilization of metallurgical slags. Ferrous slags: characterization, properties, fields of use. Technologies for treatment and recovery of furnace slag. Technologies for treatment and recovery of steel slags. Non-ferrous metallurgy slags: features, technological solutions for treatment and recovery. Pulverized waste from gas fired in industrial air quality control facilities: characterization, sources. Technologies for the utilization of dusts and sludges from the metallurgical industry. Technologies for treating and capitalizing	

					on oily dross. Mechanical preparation (sorting, sorting). Thermal preparation (briquetting, pelleting, sintering). Utilization for recovery of useful elements from waste, by pyrometallurgical processes (in rotary furnaces, rotary hearth, high-volume, multistage, fluid bed reactors, cyclone melting technology, etc.). Utilization for the recovery of useful elements from the waste, by hydrometallurgical processes (leaching, cementation, filtration, electrolytic separation).	
			4-th Year	2	**Automation of Technological and Biotechnological Processes** General notions. Automatic regulation systems. The main components of automatic regulation systems. Automatic modes of operation of automatic systems and their characteristics. Automatic measurement of the main technological variables: temperature, fluid flow, pressure, depression, air and gas humidity, chemical composition, angular position, rotation speed. Extreme regulation of specific plant parameters.	4
			4-th Year	2	**Sustainable Development** Sustainable product development (SPD) require that product design achieve minimal or zero environmental impact, while satisfying other design criteria such as functionality, quality, desirable features, and acceptable cost and time to market. Therefore, environmental evaluations must be incorporated into the design stage. This course is aimed at the development of a new approach to lifecycle design and evaluation. This	3

					paper proposes a framework to optimize functional, environmental, and economic (FEE) performance towards sustainable design. Implementing Sustainable Development. In 1992, the United Nations Conference on Environment and Development (UNCED), also known as the Rio Summit or the Earth Summit, published the Earth Charter and Agenda 21. While the Earth charter was a declaration of fundamental values and principles for sustainability, Agenda 21 was outlined as an Action Plan for the implementation of the Sustainable development principles. Agenda 21 laid out the key building blocks that would help countries achieve sustainable development, rooted on the three pillars of sustainability: economic growth, social progress and environmental protection.	
			4-th Year	2	**Environmental economics** The discipline addresses with priority the relationship between enterprise and environment. The content of the course would lay the foundations for theoretical-methodical rules of the concept of sustainable development and taking into account the environmental factors in the modern business activity. The course aims to provide a theoretical and scientific basis for the future engineer and of specific activities for the environment protection. It observes too, the components of environmental factors that influence the factory functioning, for the proper conduct of the production activities in the context of the compliance with the sustainable development concept.	3

			4-th Year	2	**Graduation project elaboration** Achieving a technical project, under conditions of qualified assistance, observing the principles of professional ethics and professional values. Bibliographic documentation. Identify and describe the materials and methods used for the license work. Experimental research on the proposed theme. Visits to industrial units for the purpose of collecting data and harmonizing them with the research theme chosen. 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 Sustainable Product Development (SPD) requires that product design has a minimal impact on the environment or a zero impact on the environment while satisfying other design criteria such as functionality, quality, desirable characteristics and costs and time acceptable on the market. Environmental assessments should therefore be included in the design phase. This course aims at developing a new approach to designing and evaluating the lifecycle. This document proposes a framework for optimizing the functionality, environment and economic environment (FEE) performance against sustainable design. Implementation of sustainable development. In 1992, the United Nations Conference on Environment and Development (UNCED), also known as the Rio Summit or the Earth Summit,	2

					published the Earth Charter and Agenda 21. Although the Earth Charter was a statement of the values and fundamental principles for sustainability , Agenda 21 was presented as an Action Plan for the implementation of sustainable development principles. Agenda 21 presents key key elements that would help countries achieve sustainable development, based on the three pillars of sustainability: economic growth, social progress and environmental protection.	
			4-th Year	2	**Energy Management** Energy management covers a range of topics relevant to understanding all aspects of reducing the cost of energy used by an organization, with the added spin of minimizing CO2 emissions as well. Reducing energy costs has two aspects: price and quantity. The focus is on: solving the problems of energy efficiency; improving the energy consumption of energy-using goods; estimating the environmental impact of greenhouse gases; providing best practices for energy efficiency; determining the internal consumption profile, hierarchy and prioritization of energy saving measures, impact assessment of implementations, action plan, economic evaluation of efficiency of investments in efficiency and performance indicators.	4
			4-th Year	2	**Management of Health and Safety at Workplace** General notions. European premise on SSM management. Main elements of SSM management systems. The concepts of hazard and risk. Define.•	3

					Perception of risk.. How risk can be characterized; Risk and probability quantification. Risk factors. Technical / Technological Risk – Case Study. Risk assessment. The objectives of risk assessment. Requirements for risk assessment. Need for risk assessment. Methods of risk assessment. Qualitative risk assessment. Case studies. Risk management. Principles of risk management. Specific risk management activities .Post-decision risk management.- Tools in risk management. Case studies. Steps of the implementation process of the SSM management .Management in the organization of work processes ESM management at European level. Management of risk factors. The requirements of an SSM management system. The OHSAS 18001 standard and its implementation guide.	
			4-th Year	2	**Information Technology Systems in Environmental Engineering** This course covers the basic principles of environmental modeling using mathematics and computers to simulate physical and chemical phenomena in the environment (e.g., environmental pollution). Information technology systems for environmental applications was developed by demand for accurate, up-to-date information for natural resource management, environmental and disaster management and biodiversity. These systems integrate computer software, hardware and data-handling procedures with spatial analysis and digital mapping. The course provides an overview of: site	3

					assessment and clean-up; pollution monitoring; risk analysis; management of natural resources and man-made assets; and environmental analyses.	
			4-th Year	2	**Waste Treatment and Recovery Technologies** The topics in this course include the generation, processing, and disposal of municipal, industrial, and agricultural waste materials, along with emerging issues like zero waste, producer responsibility and life cycle assessment. These topics are addressed from a technical, economic and environmental perspective, with an emphasis on beneficial reuse and resource recovery as opposed to traditional waste management. The interdisciplinary nature of this field, as well as its increasing emphasis on sustainability, will also be addressed through discussions, exercises and projects.	3
			4-th Year	2	**Technologies and Equipment for Contaminated Soils Treatment** The content of the discipline. Pedology and pedogeography. Evolution of soil knowledge. Development of Pedology and pedogeography in Romania. The emergence and development of pedology. Development of Pedology and Pedagogy in Romania. The link between pedology and other sciences. The global composition of the soil. The mineral constituents of the soil. Organic soil constituents. The liquid and gaseous phase of the soil. Living organisms in the soil. Soil composition and properties. The main soil properties. Soil pollution. Soil	4

					pollution sources. Chemical pollution. Soil quality. Soil Quality Indicators. Emissions from soil. Organic pollutants. Petroleum products. Persistent organic pollutants. Chemical fertilizers based on phosphorus. Inorganic soil pollutants. Ammonia and nitrates in the soil. Heavy metals. Soil acidity. Natural sorbents used for soil removal. The use of peat for the decontamination of contaminated soil with petroleum products. General notions about peat. Physical and chemical characterization of peat. Microbiological characterization of peat and contaminating soils with petroleum products. Study of the oil hydrocarbon absorption process. Study of aerobic biodegradation of petroleum hydrocarbons. Measures to stimulate the biodegradation process. Use of polymers for conditioning and / or remediation of contaminated or polluted soils.	