Transilvania University of Braşov, Romania

Study program: Industrial Environmental Engineering and Protection

Faculty: Product Design and Environment
Study period: 4 years (bachelor)

1st Year

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Mathematical analysis	DIAM01	5	2		3	

Course description (Syllabus): Relations; the Body of Real Numbers; numerical series; real functions of a variable; strings and series of functions; real n-dimensional space; limit and continuity; differentiable functions of several variables; applications of differential calculation; Riemann Integral; double integral; improper integral; parameter integral. Euler's functions. Curvilinear Integral of the first species; curvilinear; integral of the second species.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Chemistry I	DICH01	5	2	2		

Course description (Syllabus): General concepts of chemistry. The structure of the atom. Classification of chemical elements. Properties of elements. The laws of chemistry. Relationship between structure and properties of substances. Chemical bonds. Chemical kinetics. Chemical reactions. Renewable energy applications. Water hardness. Water softening and demineralization. Molecular and colloidal dispersed systems. Metals. Corrosion. Thermochemistry. Fuels. Materials of economic and practical importance for renewable energy equipment. Special materials used in renewable energy systems. Electrochemical energy conversion. Pollution and environmental protection. Notions regarding the development of new materials for photovoltaic conversion.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Computer programing and Programing languages	DIPC01	4	1	2		

Course description (Syllabus): Computer hardware. Central unit. Input and output peripheral units. Organization and management of data. Physical organization of data: files and folders. Logical organization of data: organization systems. Computer management programs - operating systems. Text editing with Microsoft Office Word. Elementary operations in Word documents. Formatting characters and paragraphs. Tables and graphics in text documents. Spreadsheet calculation with Microsoft Office Excel. Basic operations. Formatting cells. Formulas, functions, charts.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Descriptive geometry	DIGD01	4	2	1		

Course description (Syllabus): Point and line representation as epure, particular lines, particular planes, relative positions line-plan, geometrical figures in the plan, geometrical transformations, geometrical transformations, polyhedrons: the right and the oblique prism, polyhedrons: the right and the oblique pyramid, particular prisms and pyramids, rotation corps: the cylinder and the cone, sections through cones and cylinders, intersected cylinders.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Technical drawing and infographics I	DIDT01	4	2	2		

Course description (Syllabus): The importance of standards in technical drawing. Classification of technical drawings. Representations used in industrial design. Representation of views. Ruptures and interruptions. Sections. Quotation in industrial technical drawing. Representation and quotation of some machine organs. Indication of the execution accuracy of the parts. The overall drawing.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Materials science and engineering	DISM01	5	3	2		

Course description (Syllabus): Introduction to materials. Types of materials. The atomic structure and imperfections in the atomic structure. Crystalline networks. Defects. Balance diagrams. Solidification of metals and alloys. Ferrous alloys. Non-ferrous alloys. Polymers. Thermoplastic polymers. Composite materials. Ceramic materials. Extractive metallurgy. Execution of parts by casting. Processing of metals and alloys by plastic deformation. Processing of plastics and composites.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Pollution sources, processes and products	DIPC02	3	1	1		

Course description (Syllabus): the environmental engineer in the working market, interdisciplinary features in environmental engineering, the role of fundamental courses in environmental engineering, domain courses in environmental engineering, horizontal competencies in environmental engineering.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Technical drawing and infographics II	DIDT02	3	1	2		

Course description (Syllabus): Object-oriented programming concepts. Objects. Encapsulation and transmission of messages. Classes. Inheritance and polymorphism. Concepts from DELPHI. Development of applications with simple structures. Forms. The structure of a DELPHI application. Components: Label, Text Box Components and Conversion Functions, Command Buttons, Radio Buttons, Validation Boxes, List Boxes. Component Self; Format and Input Box functions. Main menus and pop-up menus. Handling exceptions. Windows for displaying messages; Show Message procedure; MessageDlg function. Fundamentals of graphics. CANVAS object; Properties and methods CANVAS. Image component. ImageUsr user component; Setting the graphical user mode.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Mechanics	DIMC02	4	3		2	

Course description (Syllabus): Reduction of forces acting on a rigid. Mass centers. Static solid state. Static rigid systems. The friction balance of the rigid. Kinematics of the material point. Kinematics of the material point in relative motion. Kinematics of the rigid. Fundamentals in dynamics. Fundamental theorems in dynamics. d'Alembert's principle. Dynamics of the rigid.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Physics	DIFZ02	4	2	1	1	

Course description (Syllabus): Mechanics and acoustics. Thermodynamics and statistical physics. Electromagnetism. Wave optics. Corpuscular optics. Notions of atom physics. Solid physics. Notions of nuclear physics.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Linear algebra, analytical and differential geometry	DIAGAD	4	2	2		

Course description (Syllabus): Sets. Binary Relationships. Systems of linear equations. Composition laws. Vector spaces. Vector subspaces. Linear transformations. Vectors. Line and plan in space. Generation of surfaces. Analytical geometry. Differential geometry of curves.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Chemistry II	CHIMAN	6	3	2		

Course description (Syllabus): inorganic chemical substance, chemical reactions involving inorganic substances, hydrogen, oxygen and ozone, water, hydrogen peroxide, Sulphur and its main compounds, nitrogen and its main compounds, carbon, carbon monoxide and carbon dioxide, metals, main metal compounds: oxides and oxihydrogenated compounds, salts and complexes.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
General Economy	DIDC02	3	1		1	

Course description (Syllabus): Economic theory: definitions, evolution. Principles of economic thinking. Fundamentals of economic analysis. Market: demand, supply, market balance. The assembly of the economic circuit. Economic fluctuations.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Modern languages (English, French, German, Spanish)	LS01	3	1		1	
	LS02	3	1		1	

Course description (Syllabus): Introductory course. The Noun. The Adjective. The English Verb System. Present tense. Past tense. Future tense. Modal verbs. Sequence of Tenses. Conditional sentences. Reported speech. Revision.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Physical education and sport	EF01	1			1	
	EF02	1			1	

Course description (Syllabus): The basic technical elements of the optional sports discipline, the rules of integral practice of the chosen sport. Practicing under the prescribed conditions of the chosen discipline. Variety of exercise complexes depending on the chosen sport. Exercise complexes with the weight of your own body. Exercise complexes with objects. Exercise complexes with partner. Exercise complexes for mobility development. Exercise complexes for the development and education of the musical rhythm, the rhythmic education.

2nd Year

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Special mathematics	DIMS03	4	2		2	

Course description (Syllabus): First order differential equations: differential equations with separable variables, homogeneous differential equations, first order linear differential equations, Bernoulli differential equations. Differential equations with homogeneous and non-homogeneous constant coefficients. Systems of linear differential equations. Symmetrical systems. Equations with partial derivatives of the first order. Elements of field theory, 2nd order operators, vector integrals, particular vector fields. Complex functions of complex variable; holomorphic functions. The residue theorem and its applications. Laplace transform. Original functions. Laplace transform.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Databases and statistical processing	DIBDPS	3	1		1	

Course description (Syllabus): The Project Manager tool. Working with tables. Creating tables. Opening and closing tables. View and change the structure of the tables. Adding records to tables. View the records. Record indicator. Modifying records. Deleting records. Sorting data using table indexing. Storing tables in databases. Creating queries. Create queries based on a table or view. Updating the records with the help of local views. Creating queries with data from multiple tables or views. Statistical data processing. Statistical parameters that characterize the distribution of data. Systematization and presentation of statistical data.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Strengths of materials	DIRM03	4	3	1	1	

Course description (Syllabus): Introduction to the strength of materials. Chart drawing rules. Traction-compression stress. Conventional calculation of pure shear bars. Torsion stress of the straight bars. Bending stress of straight beam. Theories of resistance. Tensions at compound stress. Energy methods for calculating deformations. Dynamic stresses with shock. Stability of straight bars.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Chemistry III	SIMCO03	6	3	3		

Course description (Syllabus): the structure of organic compounds with polluting effect, saturated aliphatic hydrocarbons, unsaturated aliphatic hydrocarbons, aromatic hydrocarbons, halogenated derivatives, hydroxyl derivatives, nitrogen containing derivatives, carbonyl derivatives, carboxyl compounds, glucoses, lipids, amino-acids and proteins, vitamins, enzymes.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Thermodynamics	SIMCF03	6	2	2		

Course description (Syllabus): chemical thermodynamics, thermodynamic potential and chemical potential, physical equilibrium Clausius-Clapeyron equation, equilibrium in diluted solutions (Henry's law, Raoult law), vapor – liquid equilibrium in multi-component systems, liquid-liquid equilibrium, liquid-solid equilibrium, chemical equilibrium.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Applied informatics	DIM3D	3	1	1		

Course description (Syllabus): Numerical methods for solving the various technical problems specific to the engineering activity. The stages of solving an engineering problem using a numerical method. Errors of numerical calculation. Numerical approximation of functions. Solving nonlinear algebraic equations. Solving systems of linear equations. Numerical derivation and integration. Integration of ordinary differential equations. Numerical design and optimization.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Sustainable development	DIDD04	3	2	1		

Course description (Syllabus): Sustainable development: history; promotion, development, current status and prospects. The components of sustainable development: economic, social, educational, legislative and security aspects; integrated approach. Sustainable development and energy; Sustainable energy. Renewable energy sources and systems; conversion principle, systems, components, legislation, policies, strategies, European and national organisms, market penetration: Solar-thermal, photovoltaic, wind, micro-hydro, geothermal, biomass and hybrid systems. Promoting the principles of sustainable energy at the society and authorities level.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Transfer phenomena and unit operations I	DITMT	3	2	1		

Course description (Syllabus): thermodynamic systems and parameters of state, work and heat, enthalpy, entropy, thermodynamic cycles, internal combustion engines, steam installations (the Rankine cycle), wet air, fuels, compressors, heat transfer through conduction and convection in various geometries (plan, cylinder and spherical walls, extended surfaces). Radiative heat transfer.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Electrochemistry and corrosion	ECHC04	4	3	2	1	

Course description (Syllabus): Notions of chemical kinetics: elements of formal kinetics of simple reactions and of compound reactions. Factors influencing reaction rate; the influence of temperature and catalysts. Electrolyte solutions: Electrolytic dissociation, Solution theories, Particular electrolyte solutions, Transport phenomena in electrolyte solutions. Processes in heterogeneous electrochemical systems. Practical applications of electrochemical processes: energy conversion, storage of electricity. Elements of photo-electrochemistry. Corrosion of metallic materials (chemical and electrochemical corrosion; passivation and corrosion protection).

Corse title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Mechanical engineering	DIOM04	4	3	2		

Course description (Syllabus): fundamental of the mechanisms structure, structural, kinematic and dynamic aspects of fixed-wheel gear mechanisms. Structural, kinematic and dynamic aspects of planetary mechanisms. Introduction to the study of machine elements. Joints: threaded assemblies, screw-nut transmissions, feather assemblies, grooves, pins, bolts, shape, pressed assemblies, by tightening on the cone, with truncated rings. Springs: general characterization, materials and technology, characteristic of springs, coil springs, torsion bar springs, lamellar springs, ring springs, disc springs, rubber springs. Mechanical couplings: general characterization, calculation load, permanent couplings, intermittent couplings.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Fluids mechanics	DIMF04	3	2	1		

Course description (Syllabus): Fluids. Equations of static equilibrium of perfect fluids. Fluid action forces at rest on solid walls. Notions of fluid kinematics. Equations of fluid dynamics. Euler's equations for an ideal fluid. Particular cases. Bernoulli's equation and its extension for a current tube and for viscous and incompressible fluids. Pitot-Prandtl probe. The impulse theorem. Formulation of the problem for a current tube. The principle of the turbine with action. Hydrodynamic similarity. Reynolds criterion. Permanent movement in forced pipes. The flow of viscous fluids in laminar regime through forced pipes. The turbulent flow. Relations for the calculation of load losses in forced pipes. Flow measuring devices based on Bernoulli's equation. The principle of the measurement method, restrictions in the application of the method. Practical devices for estimating the flow. Disturbances in compressible fluids. The propagation speed of the disturbances in forced pipes. Methods to mitigate the effects of the ram. Effluent movements. The flow of incompressible fluids through small holes and nozzles. Expansion fluid flow through small holes and nozzles. The characteristic of a pipe. Pipes in series or parallel. Hydraulic machines (classification, energy parameters). Centrifugal pump. Bulk machines (pumps and motors). Hydrostatic drives.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Domain practice	PR04	4		90		

Course description (Syllabus): The practical work aims to familiarize the students with the real environment in companies and to stimulate the use of the knowledge gained in faculty into the practical activity. Management of the

chemical substances in an environmental laboratory, safety rules, security technical files, wastes management, dangerous wastes, circular economy rules.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Electrotechnics / or Electronics	DIEA03 MAE04	5	2	2		

Course description (Syllabus): Electrical machines and actuation: electric transformer, the synchronous machine, the asynchronous machine, the DC machine, elements of electric drives. Elements of electronics: signals in electronics, semiconductor physics, optoelectronic devices, rectifier diodes, field effect transistor, resistive reaction network circuits, nonlinear circuits.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Modern languages (English, German, French or Spain)	LS03	2	1		1	
	LS04	2	1		1	

Course description (Syllabus): Introduction, Verb Phrases: V-ing vs. To V, Active vs. Passive, Causation, Obligation and Requirements, Ability and Inability, Cause and Effect, Relative Clauses, Clauses of Result and Purpose, Quantifiers, Contrasting Ideas Revision.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Eco-toxicolog or/ Natural resources	SMCA04 SMRN04	4	2	1		

Course description (Syllabus): types of toxic substances, toxics: heavy metals, pesticides, dioxins, oil and oil derivatives, chlorinated compounds, radio-toxicology and radio-toxic wastes, bio-processes, pollutants bio-chemical effects, reducing and treatment of toxic and dangerous wastes.

Corse title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Physical education and sports	EF03	1			1	
	EF04	1			1	

Course description (Syllabus): The basic technical elements of the optional sports discipline, the rules of integral practice of the chosen sport. Practicing under the prescribed conditions of the chosen discipline. Variety of exercise complexes depending on the chosen sport. Exercise complexes with the weight of your own body. Exercise complexes with objects. Exercise complexes with partner. Exercise complexes for mobility development. Exercise complexes for the development and education of the musical rhythm, the rhythmic education.

3rd Year

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Product ecological design I	BPP05	4	2			2

Course description (Syllabus): Engineering design. Technical products/systems. Structural analysis of the product design process. The phases of the life of a technical product and its associated cycles. Generalized algorithm for product design. The main structural stages of the design process of a technical product: the specifications or the list of requirements.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Environmental chemistry	SMCM5	4	2	2		

Course description (Syllabus): introduction on environment pollution, bio-geo-chemical flows, air pollution (chemical reactions in atmosphere, pollution indicators), water pollution (oxygen solved in water, inorganic and organic pollutants in water, pollution indicators), soil pollution (most common soil pollutants).

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Soil science and soil depollution	SSPD06	3	2	1		

Course description (Syllabus): soil pollution and depollution, national monitoring programs for soil (de)pollution, steps in a soil monitoring program, sampling the soil, data processing and reporting, preventing soil degradation, traditional methods for soil decontamination from metals, modern methods for soils (bio)remediation.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Information technology	DIMEF5	4	2	3		

Course description (Syllabus): The general problem of analysis with the finite element method (FEM). Types of problems that can be solved with the FEM. The general modeling and analysis algorithm with the FEM. Finite element modeling methods. Finite element types. Material modeling. Modeling of constraints and loads. 1D/2D/3D modeling. Modeling of unknown physical parameters. Numerical model and finite element analysis of the bar-type mechanical structures. FEM software.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Instrumental analysis	SMAI05	5	2	3		

Course description (Syllabus): atomic absorption spectroscopy (AAS), RES, RMN and Roentgen spectroscopy, molecular spectroscopy (UV-VIS, IR), refractometry, nefelometry, polarimetry, polarography, potentiometry, conductometry, thermal analysis (TGA, DSC, DTA).

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Separation methods for pollutants	SMSEP05	3	1	1		

Course description (Syllabus): analytic separatology, chromatography, chromatography techniques, electrophoretic separation methods, capillary electrophoresis.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Communication	DIDC05	3	1		1	

Course description (Syllabus): models and theory of communication, interpersonal communication, personal presentation (CV, letter of intent, carrier plan), virtual communication, scientific communication (documentation techniques), writing a scientific paper, plagiarism, presenting the scientific results.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Meteorology and climatology	MET05	4	1	2		

Course description (Syllabus): parameters of state for the terrestrial atmosphere, physical basis of the climate: energy factors, physical and geographical factors, dynamic factors, weather and climate, climate change: oscillations and climate changes, climatic resources in Romania.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Chemometry	SMCH05	2	1	1		

Course description (Syllabus): type of analysis errors, Gauss distribution, Student distribution, removal of untrustworthy values from a database the t and the Q tests, accuracy and precision the t and the F tests.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Transfer phenomena and unit operations II	SMFT05	4	2		1	1

Course description (Syllabus): unit operations in environmental engineering, fractioning of poly-dispersed solids, sedimentation fundamentals and equipment, filtering and filters, centrifugation, diffusion fundamentals and devices, G–L absorption columns, distillation fundamentals and devices, adsorption fundamentals and devices, L–L extraction fundamentals and devices.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Ecology	ECOIPMI	3	1	1		

Course description (Syllabus): organization level in the living world, ecology laws, biocenosis, the biotope in forestry, ecological factors with direct influence, the ecosystem, the transfer between the biocenosis and the abiotic environment, intra- and inter-specific relations, the dynamic of the forestry eco-system, the species flow and the biologic diversity, biodiversity and natural resources management.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Product ecological design II	DIDC06	2	2		1	

Course description (Syllabus): lifecycle modelling of an ecological product, conceptual design of technical products, identifying the optimal conceptual design solution, broadly used functions in the conceptual design.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Project – Product ecological design II	DIDCP05	2				1

Course description (Syllabus): the conceptual analysis of a given product, according to the list of pre-requisites the conceptual synthesis of the principle solution will be developed for a composed sub-function.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Analysis and synthesis of the technological processes	ASPT	3	2	3		

Course description (Syllabus): introductory notions, the mass and the energy balance, operations in technological processes: mechanical operation (grinding, sorting and transport), hydro-aero-dynamic operations (fluids flow, gases compression and detention, solids liquids and gaseous mixing, separation operations for heterogeneous L and G mixtures), thermal operations, diffusion operations, raw materials and auxiliary materials in technological processes, drinking and industrial water, analysis and synthesis of the processes in the sodic and chloro-sodic industries, analysis and synthesis of the processes in the chemical fertilizers industry, analysis and synthesis of the processes in the polymers industry.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Technology and equipment for water and wastewater treatment I	TRATAP	4	2	2		

Course description (Syllabus): water – structure and properties, natural water sources: alkalinity and acidity, pollution sources of natural waters, water quality monitoring, residential water treatment, water treatment as thermal agent, advanced water treatment.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Technology and equipment for air treatment	PEPA06	3	2	1		

Course description (Syllabus): clean and polluted air, pollution sources in atmosphere, air self-cleaning, impurities dispersion, mass balance, air sampling and their characterization, air depollution installations, sedimentation rooms, impact, inertia and shock equipment, cyclones, filters, electrostatic separators, wet separators, separation of submicronic sized particles.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Specialty practice	PR06	4	90			

Course description (Syllabus): legal frame for environmental and wastes management, waste characterization methods, recycling organic wastes, reducing the wastes impact in the environment, inter-institutional communication, optimizing the industrial flows for reducing the solid and liquid wastes in the host institution.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Colloids and surface chemistry or Interfacial processes	SMSP6 INT06	3	2	2		

Course description (Syllabus): dispersed systems, colloidal systems, stability of dispersed systems (sedimentation and diffusion, rheology of the dispersed systems), optical properties of colloidal systems, surface thermodynamics, surface tension, wetting and adhesion properties, adsorption, emulsions, dispersions and foams. OR: interfaces definition, free energy at the level of surfaces, thermodynamics of surfaces, adhesion, cohesion and wetting, L/S interfaces: adsorption, sedimentation and flocculation, G/S interfaces, surface soil pollution, L/L interfaces: water pollution with oil products, stabilizing and destabilizing the interfaces – the DLVO theory.

4th Year

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Product ecological design III	DP07	4	2			2

Course description (Syllabus): welded assemblies, rivet assemblies, special camps, actuators, constructive design steps, fundamental rules in design, design elements, constructive design assessment.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Biomass based energy systems	BIO07	4	2	2		

Course description (Syllabus): biomass as energy source, aerobic and anaerobic biomass conversion processes, enzymatic biomass conversion processes, biomass conversion into heat, biomass conversion into bio-Diesel fuel, processes using biomass wastes, energy plants.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Technology and equipment for water and wastewater treatment II	APE07	5	2	2		

Course description (Syllabus): water pollution, types of wastewater, sources of wastewater, organic, inorganic and biochemical pollutants in wastewater – legal frame, wastewater characterization, wastewater mechanical treatment, chemical wastewater treatment, biochemical wastewater treatment, tertiary wastewater treatment, residential

wastewater treatment, industrial wastewater treatment, agriculture wastewater treatment, food industry wastewater treatment.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Environment quality acquisition, monitoring and diagnosis techniques	MONIT07	5	2	2		

Course description (Syllabus): pollutants and their effect on humans, the Romanian strategy for environment, integrated monitoring system in Romania, soil, water, air, radioactivity and noise monitoring, types of monitoring, sampling, environmental chemical analyses, environmental data processing.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Automation of technological and biotechnological processes	COM07	4	2	2		

Course description (Syllabus): electrical automation systems, continuous current machines, the asynchrony machine, step-by-step engines, pneumatic and hydraulic action systems, sensors and sensorial systems, system theory, circuits for signal conditioning, continuous linear behavior of the control systems, discrete linear systems, the structure of the control system.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Engineering of the depollution processes	DEPOL07	3	2		1	

Course description (Syllabus): environmental processes analyses and design, depollution processes design, main and secondary materials flow, energy flows, process modelling: stationary continuous flow, discontinuous flow – mass and energy balance, equipment choice, the equipment scheme, the installation sketch, economical analyses.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Engineering of the depollution processes - Project	DEPOLP07	2				2

Course description (Syllabus): steps of the designed process: the main and the secondary steps, the technology flow: main and secondary flows, main and secondary products and their pollution potential, analysis and optimization of the material and energy flows in the installation, the equipment scheme, the installation sketch, economical analysis.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Environment and society	MSOC07	3	1		2	

Course description (Syllabus): environment and its interaction with the society, quantitative indexes for assessing the environmental quality and sustainable development, environmental control, ecological behavior in industry and environment, social learning.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Wastes treatment and recycling technologies	DES08	4	2	2		

Course description (Syllabus): the Romanian national plan for wastes management, types of wastes, selective and non-selective wastes collection, waste sorting: dimensional sorting, density sorting, magnetic sorting, optical sorting, manual sorting, waste treatment, wastes recycling and reuse.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Impact studies	IMP08	5	2		2	

Course description (Syllabus): impact assessment as part of sustainable development, Romanian legal frame on impact assessment, the content of an impact study, steps in developing an impact study, analysis of the identified impacts, assessing the effect of the identified impacts on the environment, assessing the socio-economic impact, global pollution index, integrated environmental impact assessment.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Environmental legal frame	LEG08	3	1		1	

Course description (Syllabus): EU environmental policies, specific environmental policies for air and climate, specific environmental policies on wastes, specific environmental policies for water, specific environmental policies for energy, specific environmental policies on bio-diversity, international environmental policies: conventions and treats, national environmental policies.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Practical work for the Diploma project	PR08	2	88			

Course description (Syllabus): identifying and implementing the main steps of the experimental study, experimental data analysis, refining and assessment, gathering additional experimental data according to the assessment.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Developing the Diploma project	LIC08					4

Course description (Syllabus): study on the state of the art, aim and objectives of the project, discussion on the experimental data, according to the objectives, design of the installation, conclusions and recommendations, writing the diploma project (*.doc), developing the presentation material(s) in *ppt form.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Industrial ecology or: Implementing renewable energy systems	EIND EPE0	4	2	2		

Course description (Syllabus): major environmental pollution sources, industrial activities – pollution sources for the environment, conventional methods for the constructive and technological design, optimizing the ecological designs, industrial ecology, lifecycle analysis for products and processes, eco-efficiency and eco-indicators.

or:

Course description (Syllabus): state of the art in assessing the energy needs in the built environment, building concepts supporting the sustainable development (Passive house, Low energy building, Nearly zero energy building, Zero energy building, Plus energy building), renewable energy sources and systems, renewable energy systems implemented in the built environment.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Integrated wastes management or: Ecological management	MCM08 MNGEC08	4	2		2	

Course description (Syllabus): integrated wastes management, legal frame, steps in wastes management: reducing the residential solid wastes, wastes collection and transport, solid wastes sorting and separation, solid waste recycling, thermal treatment and (co)burning, pyrolysis and gasification, chemical and biochemical solid waste reduction.

or:

Course description (Syllabus): the managerial concept and theory of the company management, eco-management: environment policies and strategies applied to a company supporting the sustainable development, over-exploitation of the ecosystems, desertification and rehabilitation, industrial ecology, education on ecology.

Course title	Code	No. of credits	No. of hours per week			
			Course	Laboratory	Seminary	Project
Environmental projects development and management or: Health and security at the working place management	PRO08 INT08	4	2			2

Course description (Syllabus): relevant concepts in project management, project planning (SWOT analysis, PERT analysis), feasibility study, the working program, project implementation, project management.

or:

Course description (Syllabus): legal frame, working accidents and their prevention, professional diseases, prevention and stopping fires, emergency situations and specific behavior during: earthquake, flood, storm or terrorist attacks, first aid during heart attack, fading, animals bites, drowning, fractures.