

Faculty of Sciences and Environment

Domain of study	Level (BA/MA)	Study programme	Year of study	Semester	Course title	Credit units
Mathematics	BA	Mathematics and Computer Science	I	1	Linear Algebra /Algebră liniară This course provides the basics and applications of matrix theory and linear algebra. Emphasis is given to topics that will be useful in other disciplines, including vector spaces, linear transformations, inner products, matrix representations, binary and quadratic forms, eigenvectors and functions of matrices.	7
			I	1	Mathematical Analysis(Differential and Integral calculus on R)/ Analiză matematică (Calcul diferențial și integral pe R) This course presents fundamental notions of mathematical analysis such as convergence, limit, continuity, differentiability, integrability for real functions of the real variable	7
			I	1	Synthetic Geometry /Geometrie sintetică In this course, students will broaden their understanding of Euclidean geometry; study the geometry of triangles and quadrangles, circles, lines, planes, parallelism and perpendicularity, geometric bodies, areas and volumes. and apply geometric concepts to real-world situations.	7
			I	1	Algorithms and Programming I/ Algoritmi si programare I The main objective of this discipline is to familiarize students with the basic notions about algorithms and with C ++ programming language. The applications will be based on number processing, divisibility, vectors, strings, arrays, structures, pointers, single and double linked lists, stacks, queues, sorting and searching algorithms, files.	6
			I	1,2	English Language/ Limba engleză	2+2
			I	1,2	Phisycal Education/Educație fizică	1+1
			I	2	Algorithms and Programming II/ Algoritmi si programare II This course presents the main programming techniques: backtracking, greedy, divide et impera, dynamic programming, branch and bound, graphs. Other issues are: algorithms complexity analysis and object-oriented programming in C ++.	6
			I	2	Algebra(Fundamental Algebraic Structures)/ Algebra(Structuri algebrice fundamentale_	6

					The aim of this course is to introduce basic ideas group theory with a good range of examples so that the student has some familiarity with the fundamental concepts of abstract algebra and a good grounding for further study.	
			I	2	Mathematical Analysis (Differential calculus on \mathbb{R}^n) / Analiză matematică (Calcul diferențial pe \mathbb{R}^n) This course presents fundamental notions of mathematical analysis such as limit, continuity, differentiability, for functions of the several variables.	6
			I	2	Logic and set theory/ Logica si teoria multimilor This course is an introduction to classical logic (propositional calculus and predicate calculus), set theory (including algebraic operations with sets and cardinality), and relations. Binary relations relevant to mathematics and theoretical computer science, such as equivalence relations and order relations are examined in detail. Basic definitions and results on posets, lattices, Boole lattices, Boole algebras and Boolean rings are also provided.	3
			I	2	Analytical Geometry / Geometrie analitică The aim of this course is to introduce the geometry of lines and plane in the Euclidean space. Students can develop geometry with a degree of confidence and will gain fluency in the basics of Euclidean geometry. In this course, foundational mathematical training is also pursued.	6
			II	3	Algebra/Algebră The aim of this course is to introduce the algebraic structures of rings and fields; describe the quotient structure and its connection with homomorphisms of rings; present important examples rings and develop some of their properties with particular emphasis on polynomial rings.	6
			II	3	Mathematical Analysis (Integral calculus on \mathbb{R}^n) / Analiză matematică This course is divided in two parts. The first part is dedicated to sequences and series of functions. In the second part, which is the main part of the course, we study integrals for two and three variable functions, such as line integrals, double integrals, surface and triple integrals.	6
			II	3	Differential Geometry/ Geometrie diferentia The main aim of this lecture is to give an introduction to the basics of Differential Geometry, as illustrated by the geometry of curves and surfaces lying in 3-dimensional	6

					space. Outline syllabus includes: Curves and parameterization; Curvature of curves; Surfaces in Euclidean space; The first and second fundamental forms; Curvature of surfaces.	
			II	4	<p>Differential Equations /Ecuatii diferențiale Introduction to the first order ordinal differential equations (ODEs) – the simplest type of ODEs and exact analytical methods: separable equations, homogeneous equations, linear equations, exact differential equations, Bernoulli and Riccati equation types. Remarkable models of ODEs.</p> <p>Higher order Linear ODEs with variable and constant coefficients – general properties of solutions; The Wronskian and the Abel’s theorem.</p> <p>Systems of Linear ODEs with variable and constant coefficients – general properties of solutions; the Wronskian and the Abel’s theorem.</p> <p>The Laplace transform method for the solving LODEs and SLODEs.</p> <p>Aotonomous Systems and Stability – the structural properties of the solutions of the ODEs and SDEs.</p>	6
			II	4	<p>Algorithmic Graph Theory/ Algoritmica grafurilor This course is an introduction to graph theory with an algorithmic approach and is designed for students interested in mathematics or computer science. Topics covered in the course include: basic concepts and properties of undirected and directed graphs; paths and cycles, connectivity, optimal paths; trees, minimum spanning tree; Hamiltonian and Eulerian graphs; matchings; planar graphs; graph colouring; network flows.</p>	5
			II	3	<p>Database/ Baze de date This course of study introduces students to basic relational database concepts. The course teaches students relational database terminology, as well as data modeling concepts and building Entity Relationship Diagrams. The Structured Query Language (SQL) is used to interact with a relational database and manipulate data within the database.</p>	6
			II	3,4	Phisycal Education/Educație fizică	1+1
			II	4	<p>Web Technologies/ Tehnologii WEB The objective of this discipline is to create Web pages using the HTML, XHTML and</p>	5

					XML markup languages, CSS, PHP language, and MySQL databases.	
			II	4	Complex Analysis/ Analiza complexa This course provides the basics and applications of theory of complex functions. Emphasis is given to topics that will be useful in other disciplines, including integral transformations: Laplace transformation, Fourier transformation.	5
			II	3	Object Oriented Programming/Programare orientate pe obiect This course provides an introduction to object-oriented programming presenting basic concepts about classes and objects, subclasses and superclasses, inheritance, polymorphism. Practical applications will be realized in Java and involve the implementation of classes and interfaces, input / output streams, serialization of objects, collections, graphical interfaces, drawing, threads, applets.	5
			II	4	Training/ Practică	3
			II	4	Operating Systems/Sisteme de operare This course provide information concerning operating system design and implementation. . Particular emphasis will be given to hardware componentes informance exchance using operating system features. Basic concepts for using operating system is studied in a practical based approach. Programming language is used to test SO specific features.	5
			III	5	Probability Theory/ Teoria probabilităților Probability – Notation and experiments; Events and sequences of events; properties of probability; Conditional probability and independence – main properties and formula. Types of random variables – distribution and expectation; Special examples of probabilistic distributions – the Bernoulli and binomial random variables, the Poisson random variables, the Normal/Exponential/Gamma random variables. Distributions arising from the Normal – the chi-square distribution; the t-distribution; the F-distribution. Applications.	5
			III	6	Mathematical Statistics/ /Statistică matematică Introduction to Statistics – Data collection and descriptive statistics; populations and samples. Describing data sets – Frequency tables and graphs; grouped data, histograms.	6

					<p>Summarizing data sets – sample mean, sample variance, sample median, sample mode, sample standard deviation, sample percentiles, sample correlation coefficient for the paired data sets.</p> <p>Distribution of the sampling statistics – the weak (and strong) law of large numbers; the Central Limit Theorem; the sample mean and the sample variance; sampling distributions from a Normal population.</p> <p>Parameter Estimation – Maximum Likelihood estimators; Confidence interval estimators for the mean and the variance of a Normal distribution; Confidence interval for the parameters of the other distributions. Hypothesis testing – significance levels. Tests concerning the mean and the variance of a Normal population. Regression – least squares estimators of the regression parameters. Statistical inferences about the regression parameters.</p>	
			III	5	<p>Numerical Analysis/ Analiza numerică</p> <p>This course provides computational methods for the study and solution of mathematical problems. In this context we emphasize numerical methods for the solution of the most common mathematical problems and we analyze the errors present in these methods. Because almost all computation is now done on digital computers, we also discuss the implications of this in the implementation of numerical methods using MATLAB software.</p>	6
			III	5	<p>Computer Networks /Rețele de calculatoare</p> <p>In this course the emphasis is put on design and analysis of computer communication networks. Topics include application layer protocols, Internet protocols, network interfaces, local and wide area networks, wireless networks, as well as specific software and hardware used in the field of study.</p>	5
			III	5	<p>Artificial Intelligence/ Inteligența artificială</p> <p>This course presents the AI specific problems, strategies to solve an artificial intelligence problem (irrevocable strategies, attempt strategies, depth first search, breadth first search, best-first search, MIN-MAX algorithm, alpha-beta algorithm, and methods to compare and eliminate differences), knowledge representation and reasoning, natural language processing, LISP programming language.</p>	6

			III		<p>Formal Languages and Automata Theory/ Limbaje formale si compilatoare Basics – algebraic introduction in the formal languages theory. Finite automata and regular languages. Equivalence of Deterministic and Non-deterministic Finite Automata. Minimization of Finite Automata. Pumping lemma and advanced closure properties of the regular languages. Context-free grammars and languages. Definition and main properties of the context-free grammars – derivation trees, simplification and algorithms, normal forms (Chomsky, Greibach). Non-deterministic and deterministic pushdown automata – languages recognized. Closure properties of the context-free languages. Parsing and recognition in general grammars. Top-down parsing and LL($k \geq 1$) grammars. Bottom-up parsing and LR($k \geq 0$) grammars. Turing Machines Model – programming a Turing machine as Acceptors, and as Transducers. Chomsky hierarchy.</p>	5
			III	6	<p>Mathematical modeling/Modelare matematica The main aim of this course is to demonstrate that mathematical techniques can be applied to real-world situations and explain real life phenomena.</p>	5
			III	5	<p>History of Mathematics\ Istoria matematicii This course focuses on how the mathematical ideas have developed over time, from the first thoughts on numbers and space to modern and contemporary mathematics. The development of mathematics is examined in a historical, social and cultural context.</p>	3
			III	6	<p>Cryptography /Criptografie The aim of this course is to introduce the student to the areas of cryptography and cryptanalysis. This course develops a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms. Our aim is to develop a workable knowledge of the mathematics used in cryptology and information security.</p>	5
			III	6	<p>Calculus of Variations/Calcul variațional Calculus of Variations is a chapter of mathematical analysis that studies the problems of determining the extremes of a functional one. In the first part, starting from the</p>	5

					extremes of the integral functions reaches Euler-Lagrange equations. In the second part are studied some types of operator equations, using the variational methods.	
			III	6	Number Theory/ Teoria numerelor This course provides the basics and applications of number theory. Emphasis is given to elementary results which are interesting in themselves and which are useful other contexts(for example in olympiad problems).	5
Mathematics	MA	Didactic Mathematics	I	1	Selected topics in Calculus/Capitole speciale de analiză matematică In this course, is deepening and expand a series of basic concepts of mathematical analysis, such as sequences convergence, limits, continuity and derivability for the real function of the real variable.	7
			I	1	Selected topics in Geometry/Capitole speciale de geometrie Points and lines in a triangle. Quadrilaterals. Angles in a circle. Circumscribed and inscribed circles. Metric relations in a triangle. Metric relations in a quadrilater. Menelaus theorem. Ceva's theorem. Isometries. Homothety. Inversion.	7
			I	1	Selected topics in Algebra/ Capitole speciale de algebră Actual research topics are presented from the field of algebra which among others include the following areas: group theory, ring theory, field theory.	7
			I	1	Forms and Techniques of Communication in Mathematics/ Forme si tehnici de comunicare in matematica This course develops professional skills in writing and presenting mathematical ideas and results. The topics include: how to organize a paper (a scientific article, a thesis, a book); writing and giving a talk; preparing a poster; how to create and deliver scientific presentations; how to use the document preparation system LaTeX	6
			I	2	Complements in Calculus\ Complemente de analiză matematică This course is dedicated to integration theory of one real variable functions. Some types of integrals are presented here, such as Riemann, Darboux, Riemann-Stieltjes and Lebesgue integrals and the relationship between them.	7
			I	2	Complements in Geometry/Complemente de geometrie In this course, students will broaden their understanding of Affine Geometry; study	7

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					affine spaces, affine combinations, barycenters, affine independence, coordinate systems, affine maps, morphisms of affine spaces, affine and bi-affine forms.	
			I	2	Mathematics solving problem strategies/ Tehnici de rezolvare a problemelor de matematică This course provides mathematical methods and techniques to solve classic theorems and practical problems which appear in elementary mathematics.	7
			I	2	Etics and academic integrity/Etica si integritate academica This course will explore etics and academic integrity and how you can demonstrate it in your work, study and research at university.	2
			I	2	Statistical processing of experimental data/Prelucrarea statistică a datelor experimentale The goal of this course is to introduce several adequate and recently emerged statistical techniques not covered by traditional statistical courses. The role of optimization methods for inverse and ill-posed problems is emphasized.	4
			II	3	Teaching mathematics for performing students /Predarea matematicii pentru elevi performanți In this course are presented a series of famous inequalities in elementary mathematics, elements of combinatorial analysis, function theory and modern techniques to solve the problems encountered in school competitions	6
			II	3	Mathematical modeling/ Modelare matematica The main aim of this course is to demonstrate that mathematical techniques can be applied to real-world situations and explain real life phenomena. Outline syllabus includes: fundamental concepts of linear programming, model formulations and applications to various economics problems; introduction to graphs: (undirected and directed graphs), weighted graphs, graph representation and special classes of graphs, algorithmic problems on graphs, applications of linear algebra and matrix algebra in algorithms (e.g., in web searching).	6
			II	3	History of Mathematics\ Istoria matematicii This course focuses on how the mathematical ideas have developed over time, from the first thoughts on numbers and space to modern and contemporary mathematics. The	6

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					development of mathematics is examined in a historical, social and cultural context. The course includes topics such as: ancient mathematics, Greek mathematics, the history of solving algebraic equations, the beginning of mathematical analysis, the birth of mathematical logic and set theory and their impact on mathematics. Main directions in the philosophy of mathematics as well as the relationships between mathematics and computer science are also examined.	
			II	3	Number theory and elementary arithmetic/ Teoria numerelor This course provides the basics and applications of number theory and elementary arithmetic. Emphasis is given to those theorems of number theory and combinatorics which are derivable in elementary arithmetic.	6
			II	3	Financial Mathematics/Matematici financiare This course provides an introduction to the basic mathematical concepts and techniques used in finance and business. It gives the different types of interest (simple interest, discount interest, compound interest), annuities, debt retirement methods.	6

ENVIRONMETAL SCIENCES	BA	ENVIRONMETAL SCIENCES	I	1	General Physics / Fizică generală This course aims at updating and deepening the general knowledge of physical Physics and their measurement units, the kinematics and the dynamics of the material point and the rigid solid, the notions of mechanical impulse, mechanical work, energy, power, efficiency, collisions, theorems of variation and laws conservation and familiarization with the working methods of the Physics Laboratory, all concepts being treated in close connection with their applicability in the study of the environment.	6
			I	1	General Chemistry / Chimie generală This course presents general notions of chemistry laws and chemical structure of matter, the presentation of chemical elements, their distribution and role in nature, chemical equilibria and applications in electrolytic solutions, the notions of: pH, acidity, basicity, notions of electrochemistry, oxidation-reduction processes, chemical processes occurring in nature, preparation of standard and non-standard solutions, water hardness and methods of determination, notions of corrosion (chemical, electrochemical and biochemical) and its prevention, different applications in ecosystems and the way in which the various chemicals interact with the flora and fauna, and also about environmental friendly chemicals and technologies and low-impact chemical technologies.	6
			I	1	General Physical Geography / Geografie fizică generală This course aims to acquaint students with the specificity of Physical Geography in relation to the other fields of human knowledge, by appropriating and correctly using the notions of physical geography in the context of their historical development, understanding the terrestrial environment as part of the Solar System, understanding the architectural structure and the functioning mechanisms of terrestrial geosystems in their interrelation with the socio-human systems and the understanding of the dynamic and evolutionary circuits between the various components of the terrestrial environment.	5
			I	1	Vegetal Biology / Biologie vegetală This course presents notions regarding: 1) Vegetal cytology: plant cell	5

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					structure, mitotic and meiotic division; Vegetal histology: types of tissues and their characteristics; 2) Organography: root: morphology, anatomy, types, functions, strain: morphology, morphological types of strains; the primary strain structure; leaf: the disposition and succession of the leaves on the stem axis; leaf morphology; morphological types; 3) Plant reproduction: asexual multiplication, alternations of generations to: algae, fungi, muscules, pteridophytes, gymnosperm and angiosperms; flower in angiosperms, flower anatomy, fruit: morphology and fruit classification; seed: morphology, structure, dissemination and distribution of seeds.	
			I	1	Mathematics / Matematică This discipline presents elements of mathematical analysis and theory of differential equations: limits, continuity and derivability for functions of a real variable, study of function variations, graphical representations, series of real numbers, powers series, developments in series, real functions of several variables, limits and continuity, differentiability, extremes, integrability, the Riemann integrals, integration methods, Euler integrals, first order differential equations, and linear higher order differential equations with constant coefficients.	5
			I	1, 2	Foreign Languages / Limbi străine This discipline aims at deepening students' knowledge of foreign languages by applying them to the specifics of environmental studies.	2
			I	1, 2	Physical Education / Educație fizică This discipline aims at keeping students fit and healthy while learning general and specific notions of Environmental Science.	1
			I	1	Anatomy and Hygiene (facultative) / Anatomie și igienă (facultativă) The course presents basic notions of Anatomy, animal tissues, bone system, muscular system, nervous system, sensory organs, skin system, endocrine glands, systems: digestive, respiratory, circulatory, urinary, and genital, and about human hygiene: physical development and neuropsychics, hygiene rules for the human activity and rest regime, communicable diseases in communities	4
			I	2	The Basics of Environmental Science / Bazele Științei mediului This course aims at familiarizing students with the complexity of the	5

					environment as structure, interactions and problems, along with the introduction into the study specific of each environmental component: soil and relief, air, water, biosphere and anthroposphere, including the typical environmental legislation and assessment environment.	
			I	2	Environmental Chemistry (organic) / Chimia mediului (organică) This course aims at presenting the structure, functional classification, spreading in nature, physical properties and reactivity of organic compounds by: knowledge and appropriate use of specific notions of Chemistry of the environment, knowledge of the main types of organic pollutants resulting from the main industrial processes and their influence on organisms and the environment, knowledge of methods of reduction of noxes of organic nature and formation in students of the capacity to solve concrete problems of environmental protection they will face in productive activity and/or monitoring of environmental factors.	6
			I	2	Physics of the Environment (Fluids, Molecular Physics and Thermodynamics) / Fizica mediului (Fluide, Fizică moleculară și Termodinamică) The course presents fundamental notions concerning the fluids, their phenomena and laws, about molecular Physics (theory of atoms and molecules and their physical states and properties) and Thermodynamics (heat exchanges, temperature, pressure, volume and mass changes and their corresponding laws), all these applied to the study of the Environment.	6
			I	2	Environmental chemistry (inorganic, analytical) / Chimia mediului (anorganică, analitică) This course presents detailed notions on the classification of chemicals, on classes of inorganic chemical compounds: oxides, acids; bases, salts; on aggregation states: gaseous state and its laws; the liquid state; solutions: properties and concentration, and about the solid state and its properties. It also deals with chemical methods of pollutant analysis: qualitative and quantitative chemical analysis, analytical reactions, analytical reagents, Gravimetry, Volumetry, quantitative chemical analysis, acid-base Volumetry, REDOX volumetry and Volumetry based on precipitation reactions.	6

			I	2	Informatics / Informatică The course presents basic notions concerning computer use (Office, internet, drawing facilities) and computer programming in C as related and used in Environmental Science studies.	4
			II	3	Atmosphere and air quality / Atmosferă și calitatea aerului The course deals with the composition and structure of the terrestrial atmosphere, its shape, atmospheric Thermodynamics, Physics of the aerosols and atmospheric pollution and atmospheric quality.	5
			II	3	Integrated Environmental Monitoring / Monitoring integrat de Mediu The course presents the definition of environmental monitoring system, its purpose, activities, elements, attributes, indicators and quality, about monitoring domains, about scheduling a monitoring program, on environmental monitoring strategies and types of monitoring programs, about advanced analytical techniques used in environmental monitoring and also about environmental monitoring in Romania - SMIR integrated system and monitoring system in the Danube Delta Biosphere Reserve.	5
			II	3	Pollution and protection of the environment / Poluarea și protecția mediului The course presents introductory notices on environmental pollution, monitoring and quantification of environmental status, water (characteristics, sensitivity of aquatic ecosystems, transition ecosystems, pollution, limitation of impacts on aquatic ecosystems, wastewater), about the atmosphere (characteristics, interactions, pollution limitation of atmospheric pollution), soil (characteristics and sensitivity of soil ecosystems), cross-border pollution, and environmental projects financing.	5
			II	3, 4	Physical Education / Educație fizică This discipline aims at keeping students fit and healthy while learning general and specific notions of Environmental Science.	1

			II	3	Physics of the Environment (Waves, Electromagnetism, Optics) / Fizica mediului (Unde, Electromagnetism, Optică) The course presents fundamental notions concerning waves: definition, classifications, waves phenomena and laws, electrical and magnetic fields, their reciprocal interaction and inter-generation and interaction with matter, waves and photonic Optics, all these applied to the study of the Environment.	5
			II	3	Water resources management / Gestiunea resurselor de apă The course presents notions regarding: the water structure and its characteristics, the water resources of the Earth, Romania's water resources, the management of the atmospheric, surface, groundwater, ocean and maritime waters, strategies for the sustainable exploitation of water resources, water supply of localities and its capture, natural water treatment operations for potable water supply, water distribution system, water management in Romania.	4
			II	3	Ecological processes modeling / Cartography, Remote sensing, GIS (optional) / Modelarea proceselor ecologice / Cartografie, teledetecție, GIS (optional) Ecological processes modeling: The course presents notions regarding: structure and functions of ecosystems; primary and secondary production: concepts, measurement methods, analytical models; the flow of energy and the circulation of matter through ecosystems; self-control and stability of ecosystems, specialization and extinction: notions, statistical models; biological diversity and biodiversity levels, with local, zonal modeling, etc. Cartography, Remote sensing, GIS: This course deals with the understanding of the processes through which remotely sensed data are transformed into meaningful information. Remote sensing, GIS and cartography are presented as interacting mapping fields in the sense that they exhibit mutual dependencies as far as sound information extraction is concerned, and complement each other into picking up useful information about the environment at different spatial scales/resolution.	5
			II	3	Modeling physical phenomena with applications in environmental science (facultative) / Modelarea fenomenelor fizice cu aplicații în Știința	4

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				Mediului (facultativ) This course explains the principles of using and building physical-mathematical models to simulate and to explain the behavior of the environmental systems and its components.	
		II	3	Elements of entrepreneurial education in environmental management (facultative) / Elemente de educație antreprenorială în managementul mediului (facultativ) The course presents the introduction of the environmental elements into the study of the entrepreneurial learning process and the other way around: as the economic principles of entrepreneurship can be applied to the environmental management.	2
		II	4	General Biochemistry / Biochimie generală The aim of this course is to familiarize students with the essential aspects of metabolic processes: chemical transformations from living organisms, the main types of biomolecules and biochemical reactions and enzymatic biocatalysts.	5
		II	4	Soil Science / Știința solului This course follows the assimilation of the knowledge concerning the nature and composition of the soil, soil types, soil biological activity, and soil's interaction with the other environmental components, soil pollution and soil remediation.	5
		II	4	Chemical pollution and analysis of the environmental samples / Poluare chimică și analiza probelor de mediu The course presents notions regarding: chemical pollution - general notions, chemical pollution of the atmosphere, water and soil, chemical analysis of the environmental samples: the analytical process; sensitivity, precision and selectivity; classification of analytical methods, sampling, errors in analysis of environmental samples, instrumental methods for environmental samples analysis, electrochemical methods of analysis: conductometric analysis and potentiometric analysis and optical methods of analysis of chemical compounds.	5
		II	4	Physical Chemistry / Chimie fizică This course presents fundamental and Environmental studies-applied notions	4

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				regarding: Chemical Thermodynamics, Electrochemistry and Chemical Kinetics.	
		II	4	Specialty practice / Practică de specialitate This part of the programme concerns performing practical, specific environmental science studies and activities at various economic operators and institutions and /or within the didactic and research laboratories within the university.	2
		II	4	Environmental law, legislation, policies and strategies/The Economy of the Environment (optional) / Legislația mediul înconjurător, politici și strategii de mediu / Economia mediului (opțional) Environmental law, legislation, policies and strategies: This course deals with: environmental protection and environmental protection tasks, environmental policy and economic development, general aspects regarding the right to a healthy environment, including environmental protection instruments, environmental law in the Romanian law system, environmental law and legal protection environment: the protection of natural resources, water and aquatic ecosystems, the atmosphere, soil and fauna, respectively. The Economy of the Environment: This course deals with: the subject of Economy, the interaction between the Economy and the natural environment, the theoretical and practical fundamentals of the environment economy, the eco-eco growth and development, the ecological crisis - traits, causes, remedies, energy - environment, economy, perspectives, biodiversity - economic development, extinction, conservation and assessment, natural and anthropogenic risks - their economic impact, the environment and corporate responsibility - realities and perspectives in the 21st century.	3
		II	4	Ecotoxicology/Chemistry of natural products (optional) / Ecotoxicologie / Chimia produselor naturale (opțional) Ecotoxicology: This course deals with: the definition of ecotoxicology, the main categories of toxic substances, the main sources of toxic substances, the effects of toxic substances contamination, the ways of penetration of polluting chemical substances, the mechanisms of defense of organisms against	5

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				<p>chemical pollution, dispersion and concentration of pollutants in biomass, trophic chain modifying factors, epidemiological studies, biomarkers, action of physical, chemical and biological factors, natural toxicity, and ecotoxicology of aquatic and terrestrial environments.</p> <p>Chemistry of natural products: This course deals with: primary and secondary metabolism, biosynthesis of natural compounds, odorants and flavorings, alkaloids, oligosaccharides and polysaccharides / hydrocolloids, natural dyes, natural antibiotics.</p>		
			II	4	<p>Modeling of chemical phenomena with applications in environmental science (facultative) / Modelarea fenomenelor chimice cu aplicații în Știința Mediului (facultativ)</p> <p>This course presents the principles of using and building chemical-mathematical models to simulate and to explain the behavior of the environmental systems and of their components and phenomena.</p>	4
			III	5	<p>The radioactivity of the Environment / Radioactivitatea mediului</p> <p>The course presents the general characteristics of atomic nuclei and nuclear forces, it talks about the natural radioactivity, about sources of radiation (natural and artificial), it deals with nuclear reactions, with the interaction of nuclear radiation with the substance, and with the detection and measurement of nuclear radiation; it also deals with applications of radiation and radioactive isotopes in the field of environment, and about the principles and basic concepts of dosimetry.</p>	5

			III	5	<p>Methodology of drafting impact studies/Metodologia întocmirii studiilor de impact</p> <p>The course presents the general aspects of the environmental impact of anthropogenic activities and environmental impact studies, as well as the application of the legislation in the field regarding their realization. It also presents theoretical aspects of the environmental impact assessment, the stages and components of the environmental impact assessment and the main indicators used in the impact studies. The course also deals with the structure of an environmental impact assessment report and explains the purpose and necessity of the environmental impact assessment action, with the presentation of the environmental consequences. The course also presents methods and techniques for carrying out environmental impact studies, integrating models and processing data acquired in the impact studies used in the environmental impact assessment stages. In addition, the course explains how to prepare the environmental balance sheets and environmental risk assessment methodology, as well as ways to act in case of environmental risks.</p>	5
			III	5	<p>Environmental pollution by physical agents / Poluarea mediului prin agenți fizici</p> <p>The course contains the following topics: sounds - basic concepts, sound intensity, oscillations and elastic waves, sound frequency analysis, microphones; the selection and use of microphones; the interaction and influence of sound pollution on the environment and the body; sources and electromagnetic compatibility, and electromagnetic field influence on the human body; the thermal effect of electromagnetic radiation; the exposure to mobile phone radiation; technical measures to limit the effects of electromagnetic fields.</p>	5

			III	5	<p>General Ecology / Ecologie generală The course talks about Ecology - general notions, about the organization of a system, system categories and system stability, about the biological system, its general characteristics and the biology system hierarchy, about natural ecological systems, the structure of ecosystems and relationships between ecosystem components and between organisms, as well as between organisms and their environment, about the ecosystem and its components, about anthropic ecological systems. The course also presents fundamental notions of the biotope, its physical and chemical factors, the correlated action of abiotic factors, biocenosis, its structural indices and the relationships between the populations of biocenosis, the productivity of ecosystems, their energy, material and energy flows and energy exchanges, and materials. The course also presents the succession and evolution of ecosystems, the description of the functioning of natural ecosystems, their degradation and current trends in the study of ecological systems.</p>	4
			III	5	<p>Spectral methods of analysis / Metode spectrale de analiză The course comprises the following chapters and associated contents: 1. General notions of Spectroscopy: the atomic-molecular structure of the substance, energy levels; energy spectra, spectral transitions, electromagnetic radiation, spectral expression modes, classification of energy levels and their transitions, spectral fields of analysis, classification of spectra according to different criteria, transition probabilities, Einstein coefficients, relative intensity in spectra, coefficients of absorption, Beer's law, absorption spectra, essential parts of a spectral apparatus, electromagnetic radiation receptors; 2. Atomic spectroscopy: atomic models, spectral analysis by atomic emission and spectral analysis by atomic absorption and their application to the study of the environment; 3. X-ray Spectroscopy: X-ray emission Spectroscopy, X-XRF fluorescence Spectroscopy, Electron Microscopy - EDAX spectra, basic crystalline structure and X-ray diffraction patterns, X-ray Spectrometry / X-ray Diffractometry: principles, equipment, applications for the study of the environment; 4. Molecular Spectroscopy in UV-VIS-IR: rotation spectra, vibration and vibration-rotation spectra, electronic spectra, Spectrophotometry and applications of Absorption Spectroscopy in the study</p>	5

				of the environment.	
		III	5	<p>Meteorology and Climatology/Global changes (optional) / Meteorologie și Climatologie / Modificări globale</p> <p>Meteorology and Climatology: The course talks about the temperature gradient and temperature variability in the atmosphere, about baric formations, about the statics and thermodynamics of the atmosphere, about humidity, fog and clouds, about precipitation, atmospheric dynamics, wind and its causes and characterization, about the radiation budget, the atmospheric circulation, weather fronts, and climate types.</p> <p>Global changes: The course presents the main issues concerning: global climate change, natural and human factors of climate change, greenhouse effect, effects of climate change on natural and human systems, global, national and local responses to climate change, management policies and economic tools, adaptation strategies and policies.</p>	6
		III	5	<p>Advanced interdisciplinary study of physical-chemical phenomena with applications in environmental science (facultative)</p> <p>The course presents the methodology of treating interdisciplinary the topics and analysis of the environment, combining the knowledge in Physics, Chemistry, and Biology, from Informatics and Statistics, with specific examples from practice and the scientific literature.</p>	4
		III	6	<p>Alternative energies</p> <p>The course presents introductory concepts of energy and basic principles for energy production, it talks about the conversion of solar energy into electric and thermal energy, about the conversion of nuclear, wind and hydroelectric energy into electricity, about the exploitation of planetary ocean resources, the production of energy from biomass, about geothermal energy, about the production energy by thermal conversion of heat in electricity, it also deals with the photovoltaic power generation systems, with power systems with fuel cells, and with wind turbine power systems.</p>	6
		III	6	<p>Elaboration of the bachelor thesis</p> <p>This is an individual activity of each student through which he/she demonstrates the ability to apply the knowledge gained along the 3 years of</p>	2

					B. Sc. studies to a specific subject that he/she deepens it and applies it to a specific region, environmental component or environmental aspect, both through theoretical and practical activities which he/she presents in a written form obeying specific rules of content, organization and format.	
			III	6	<p>The environmental risk in health/Nanotechnologies in environmental studies (optional)</p> <p>The environmental risk in health: The course presents the following topics: analyzing changing multi-hazard risk for decision making, the environmental impact assessment, the water system and society; environmental, health, and social risks: cancer risks from workplace and environmental chemicals, seismic hazards and risks from earthquakes, quantifying the health risks from air pollution, occurrence of antimicrobial resistance genes in aquatic systems; the management of emergent risks: permafrost engineering and periglacial risks and about how safe are nanomaterials?</p> <p>Nanotechnologies in environmental studies: The course includes the following chapters and related contents: 1. Introductory notions: the significance of a nanometer, the definition of nanomaterials and nanotechnologies, technological currents on nanomaterials and nanotechnologies, the motivation for studying and obtaining nanomaterials, nanomaterials classification, examples of nanomaterials, approaches to nanomaterials, properties and applicability of nanomaterials; 2. Fundamentals of crystalline structure: macrostructure, microstructure, crystalline and amorphous materials, internal symmetry of crystals, notations of nodes, directions and crystalline planes, crystallographic systems, notions of allotropy, polymorphism and isomorphism, crystalline structure of semiconductors, defects in crystals, general presentation of crystalline study methods. 2. Radiation emission spectroscopy X; 3. X-Ray Diffractometry; 4. X-ray Fluorescence Spectroscopy-XRF; 5. Electron Microscopy and the EDAX technique; 6. Atomic force microscopy - AFM; 7. Nanomaterial manufacturing processes: devices and methods, and examples of devices and nanostructured materials with associated properties and applications.</p>	5
			III	6	Global changes / Elements of Geophysics (optional)	5

				<p>Global changes: The course presents the main issues concerning: global climate change, natural and human factors of climate change, greenhouse effect, effects of climate change on natural and human systems, global, national and local responses to climate change, management policies and economic tools, adaptation strategies and policies.</p> <p>Elements of Geophysics: The course is divided into the following chapters and corresponding content: 1. The Universe: age, chemical composition, structure, solar system; 2. The Earth: internal structure, physical properties; 3. Morpho-tectonic division of the terrestrial crust – stable and unstable areas; 4. Global Tectonics: the continental drift, the expansion of the ocean beds, the plate tectonics; 5. Seismic phenomena: the elements of an earthquake, seismic waves, classification of earthquakes, their effects, direct causes of earthquakes and their distribution on Earth.</p>		
			III	6	<p>Assessing the impact of human activities on the environment/Ecological Statistics(optional) / Evaluarea impactului activităților antropice asupra mediului/Statistică ecologică (optional)</p> <p>Assessing the impact of human activities on the environment: The course deals with the natural and human-induced changes, with examples of human transformation of the earth, it talks about sustainable development, about natural resources, natural capital, and biomes. It also talks about the terrestrial and aquatic ecosystems, about biodiversity, about the ecological footprint, the population growth and consumption, about the impacts on oceans, fisheries and coastal ecosystems, on the impacts on freshwater and on forest ecosystems, and also about the impacts of urbanization, energy and mining and of Agriculture on the environment.</p> <p>Ecological Statistics: The course presents and explains the statistical modeling applied to environmental studies, also dealing in details about spatial variation and linear modeling of ecological data, about statistical approaches to the problem of phylogenetically correlated data, mixed models for dispersed data and about mixed models.</p>	5
			III	6	Global biogeophysical cycles / Physics of the Earth and of the atmosphere	5

				<p>(optional)</p> <p>Global biogeophysical cycles: The course presents an introduction to global changes, it deals with the major elements in living matter, with biogeophysical cycles - general notions, it presents the individual cycles of: hydrogen, oxygen, carbon, phosphorus, nitrogen and sulfur, it talks about macronutrient transformations in the human body and about the changes in the structure of the environment.</p> <p>Physics of the Earth and of the atmosphere: The course presents and explains the main physical phenomena happening in the terrestrial environment, with all its components, through the practical application of the laws of Physics to the natural phenomena and nature's characteristics and behavior.</p>	
		III	6	<p>Ethics and academic integrity/ The Economy of the Environment (optional)</p> <p>Ethics and academic integrity: The course presents the principles of ethics in teaching and research at academic level, promoting the culture of honesty in all aspects of higher education at each of its levels: B. Sc., M. Sc., and Ph. D. studies and teaching and research careers.</p> <p>The Economy of the Environment: The course presents theoretical and empirical studies of the economic effects of national or local environmental policies around the world, including issues such as the costs and benefits of anthropogenic activities, legislation and politics on the environment, and also about alternative environmental policies dealing with pollution, environmental quality, toxic substances, wastes, and global warming and climate changes.</p>	2
		III	6	<p>Population Ecology (facultative)/Ecologia populațiilor</p> <p>The course deals with the presentation and explanation of the dynamics of species populations and how these populations interact with the environment, and of how population sizes of species change over time and space, along with the explanation of the processes and revealing their consequences.</p>	2

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			III	6	<p>Microbiology (facultative) The course deals with the study of all microscopic living organisms known as microbes, namely: bacteria, archaea, viruses, fungi, prions, protozoa and algae, and of their key roles in nutrient cycling, biodegradation/biodeterioration, climate change, food spoilage, the cause and control of disease, and biotechnology. Among their uses, the course presents those related to the manufacture of biofuels, cleaning up pollution, etc.</p>	2
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CHEMISTRY	BA	CHEMISTRY	I	1	<p>General Chemistry</p> <p>In this course it is the ground up of chemistry: beginning with the basics of the atom and its behavior, to the chemical properties of matter, to the chemical changes and reactions that take place.</p>	6
CHEMISTRY	BA	CHEMISTRY	I	1,2	<p>Analytical Chemistry- qualitative</p> <p>This course introduces the principles of analytical chemistry, fundamental analytical concepts and their practical applications and provides how these principles are applied in chemistry and related discipline. This course gives an introduction to analytical chemistry and an overview of important analytical methods and their range of application within detection of inorganic and organic compounds</p> <p>Analytical Chemistry- quantitative</p> <p>This course introduces the important analytical quantitative techniques from classical methods, electrochemical methods, spectrochemical / spectrophotometric methods, and separation techniques are reviewed. The course also includes risk assessment of chemical experiments, important steps and procedures in analytical chemistry, and evaluation/interpretation of results. The course gives an overview of important use of selected classical and instrumental chemical quantitative analytical methods and a short introduction to their basic theory.</p>	6 8
CHEMISTRY	BA	CHEMISTRY	I	1	<p>Nonmetals Chemistry</p> <p>This course introduces the notion of non-metallic elements and the place</p>	7

					occupied in the regular system and general and specific notions regarding the way of obtaining, the physical and chemical properties of non-metals and their combinations	
CHEMISTRY	BA	CHEMISTRY	I	2	Metals Chemistry This course presents general characterization of metals and description of representative metals and transition metals in terms of their production methods, properties and applications	8
CHEMISTRY	BA	CHEMISTRY	I	2	Structure and properties of the molecules This course introduces the notion of theoretical bases related to the molecular structure analysis, the nature of the chemical bond and the molecular properties, theoretical determination of the structural, energetic and reactivity elements of the molecular systems.	6
CHEMISTRY	BA	CHEMISTRY	II	3	Fundamentals of Organic Chemistry This course presents fundamental notions of organic chemistry such as isomers, mechanisms, functional classification and class of organic compounds like hydrocarbons, halide derivatives, hydroxylic compounds, the spread in nature, structure, physical properties and reactivity of organic compounds	7
CHEMISTRY	BA	CHEMISTRY	II	4	Organic Chemistry- simple functions This course presents the main methods of identifying and synthesizing the classes of organic compounds with simple functions like ethers, amines,	5

					nitroderivatives, carbonylic and carboxylic acids, , the spread in nature, structure, physical properties and reactivity of organic compounds	
CHEMISTRY	BA	CHEMISTRY	II	3	<p>Inorganic substances in pharmaceutical chemistry</p> <p>This course presents the elements in respect with inorganic drugs, including chemical properties and biological role as well as of elements (metals and metalloids) involved in its structure and synthesis,, biological activity of metals-metalloids, inorganic compounds of pharmaceutical interest: synthesis/origin, quality/quantity control, properties, uses, side effects and their chemical explanation</p>	7
CHEMISTRY	BA	CHEMISTRY	II	4	<p>Electrochemistry</p> <p>This course presents: Electric potentials and fields. Conductivity and capacitance. Thermodynamics of aqueous solutions. Electrolysis cells and galvanic cells with and without transfer. Electrosynthesis of metals and chemicals, electro dialysis and salt splitting. Electrochemical energy storage. Electrodes and electrode reactions. Electrochemistry in analysis of the environment and environmental remediation. Electrochemical description of biological cells.</p>	4
CHEMISTRY	BA	CHEMISTRY	II	3	<p>Thermodynamic Chemistry</p> <p>This course presents: study of chemical reactions from point of view thermodynamic to determine their feasibility; study of isothermal, isobaric, isocorous and adiabatic phenomena extremely important for the design of chemical reactors and compressors necessary for the reaction to high</p>	6

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					pressure; the theoretical calculation of the composition of a steady-state reaction system and the influence of temperature on the balance.	
CHEMISTRY	BA	CHEMISTRY	II	4	<p>Instrumental analysis</p> <p>This course is intended to provide basic skills in instrumental analysis. Students will learn properties of electromagnetic radiation and its interaction with matter, components of spectroscopic instruments and evaluation of their features, basics of molecular and atomic spectroscopic methods, details of atomic absorption and emission spectroscopy, UV-Vis absorption spectroscopy, luminescence methods. The other part of the course will include an introduction to chromatographic methods of analysis</p>	4
CHEMISTRY	BA	CHEMISTRY	II	3	<p>Colloids</p> <p>This course will focus on the theories used in colloid science, their application and associated techniques, including the properties of charged surfaces, the stability of charged systems, surfactant aggregation and adsorption, emulsions and microemulsions and rheology</p>	6
CHEMISTRY	BA	CHEMISTRY	II	3	<p>Computer aided teaching technologies</p> <p>This course is to review the applications and problems for computer education and computer assisted education in teaching chemistry training programs. The study introduces some applications and major problems on using instructional media and computers in developing chemistry lessons.</p>	4
CHEMISTRY	BA	CHEMISTRY	II	4	Optional CHEMISTRY 1 (Macromolecular compounds/Biomolecules)	3

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					This course is to present the fundamental knowledge on the polymers, natural or synthetic (nomenclature, structure, isomerism), the mechanism and kinetics of the various polymerization processes and physico-chemical properties of the macromolecular compounds, their volume and surface properties; ability to use analysis techniques to identify the properties of polymer materials of interest in modern applications.	
CHEMISTRY	BA	CHEMISTRY	II	4	Advanced techniques in instrumental analysis This course will develop critical thinking, problem solving, communication skills and practical skills in analytical chemistry – the science of obtaining, processing, and communicating information about the composition and structure of substances, finding out what a sample is made of and how much of each component is present, identification and quantification associated with chemical, physical or biological processes.	3
CHEMISTRY	BA	CHEMISTRY	II	4	Optional CHEMISTRY 2 (Coordination and biocoordination Chemistry / Organometallic compounds) This course will develop the characterization of structurally coordinating and structurally biocorordinating compounds and physico-chemical behavior in order to prefigure their applications.	5
CHEMISTRY	BA	CHEMISTRY	III	5	Organic Chemistry - Mixed Functions and Heterocyclic Compounds This course presents the main methods of identifying and synthesizing the classes of organic compounds with mixed and heterocyclic functions, like amynes, carbonylic and carboxylic acids, the spread in nature, structure,	7

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					physical properties and reactivity of organic compounds	
CHEMISTRY	BA	CHEMISTRY	III	5	<p>Kinetic Chemistry</p> <p>The course covers the key concepts of three of the principal topics in first-year undergraduate physical chemistry: thermodynamics, kinetics and quantum mechanics. This course explores the rate of reaction, stoichiometry and order, zero order reactions, first order reactions, second order reactions, determination of reaction order, and effect of temperature on reaction rate.</p>	7
CHEMISTRY	BA	CHEMISTRY	III	5	<p>Chemical technology</p> <p>This course introduce knowledge of the fundamental notions regarding the physico-chemical processes underlying the chemical technologies in general.</p>	7
CHEMISTRY	BA	CHEMISTRY	III	6	<p>Biotechnologies and Biocatalysis</p> <p>This course will inform on conducting homogeneous and heterogeneous catalytic processes; acquiring basic kinetic notions of homogeneous and heterogeneous catalytic processes; introduce the main classes of enzymes and knowledge of the reaction mechanisms</p>	5
CHEMISTRY	BA	CHEMISTRY	III	5	<p>Environmental Chemistry</p> <p>This course is to understand the significance of contaminants, recognise air pollution and its causes, understand the qualities of water source and recognise water pollution, understand multiple roles of soil, manage environmental chemicals for better-quality human health, understand how to</p>	6

					contain, reduce or eliminate contaminants.	
CHEMISTRY	BA	CHEMISTRY	III	5	<p>Optional CHEMISTRY 3 (Biochemistry/Natural compounds)</p> <p>This course is to acquiring knowledge about natural compounds, chemical transformations that occur in living organisms, knowledge of the main types of biomolecules and biochemical reactions; acquiring understanding of various metabolic pathways as a "whole" of living organisms, with the acquisition of fundamental metabolic pathways, knowledge of the main biochemical analysis methods.</p>	6
CHEMISTRY	BA	CHEMISTRY	III	5	<p>Optional CHEMISTRY 4 (Catalysis/Quality assurance and standardisation)</p> <p>This course is to understand and apply core principles and concepts in heterogeneous catalysis, know the most important catalytic materials, and their functions, describe important applications of heterogeneous catalysts in energy conversion, emissions clean-up, and clean production.</p>	3
CHEMISTRY	BA	CHEMISTRY	III	6	<p>Optional CHEMISTRY 5 (Toxicology/Ecotoxicology/ Ethics and academic integrity)</p> <p>This course will develop basic notions of toxicology and the effects of chemical compounds on organisms and the mechanism of transformation</p>	5
CHEMISTRY	BA	CHEMISTRY	III	6	<p>Optional CHEMISTRY 6 (Statistics and data processing in chemistry/ Computational chemistry)</p> <p>Systematization of selection criteria for mathematical statistics with a high</p>	5

					degree of applicability in the investigation of experimental data obtained from various analytical studies	
CHEMISTRY	BA	CHEMISTRY	III	6	<p>Optional CHEMISTRY 7 (Chemistry of materials/ Bio and nanomaterials)</p> <p>This course will develop the analysis and elucidation of structures and properties of materials to the development of synthesis and processing techniques. This course features education and research addressing our global environment and limited natural resources in response to social needs and requirements, including the design of molecular structure and chemical reactions based on theoretical calculations, development of solar battery materials as clean energy technology, environmentally-friendly functional materials.</p>	5

Domain of study	Level (BA/MA)	Study programme	Year of study	Semester	Course title	Credit units
ENVIRONMETAL SCIENCES	BA	ENVIRONMETAL SCIENCES	I	1	General Physics / Fizică generală This course aims at updating and deepening the general knowledge of physical Physics and their measurement units, the kinematics and the dynamics of the material point and the rigid solid, the notions of mechanical impulse, mechanical work, energy, power, efficiency, collisions, theorems of variation and laws conservation and familiarization with the working methods of the Physics Laboratory, all concepts being treated in close connection with their applicability in the study of the environment.	6
			I	1	General Chemistry / Chimie generală This course presents general notions of chemistry laws and chemical structure of matter, the presentation of chemical elements, their distribution and role in nature, chemical equilibria and applications in electrolytic solutions, the notions of: pH, acidity, basicity, notions of electrochemistry, oxidation-reduction processes, chemical processes occurring in nature, preparation of standard and non-standard solutions, water hardness and methods of determination, notions of corrosion (chemical, electrochemical and biochemical) and its prevention, different applications in ecosystems and the way in which the various chemicals interact with the flora and fauna, and also about environmental friendly chemicals and technologies and low-impact chemical technologies.	6
			I	1	General Physical Geography / Geografie fizică generală This course aims to acquaint students with the specificity of Physical Geography in relation to the other fields of human knowledge, by appropriating and correctly using the notions of physical geography in the context of their historical development, understanding the terrestrial environment as part of the Solar System, understanding the architectural structure and the functioning mechanisms of terrestrial geosystems in their interrelation with the socio-human systems and the understanding of the	5

					dynamic and evolutionary circuits between the various components of the terrestrial environment.	
			I	1	Vegetal Biology / Biologie vegetală This course presents notions regarding: 1) Vegetal cytology: plant cell structure, mitotic and meiotic division; Vegetal histology: types of tissues and their characteristics; 2) Organography: root: morphology, anatomy, types, functions, strain: morphology, morphological types of strains; the primary strain structure; leaf: the disposition and succession of the leaves on the stem axis; leaf morphology; morphological types; 3) Plant reproduction: asexual multiplication, alternations of generations to: algae, fungi, muscules, pteridophytes, gymnosperm and angiosperms; flower in angiosperms, flower anatomy, fruit: morphology and fruit classification; seed: morphology, structure, dissemination and distribution of seeds.	5
			I	1	Mathematics / Matematică This discipline presents elements of mathematical analysis and theory of differential equations: limits, continuity and derivability for functions of a real variable, study of function variations, graphical representations, series of real numbers, powers series, developments in series, real functions of several variables, limits and continuity, differentiability, extremes, integrability, the Riemann integrals, integration methods, Euler integrals, first order differential equations, and linear higher order differential equations with constant coefficients.	5
			I	1, 2	Foreign Languages / Limbi străine This discipline aims at deepening students' knowledge of foreign languages by applying them to the specifics of environmental studies.	2
			I	1, 2	Physical Education / Educație fizică This discipline aims at keeping students fit and healthy while learning general and specific notions of Environmental Science.	1
			I	1	Anatomy and Hygiene (facultative) / Anatomie și igienă (facultativă) The course presents basic notions of Anatomy, animal tissues, bone system, muscular system, nervous system, sensory organs, skin system, endocrine glands, systems: digestive, respiratory, circulatory, urinary, and genital, and about human hygiene: physical development and neuropsychics, hygiene	4

					rules for the human activity and rest regime, communicable diseases in communities	
			I	2	The Basics of Environmental Science / Bazele Științei mediului This course aims at familiarizing students with the complexity of the environment as structure, interactions and problems, along with the introduction into the study specific of each environmental component: soil and relief, air, water, biosphere and anthroposphere, including the typical environmental legislation and assessment environment.	5
			I	2	Environmental Chemistry (organic) / Chimia mediului (organică) This course aims at presenting the structure, functional classification, spreading in nature, physical properties and reactivity of organic compounds by: knowledge and appropriate use of specific notions of Chemistry of the environment, knowledge of the main types of organic pollutants resulting from the main industrial processes and their influence on organisms and the environment, knowledge of methods of reduction of noxes of organic nature and formation in students of the capacity to solve concrete problems of environmental protection they will face in productive activity and/or monitoring of environmental factors.	6
			I	2	Physics of the Environment (Fluids, Molecular Physics and Thermodynamics) / Fizica mediului (Fluide, Fizică moleculară și Termodinamică) The course presents fundamental notions concerning the fluids, their phenomena and laws, about molecular Physics (theory of atoms and molecules and their physical states and properties) and Thermodynamics (heat exchanges, temperature, pressure, volume and mass changes and their corresponding laws), all these applied to the study of the Environment.	6
			I	2	Environmental chemistry (inorganic, analytical) / Chimia mediului (anorganică, analitică) This course presents detailed notions on the classification of chemicals, on classes of inorganic chemical compounds: oxides, acids; bases, salts; on aggregation states: gaseous state and its laws; the liquid state; solutions: properties and concentration, and about the solid state and its properties. It also deals with chemical methods of pollutant analysis: qualitative and	6

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					quantitative chemical analysis, analytical reactions, analytical reagents, Gravimetry, Volumetry, quantitative chemical analysis, acid-base Volumetry, REDOX volumetry and Volumetry based on precipitation reactions.	
			I	2	Informatics / Informatică The course presents basic notions concerning computer use (Office, internet, drawing facilities) and computer programming in C as related and used in Environmental Science studies.	4
			II	3	Atmosphere and air quality / Atmosferă și calitatea aerului The course deals with the composition and structure of the terrestrial atmosphere, its shape, atmospheric Thermodynamics, Physics of the aerosols and atmospheric pollution and atmospheric quality.	5
			II	3	Integrated Environmental Monitoring / Monitoring integrat de Mediu The course presents the definition of environmental monitoring system, its purpose, activities, elements, attributes, indicators and quality, about monitoring domains, about scheduling a monitoring program, on environmental monitoring strategies and types of monitoring programs, about advanced analytical techniques used in environmental monitoring and also about environmental monitoring in Romania - SMIR integrated system and monitoring system in the Danube Delta Biosphere Reserve.	5
			II	3	Pollution and protection of the environment / Poluarea și protecția mediului The course presents introductory notices on environmental pollution, monitoring and quantification of environmental status, water (characteristics, sensitivity of aquatic ecosystems, transition ecosystems, pollution, limitation of impacts on aquatic ecosystems, wastewater), about the atmosphere (characteristics, interactions, pollution limitation of atmospheric pollution), soil (characteristics and sensitivity of soil ecosystems), cross-border pollution, and environmental projects financing.	5
			II	3, 4	Physical Education / Educație fizică This discipline aims at keeping students fit and healthy while learning general and specific notions of Environmental Science.	1

			II	3	Physics of the Environment (Waves, Electromagnetism, Optics) / Fizica mediului (Unde, Electromagnetism, Optică) The course presents fundamental notions concerning waves: definition, classifications, waves phenomena and laws, electrical and magnetic fields, their reciprocal interaction and inter-generation and interaction with matter, waves and photonic Optics, all these applied to the study of the Environment.	5
			II	3	Water resources management / Gestiunea resurselor de apă The course presents notions regarding: the water structure and its characteristics, the water resources of the Earth, Romania's water resources, the management of the atmospheric, surface, groundwater, ocean and maritime waters, strategies for the sustainable exploitation of water resources, water supply of localities and its capture, natural water treatment operations for potable water supply, water distribution system, water management in Romania.	4
			II	3	Ecological processes modeling / Cartography, Remote sensing, GIS (optional) / Modelarea proceselor ecologice / Cartografie, teledetectie, GIS (optional) Ecological processes modeling: The course presents notions regarding: structure and functions of ecosystems; primary and secondary production: concepts, measurement methods, analytical models; the flow of energy and the circulation of matter through ecosystems; self-control and stability of ecosystems, specialization and extinction: notions, statistical models; biological diversity and biodiversity levels, with local, zonal modeling, etc. Cartography, Remote sensing, GIS: This course deals with the understanding of the processes through which remotely sensed data are transformed into meaningful information. Remote sensing, GIS and cartography are presented as interacting mapping fields in the sense that they exhibit mutual dependencies as far as sound information extraction is concerned, and complement each other into picking up useful information about the environment at different spatial scales/resolution.	5
			II	3	Modeling physical phenomena with applications in environmental	4

				science (facultative) / Modelarea fenomenelor fizice cu aplicații în Știința Mediului (facultativ) This course explains the principles of using and building physical-mathematical models to simulate and to explain the behavior of the environmental systems and its components.	
		II	3	Elements of entrepreneurial education in environmental management (facultative) / Elemente de educație antreprenorială în managementul mediului (facultativ) The course presents the introduction of the environmental elements into the study of the entrepreneurial learning process and the other way around: as the economic principles of entrepreneurship can be applied to the environmental management.	2
		II	4	General Biochemistry / Biochimie generală The aim of this course is to familiarize students with the essential aspects of metabolic processes: chemical transformations from living organisms, the main types of biomolecules and biochemical reactions and enzymatic biocatalysts.	5
		II	4	Soil Science / Știința solului This course follows the assimilation of the knowledge concerning the nature and composition of the soil, soil types, soil biological activity, and soil's interaction with the other environmental components, soil pollution and soil remediation.	5
		II	4	Chemical pollution and analysis of the environmental samples / Poluare chimică și analiza probelor de mediu The course presents notions regarding: chemical pollution - general notions, chemical pollution of the atmosphere, water and soil, chemical analysis of the environmental samples: the analytical process; sensitivity, precision and selectivity; classification of analytical methods, sampling, errors in analysis of environmental samples, instrumental methods for environmental samples analysis, electrochemical methods of analysis: conductometric analysis and potentiometric analysis and optical methods of analysis of chemical compounds.	5
		II	4	Physical Chemistry / Chimie fizică	4

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					This course presents fundamental and Environmental studies-applied notions regarding: Chemical Thermodynamics, Electrochemistry and Chemical Kinetics.	
			II	4	Specialty practice / Practică de specialitate This part of the programme concerns performing practical, specific environmental science studies and activities at various economic operators and institutions and /or within the didactic and research laboratories within the university.	2
			II	4	Environmental law, legislation, policies and strategies/The Economy of the Environment (optional) / Legislația mediul înconjurător, politici și strategii de mediu / Economia mediului (opțional) Environmental law, legislation, policies and strategies: This course deals with: environmental protection and environmental protection tasks, environmental policy and economic development, general aspects regarding the right to a healthy environment, including environmental protection instruments, environmental law in the Romanian law system, environmental law and legal protection environment: the protection of natural resources, water and aquatic ecosystems, the atmosphere, soil and fauna, respectively. The Economy of the Environment: This course deals with: the subject of Economy, the interaction between the Economy and the natural environment, the theoretical and practical fundamentals of the environment economy, the eco-eco growth and development, the ecological crisis - traits, causes, remedies, energy - environment, economy, perspectives, biodiversity - economic development, extinction, conservation and assessment, natural and anthropogenic risks - their economic impact, the environment and corporate responsibility - realities and perspectives in the 21st century.	3
			II	4	Ecotoxicology/Chemistry of natural products (optional) / Ecotoxicologie / Chimia produselor naturale (opțional) Ecotoxicology: This course deals with: the definition of ecotoxicology, the main categories of toxic substances, the main sources of toxic substances,	5

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				<p>the effects of toxic substances contamination, the ways of penetration of polluting chemical substances, the mechanisms of defense of organisms against chemical pollution, dispersion and concentration of pollutants in biomass, trophic chain modifying factors, epidemiological studies, biomarkers, action of physical, chemical and biological factors, natural toxicity, and ecotoxicology of aquatic and terrestrial environments.</p> <p>Chemistry of natural products: This course deals with: primary and secondary metabolism, biosynthesis of natural compounds, odorants and flavorings, alkaloids, oligosaccharides and polysaccharides / hydrocolloids, natural dyes, natural antibiotics.</p>	
		II	4	<p>Modeling of chemical phenomena with applications in environmental science (facultative) / Modelarea fenomenelor chimice cu aplicații în Știința Mediului (facultativ)</p> <p>This course presents the principles of using and building chemical-mathematical models to simulate and to explain the behavior of the environmental systems and of their components and phenomena.</p>	4
		III	5	<p>The radioactivity of the Environment / Radioactivitatea mediului</p> <p>The course presents the general characteristics of atomic nuclei and nuclear forces, it talks about the natural radioactivity, about sources of radiation (natural and artificial), it deals with nuclear reactions, with the interaction of nuclear radiation with the substance, and with the detection and measurement of nuclear radiation; it also deals with applications of radiation and radioactive isotopes in the field of environment, and about the principles and basic concepts of dosimetry.</p>	5

			III	5	<p>Methodology of drafting impact studies/Metodologia întocmirii studiilor de impact</p> <p>The course presents the general aspects of the environmental impact of anthropogenic activities and environmental impact studies, as well as the application of the legislation in the field regarding their realization. It also presents theoretical aspects of the environmental impact assessment, the stages and components of the environmental impact assessment and the main indicators used in the impact studies. The course also deals with the structure of an environmental impact assessment report and explains the purpose and necessity of the environmental impact assessment action, with the presentation of the environmental consequences. The course also presents methods and techniques for carrying out environmental impact studies, integrating models and processing data acquired in the impact studies used in the environmental impact assessment stages. In addition, the course explains how to prepare the environmental balance sheets and environmental risk assessment methodology, as well as ways to act in case of environmental risks.</p>	5
			III	5	<p>Environmental pollution by physical agents / Poluarea mediului prin agenți fizici</p> <p>The course contains the following topics: sounds - basic concepts, sound intensity, oscillations and elastic waves, sound frequency analysis, microphones; the selection and use of microphones; the interaction and influence of sound pollution on the environment and the body; sources and electromagnetic compatibility, and electromagnetic field influence on the human body; the thermal effect of electromagnetic radiation; the exposure to mobile phone radiation; technical measures to limit the effects of electromagnetic fields.</p>	5

			III	5	<p>General Ecology / Ecologie generală The course talks about Ecology - general notions, about the organization of a system, system categories and system stability, about the biological system, its general characteristics and the biology system hierarchy, about natural ecological systems, the structure of ecosystems and relationships between ecosystem components and between organisms, as well as between organisms and their environment, about the ecosystem and its components, about anthropic ecological systems. The course also presents fundamental notions of the biotope, its physical and chemical factors, the correlated action of abiotic factors, biocenosis, its structural indices and the relationships between the populations of biocenosis, the productivity of ecosystems, their energy, material and energy flows and energy exchanges, and materials. The course also presents the succession and evolution of ecosystems, the description of the functioning of natural ecosystems, their degradation and current trends in the study of ecological systems.</p>	4
			III	5	<p>Spectral methods of analysis / Metode spectrale de analiză The course comprises the following chapters and associated contents: 1. General notions of Spectroscopy: the atomic-molecular structure of the substance, energy levels; energy spectra, spectral transitions, electromagnetic radiation, spectral expression modes, classification of energy levels and their transitions, spectral fields of analysis, classification of spectra according to different criteria, transition probabilities, Einstein coefficients, relative intensity in spectra, coefficients of absorption, Beer's law, absorption spectra, essential parts of a spectral apparatus, electromagnetic radiation receptors; 2. Atomic spectroscopy: atomic models, spectral analysis by atomic emission and spectral analysis by atomic absorption and their application to the study of the environment; 3. X-ray Spectroscopy: X-ray emission Spectroscopy, X-XRF fluorescence Spectroscopy, Electron Microscopy - EDAX spectra, basic crystalline structure and X-ray diffraction patterns, X-ray Spectrometry / X-ray Diffractometry: principles, equipment, applications for the study of the environment; 4. Molecular Spectroscopy in UV-VIS-IR: rotation spectra, vibration and vibration-rotation spectra, electronic spectra,</p>	5

				Spectrophotometry and applications of Absorption Spectroscopy in the study of the environment.	
		III	5	<p>Meteorology and Climatology/Global changes (optional) / Meteorologie și Climatologie / Modificări globale</p> <p>Meteorology and Climatology: The course talks about the temperature gradient and temperature variability in the atmosphere, about baric formations, about the statics and thermodynamics of the atmosphere, about humidity, fog and clouds, about precipitation, atmospheric dynamics, wind and its causes and characterization, about the radiation budget, the atmospheric circulation, weather fronts, and climate types.</p> <p>Global changes: The course presents the main issues concerning: global climate change, natural and human factors of climate change, greenhouse effect, effects of climate change on natural and human systems, global, national and local responses to climate change, management policies and economic tools, adaptation strategies and policies.</p>	6
		III	5	<p>Advanced interdisciplinary study of physical-chemical phenomena with applications in environmental science (facultative)</p> <p>The course presents the methodology of treating interdisciplinary the topics and analysis of the environment, combining the knowledge in Physics, Chemistry, and Biology, from Informatics and Statistics, with specific examples from practice and the scientific literature.</p>	4
		III	6	<p>Alternative energies</p> <p>The course presents introductory concepts of energy and basic principles for energy production, it talks about the conversion of solar energy into electric and thermal energy, about the conversion of nuclear, wind and hydroelectric energy into electricity, about the exploitation of planetary ocean resources, the production of energy from biomass, about geothermal energy, about the production energy by thermal conversion of heat in electricity, it also deals with the photovoltaic power generation systems, with power systems with fuel cells, and with wind turbine power systems.</p>	6
		III	6	<p>Elaboration of the bachelor thesis</p> <p>This is an individual activity of each student through which he/she</p>	2

					demonstrates the ability to apply the knowledge gained along the 3 years of B. Sc. studies to a specific subject that he/she deepens it and applies it to a specific region, environmental component or environmental aspect, both through theoretical and practical activities which he/she presents in a written form obeying specific rules of content, organization and format.	
			III	6	<p>The environmental risk in health/Nanotechnologies in environmental studies (optional)</p> <p>The environmental risk in health: The course presents the following topics: analyzing changing multi-hazard risk for decision making, the environmental impact assessment, the water system and society; environmental, health, and social risks: cancer risks from workplace and environmental chemicals, seismic hazards and risks from earthquakes, quantifying the health risks from air pollution, occurrence of antimicrobial resistance genes in aquatic systems; the management of emergent risks: permafrost engineering and periglacial risks and about how safe are nanomaterials?</p> <p>Nanotechnologies in environmental studies: The course includes the following chapters and related contents: 1. Introductory notions: the significance of a nanometer, the definition of nanomaterials and nanotechnologies, technological currents on nanomaterials and nanotechnologies, the motivation for studying and obtaining nanomaterials, nanomaterials classification, examples of nanomaterials, approaches to nanomaterials, properties and applicability of nanomaterials; 2. Fundamentals of crystalline structure: macrostructure, microstructure, crystalline and amorphous materials, internal symmetry of crystals, notations of nodes, directions and crystalline planes, crystallographic systems, notions of allotropy, polymorphism and isomorphism, crystalline structure of semiconductors, defects in crystals, general presentation of crystalline study methods. 2. Radiation emission spectroscopy X; 3. X-Ray Diffractometry; 4. X-ray Fluorescence Spectroscopy-XRF; 5. Electron Microscopy and the EDAX technique; 6. Atomic force microscopy - AFM; 7. Nanomaterial manufacturing processes: devices and methods, and</p>	5

				examples of devices and nanostructured materials with associated properties and applications.	
		III	6	<p>Global changes / Elements of Geophysics (optional)</p> <p>Global changes: The course presents the main issues concerning: global climate change, natural and human factors of climate change, greenhouse effect, effects of climate change on natural and human systems, global, national and local responses to climate change, management policies and economic tools, adaptation strategies and policies.</p> <p>Elements of Geophysics: The course is divided into the following chapters and corresponding content: 1. The Universe: age, chemical composition, structure, solar system; 2. The Earth: internal structure, physical properties; 3. Morpho-tectonic division of the terrestrial crust – stable and unstable areas; 4. Global Tectonics: the continental drift, the expansion of the ocean beds, the plate tectonics; 5. Seismic phenomena: the elements of an earthquake, seismic waves, classification of earthquakes, their effects, direct causes of earthquakes and their distribution on Earth.</p>	5
		III	6	<p>Assessing the impact of human activities on the environment/ Ecological Statistics(optional) / Evaluarea impactului activităților antropice asupra mediului/ Statistică ecologică (optional)</p> <p>Assessing the impact of human activities on the environment: The course deals with the natural and human-induced changes, with examples of human transformation of the earth, it talks about sustainable development, about natural resources, natural capital, and biomes. It also talks about the terrestrial and aquatic ecosystems, about biodiversity, about the ecological footprint, the population growth and consumption, about the impacts on oceans, fisheries and coastal ecosystems, on the impacts on freshwater and on forest ecosystems, and also about the impacts of urbanization, energy and mining and of Agriculture on the environment.</p> <p>Ecological Statistics: The course presents and explains the statistical modeling applied to environmental studies, also dealing in details about spatial variation and linear modeling of ecological data, about statistical</p>	5

				approaches to the problem of phylogenetically correlated data, mixed models for dispersed data and about mixed models.	
		III	6	<p>Global biogeophysical cycles / Physics of the Earth and of the atmosphere (optional)</p> <p>Global biogeophysical cycles: The course presents an introduction to global changes, it deals with the major elements in living matter, with biogeophysical cycles - general notions, it presents the individual cycles of: hydrogen, oxygen, carbon, phosphorus, nitrogen and sulfur, it talks about macronutrient transformations in the human body and about the changes in the structure of the environment.</p> <p>Physics of the Earth and of the atmosphere: The course presents and explains the main physical phenomena happening in the terrestrial environment, with all its components, through the practical application of the laws of Physics to the natural phenomena and nature's characteristics and behavior.</p>	5
		III	6	<p>Ethics and academic integrity/ The Economy of the Environment (optional)</p> <p>Ethics and academic integrity: The course presents the principles of ethics in teaching and research at academic level, promoting the culture of honesty in all aspects of higher education at each of its levels: B. Sc., M. Sc., and Ph. D. studies and teaching and research careers.</p> <p>The Economy of the Environment: The course presents theoretical and empirical studies of the economic effects of national or local environmental policies around the world, including issues such as the costs and benefits of anthropogenic activities, legislation and politics on the environment, and also about alternative environmental policies dealing with pollution, environmental quality, toxic substances, wastes, and global warming and climate changes.</p>	2
		III	6	<p>Population Ecology (facultative)/Ecologia populațiilor</p> <p>The course deals with the presentation and explanation of the dynamics of species populations and how these populations interact with</p>	2

					the environment, and of how population sizes of species change over time and space, along with the explanation of the processes and revealing their consequences.	
			III	6	<p>Microbiology (facultative) The course deals with the study of all microscopic living organisms known as microbes, namely: bacteria, archaea, viruses, fungi, prions, protozoa and algae, and of their key roles in nutrient cycling, biodegradation/biodeterioration, climate change, food spoilage, the cause and control of disease, and biotechnology. Among their uses, the course presents those related to the manufacture of biofuels, cleaning up pollution, etc.</p>	2