

Bachelor Degree in Environmental Sciences

Duration: 4 years

Language: Spanish

Modality: personal attendance

Dissertation – ECTS: 12

Internship – ECTS: 5

Contact: infoeps@unizar.es

Goals / Objectives:

The **Degree in Environmental Sciences** aims to train people addresses society's current need to develop methods and tools to study and protect our environment.

The Technological College makes use of its surroundings as an excellent natural laboratory to train graduates in Environmental Sciences. The connection between an urban area and the various surrounding sites of scientific interest in the province of Huesca gets the students closer to the kind of case study that they are going to deal with and facilitates acquisition of practical skills.

The vicinity of these natural areas allows the student to observe very different scenarios, from the more arid regions of the middle Ebro Valley, to the high precipitation rates and extreme temperature regime of the Pyrenees. In addition, they can look at areas with a wide range of environmental problems created by industry and industrial-scale agriculture, ranching and urban activity.

The main objective of the Degree in Environmental Sciences is training versatile professionals with a deep knowledge of natural resources which may be affected by human activity. This enables them to face a broad range of duties, such as management of environmental quality within a company or carrying out environmental studies on aspects related to healthy ecosystems in the agricultural, urban and industrial areas.

Subjects of plan:

The Degree in Environmental Sciences corresponds to level 2 of the Spanish Qualifications Framework for Higher Education (MECES) and to level 6 of the European Qualifications Framework (EQF). The Study Plan consists of 240 European credits (ECTS) distributed into 4 academic years (60 credits per academic year), with two semesters per academic year (8 semesters).

Of the total of 240 credits that the student must take, 66 are core (Cr), 132 compulsory (Cm), 28 optional (Op), which include 5 credits of external internships and 12 correspond to the Undergraduate Dissertation.

The 66 credits of core are placed in the first and second years of the Degree. In the second and third year most of the credits are compulsory and optional courses are placed in the last three semesters (there are sixteen electives and the students have to select five of them). Of the 60 ECTS credits corresponding to this last year, 24 are compulsory, 12 are dedicated to the Undergraduate Dissertation, 2 to verify that level B-1 of a foreign language is met (English, French, German or Italian), and the remaining 22 they correspond to optional courses.

In addition, there is the possibility of recognition of credits for participation in university cultural, sports, student representation, solidarity and cooperation activities up to a maximum of 6 ECTS credits, as contemplated in the Regulation on recognition and transfer of credits in the University of Zaragoza, approved by the Government Council of the UZ on July 9, 2009.

The syllabus is structured in semester subjects and is made up of four modules:

- Interpretation of the environment as a system
- Environmental assessment
- Environmental management and planning
- Instrumental knowledge

Year	Semester	Subject	Type	ECTS	Year	Semester	Subject	Type	ECTS
1	1	25200 Chemical foundations of the environment	Cr	6	1	2	25205 Environmental administration and law	Cr	6

1	1	25201 Biology	Cr	6		1	2	25206 Physical foundations of the environment	Cr	6
1	1	25202 Introductory geology for environmental science	Cr	6		1	2	25208 Soil science	Cr	6
1	1	25203 Basic mathematics for environmental studies	Cr	6		1	2	25251 Botany	Cr	6
1	1	25250 Environmental science and sustainability	Cm	6		1	2	25252 Zoology	Cr	6
2	1	25211 Ecology I	Cm	6		2	2	25215 Ecology II	Cm	6
2	1	25253 Society and land	Cm	3		2	2	25255 Key analysis in the environment	Cm	6
2	1	25254 Cartography and geographical information systems	Cm	9		2	2	25218 Soil degradation and pollution	Cm	6
2	1	25214 Meteorology and climatology	Cm	6		2	2	25219 Atmospheric pollution	Cm	6
2	1	25209 Statistics	Cr	6		2	2	25204 Applied economics	Cr	6
3	1	25220 Natural risks	Cm	6		3	2	25225 Management and conservation of flora and fauna	Cm	6
3	1	25223 Agrosilvopastoral systems	Cm	6		3	2	25226 Management, treatment and recovery of waste	Cm	6
3	1	25224 Water pollution	Cm	6		3	2	25228 Regional planning and urbanism	Cm	6
3	1	25210 Foundations of environmental engineering	Cm	6		3	2	25222 Clean technologies. Renewable energies	Cm	6
3	1	25256 Toxicology and public health	Cm	6		3	2	Optional subject 1	Op	
4	1	25230 Environmental impact assessment	Cm	6		4	2	25232 Undergraduate dissertation	Ds	12
4	1	25257 Environmental management and audit	Cm	6		4	2	25259 Environment projects	Cm	12
4	1	25258 Protected areas	Cm	6		4	2	Modern language B1	Cm	2
4	1	Optional subject 2	Op			4	2	Optional subject 4	Op	
4	1	Optional subject 3	Op			4	2	Optional subject 5	Op	

Cr: core; Cm: compulsory; Op: optional; Ds: dissertation.

Optional subjects	
25221 Environmental education (6 ECTS)	
25236 Radioactive contamination, acoustic and vibration pollution (6 ECTS)	
25238 Analytical technology for the detection of contaminants (6 ECTS)	
25241 Biotechnology and resource conservation (6 ECTS)	
25245 Soil and land evaluation (6 ECTS)	
25248 Classified activities (6 ECTS)	
25260 Waste application on soil and fertility (5 ECTS)	
25261 Accreditation and quality standards in environmental laboratories (5 ECTS)	
25262 Environmental hydrology (6 ECTS)	
25263 Environmental and sustainable chemistry (6 ECTS)	
25264 Internships (5 ECTS)	
25265 Environmental remote sensing (6 ECTS)	
25266 Ecosystem restoration (6 ECTS)	
25267 Bio-geography and geobotany (5 ECTS)	

25268 Aquatic ecosystems (6 ECTS)
 25269 English for environmental sciences (6 ECTS)

Study programs:

BRIEF DESCRIPTORS OF COURSES

Year	Semester	Subject	Type	ECTS	Aims
1	1	25200 Chemical foundations of the environment	Cr	6	Provide a basic scientific foundation to the chemical processes that take place in the environment. The learning outcomes should lead to an understanding and analysis of the environmental chemistry. In particular, the students should name or write chemical formulas for inorganic and organic compounds. They should recognize the main reaction types, and analyze and relate the states of matter. In the laboratory, the main aims are to apply the safety rules and to carry out the basic experimental procedures for general reaction chemistry. The student should solve, discuss and analyze numerical exercises related with chemical concepts relevant to the environment.
1	1	25201 Biology	Cr	6	The aims of this subject is to understand and assimilate the most important concepts, theories and models of Biology, fundamentally at the molecular, cellular, and structural organization levels of the organisms and on the genetic, physiological, reproductive and evolutionary mechanisms of the species. The student would acquire a global vision of the biotic environment and a basic biological formation that would allow her/him to apply this knowledge to the theoretical-practical cases of environmental sciences.
1	1	25202 Introductory geology for environmental science	Cr	6	The main goal is to provide the fundamental scientific basis so that the student can understand internal and external geological processes and their interaction with the environment. This subject represents a basic foundation for future subjects such as Edafology, Natural Risks and Environmental Remote Sensing.
1	1	25203 Basic mathematics for environmental studies	Cr	6	The subject and its expected results respond to the following approaches and objectives: It is intended, with the teaching of this subject, to provide mathematical tools that serve as a basis to construct and / or study certain mathematical models related to environmental phenomena.
1	1	25250 Environmental science and sustainability	Cm	6	<ol style="list-style-type: none"> 1. To show the multidisciplinary nature of environmental sciences 2. To publicize the main environmental problems and their origin 3. To introduce the existing sustainability strategies, relating them to the Sustainable Development Goals (SDGs - 2030 Agenda on Sustainable Development (https://www.un.org/sustainabledevelopment/es/)) 4. To train the critical thinking.
1	2	25205 Environmental administration and law	Cr	6	The main objective of this subject is to offer a general education in Environmental Law, which includes the different legal aspects of environmental protection. We intend to make known and identify the different legal instruments of public intervention in the environmental sector, and analyze European and Spanish community regulations on the subject.
1	2	25206 Physical foundations of the	Cr	6	With the teaching of this subject, it is intended to provide scientific explanations for physical phenomena directly related to the environment, especially those corresponding to fluid mechanics, thermodynamics, wave motion and electromagnetism.

		environment			
1	2	25208 Soil science	Cr	6	This course provides the scientific knowledge necessary to understand how soils are formed and what determines their essential attributes and main functions inside ecosystems, also considering their use and management. The soils and their current attributes must be considered as non-renewable resources. Nevertheless, several activities (agriculture, livestock, building, forestry, etc.) compete to take advantage of their characteristics, changing their properties sometimes in a non-reversible way. The ability of the soil scientist to understand the soil formation processes and their main characteristics is therefore essential for a proper management of the soil and of the whole ecosystem.
1	2	25251 Botany	Cr	6	To provide knowledge and train the skills and attitudes necessary so that the student acquires the basic fundamentals of botany that the professionals of the environment, showing the fields of application, academics and professionals in this discipline.
1	2	25252 Zoology	Cr	6	The subject provides the basic contents of the Zoology and the necessary vision for its use in the different facets of the professional development of the environmental scientist: Consultancy, Rangers, Protection and equivalents, Cooperation, Environmental Impact Assessment, Communication and Environmental Education, Control of Pest, Population Estimates, Protected Areas, Wildlife Conservation, Landscape Ecology, Fluvial Ecology, among others.
2	1	25211 Ecology I	Cm	6	
2	1	25253 Society and land	Cm	3	This subject deals with social and territorial contents in relation to the environment, because students must be aware that human activities can generate environmental problems. This subject can help to understand that socioeconomic and territorial organization influence in environmental processes and problems, based on the use that human groups make of resources and territory. With this subject, students will acquire the competence to detect and diagnose environmental problems generated from the different forms of social organization and the use of the territory.
2	1	25254 Cartography and geographical information systems	Cm	9	Aims to answer a series of questions such as: 1. What are the basic features and elements that characterize a good map? 2. What types of maps are there? 3. How are topographic maps made and what kind of information do they provide us? 4. How can I locate and orient myself on a map and in the field? 5. What environmental information can I obtain from aerial photographs and how can I interpret it? 6. How is a thematic or applied map designed? 7. What is a Geographic Information System (GIS) and what applications does it have for the study and analysis of the environment?
2	1	25214 Meteorology and climatology	Cm	6	The aim of teaching this subject is to provide scientific explanations to the main meteorological and climatological phenomena. This objective is approached by using strict physical- mathematical reasoning in some topics, so as with a more descriptive methodology in other ones, especially in the section of climatology.
2	1	25209 Statistics	Cr	6	The main aim of this course is that at the end of the course the student be able: To realize the situations and problems where the potential use of Statistics can be helpful or is required, in particular in the area of the Environmental Sciences. To know and to handle basic probability and statistical concepts and language. To know and to use basic probability and statistical tools to solve problems. To be proficient in the use of some basic statistical techniques. In particular,

					to: -Analyse environmental data. -Read and present the statistical results of the analysis.
2	2	25215 Ecology II	Cm	6	
2	2	25255 Key analysis in the environment	Cm	6	
2	2	25218 Soil degradation and pollution	Cm	6	The main objectives of this course are to learn how to find the most appropriate uses to different soils, to assess their quality and their degradation risks, and to propose and develop feasible and suitable mitigation or restoration techniques.
2	2	25219 Atmospheric pollution	Cm	6	Atmospheric pollution aims to provide students with an overview of the complex problem of air pollution. This course is about get knowledge, training and awareness in <ul style="list-style-type: none"> • the main atmospheric pollutants, their sources and their evolution in the atmosphere. • the different phenomena of atmospheric pollution. • air quality assessment. • calculation and prediction of the impact of some sources (dispersion models). • available techniques for reducing emissions to the atmosphere. • regulations on issues related to air pollution: air quality, emissions, noise and light pollution, etc. • negative impact of air pollutants, the need to protect air quality and the implementation of good environmental practices at the individual and collective level.
2	2	25204 Applied economics	Cr	6	The aim of the subject Applied Economics is to provide the student with a series of analytical and graphic economic concepts and tools that make him able to understand the behavior of individual and global economic agents in their relationship with natural resources and the environment. In this subject, the environmental scientist is provided with environmental economics concepts necessary to acquire the conceptual bases that allow an analysis of the behavior of the economic system from different approaches and contexts. It should provide the student with skills to interpret the link between environment and economic reality according to theoretical and conceptual frameworks of economic analysis. Specific: <ul style="list-style-type: none"> • Understand the basic concepts and terminology commonly used in the relationship between economy and natural resources • Develop the capacity for analysis and reasoning to interpret and understand economic phenomena • Learn to work with statistical sources and available economic information, understand their content and analyze and correctly handle the data they contain. <p>These approaches and objectives are aligned, at least, with one of the Sustainable Development Goals, SDGs of the 2030 Agenda (https://www.un.org/sustainabledevelopment/en/) and one of its goals, contributing to its achievement. Specifically:</p> <p>OBJECTIVE 4: QUALITY EDUCATION</p> <p>Goal 4.7. By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles</p>
3	1	25220 Natural risks	Cm	6	This course is intended to enable students to acquire the basic knowledge necessary to analyse and evaluate those processes of change and disturbance of the natural environment that may cause a situation of risk to the population, as well as the management of different methodologies and

					tools for their prediction, prevention and mitigation.
3	1	25223 Agrosilvopastoral systems	Cm	6	
3	1	25224 Water pollution	Cm	6	<p>The subject and its expected results respond to the following approaches and objectives:</p> <p>This subject, related to the field of Environmental Engineering, has as main objective to provide the student with the scientific and technical knowledge that allows him to carry out the identification and control of water pollution, providing quality training in control, evaluation, management and environmental planning, taking as reference the protection of health and the environment.</p> <p>Objectives of the subject are to train the student in water quality and pollution, in techniques or measures to minimize water pollution and in water treatment technologies, which in general allows the application of control measures and correction of environmental pollution.</p> <p>These approaches and objectives are aligned with some of the Sustainable Development Goals (6 and 12) of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific goals (6.3, 6.a and 12.4), contributing to their achievement.</p>
3	1	25210 Foundations of environmental engineering	Cm	6	
3	1	25256 Toxicology and public health	Cm	6	It is intended that students learn to understand and analyze the possible causes and environmental factors affecting human health and its effects, and the means for evaluation and forms of action within the environmental sciences that are aimed at improving individual and community health.
3	2	25225 Management and conservation of flora and fauna	Cm	6	<p>The subject and the results presented respond to the following approaches and objectives:</p> <ul style="list-style-type: none"> - Offer a vision of the process of extinction of populations and species in the current era, and examine the main anthropic threats for living beings. - Provide an overview of deterministic and stochastic processes - demographic, genetic or risk natural resources that affect the conservation of species and small populations. - Provide knowledge on the in situ and ex situ conservation programs of species, as well as on the legislative measures adopted for the protection of living beings. - Train students in the use of management tools for threatened species. - Offer a historical perspective on the conservation of Spanish flora and fauna and draw a panoramic weighted of the species threatened by taxonomic groups. - Encourage the habit of observation and analysis of biological diversity. - Awareness of the need to conserve Iberian fauna and flora. - Encourage research capacity in conservation biology. - Know the fields of academic and professional application of Management and conservation of flora and fauna.
3	2	25226 Management, treatment and recovery of waste	Cm	6	<p>The subject and its expected results respond to the following approaches and objectives:</p> <p>With this subject, is expected that the student knows the main types of waste, its production and its impact on the environment, as well as the main management operations from the generation of the waste to its final destination. It is also intended that students can develop criteria to raise the most appropriate management scheme for a given type of waste, selecting among the different treatment and minimization techniques according to the existing conditions and knowing how to translate this knowledge into practice through the preparation of plans or simplified management programs for different waste.</p>

					These approaches and objectives are aligned with some of the Sustainable Development Goals (11 and 12) of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific goals (11.6 and 12.5), contributing to their achievement.
3	2	25228 Regional planning and urbanism	Cm	6	Since one of the professional outputs of this degree is to be able to design and manage projects, plans and environmental, urban, industrial or rural programs, with this subject the students will be trained to acquire and perform those competencies and skills. Students will know the basic concepts of spatial planning, and also how to identify and examine the great number and diversity of variables and elements that influence in this discipline. They must also select and use the fundamental techniques and tools to promote and manage the sustainable development of territories and cities from a multidisciplinary and integrated vision. For all this, they must face some practical cases of spatial planning.
3	2	25222 Clean technologies. Renewable energies	Cm	6	The specific aim of the course is to provide students with a general overview on energy generation systems as well as the main environmental issues related to the production, distribution and final use of energy. Special attention is paid to enable students to compare both the efficiency and environmental impact of different technologies for a given system.
4	1	25230 Environmental impact assessment	Cm	6	The methodology of Environmental Impact Assessment is one of the most important of Environmental Sciences. The contents of the subject teach the knowledge of the regulations and the available methods and techniques, so that the student acquires the ability to approach the realization of an impact evaluation. Besides, the subject will also study the non-technical circumstances that intervene in the practice of this discipline. These objectives are aligned with some of the Sustainable Development Goals, (https://www.un.org/sustainabledevelopment/): <ul style="list-style-type: none"> - Goal 4: Quality education (target 4.7) - Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation (target 9.4)
4	1	25257 Environmental management and audit	Cm	6	The subject and its expected results respond to the following approaches and objectives: In order to students acquire the ability to handle this methodology, the subject has to focus on the following aspects: <ol style="list-style-type: none"> 1. Environmental accreditation in the company 2. Environmental Management Systems (EMS) 3. Requirements for the implementation of an Environmental Management System 4. The role of Environmental Audits in the Company. 5. Planning and realization of Environmental Audits These approaches and objectives are aligned with some of the Sustainable Development Goals (9 and 12) of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific goals (9.4, 12.2 and 12.4), contributing to their achievement.
4	1	25258 Protected areas	Cm	6	The subject and its expected results respond to the following approaches and objectives: If the Degree in Environmental Sciences pursues the objective of quality training for students in the areas of environmental assessment, environmental management and planning and environmental communication, the Protected Areas course clearly responds to the training in the second of the aforementioned areas, that of environmental management and planning. The subject aims to ensure that students who take it are able to understand, analyze and deal with the complexity of the management of Protected Areas, familiarizing them with the most common methodologies, tools, terminology and work techniques. It is focused so that the graduate can develop his professional activity in this field as a worker of or for a Protected Area with particular emphasis on the ability to understand its operation and problems.

4	2	25259 Environment projects	Cm	12	
4	2	25232 Undergraduate dissertation	Ds	12	The Undergraduate Dissertation is compulsory for all the students of the degree in Environmental Sciences. The key aim of the undergraduate dissertation is to enable students to apply and develop a range of skills and competences acquired during the degree. The undergraduate dissertation requires a written report and there will be a public defense in accordance with the corresponding regulation.

Cr: core; Cm: compulsory; Ds: dissertation.

Optional subjects	ECTS	Aims
25221 Environmental education	6	<p>The subject and its expected results respond to the following approaches and objectives:</p> <p>Show an overview of the problems of environmental conservation and the approach that environmental education represents for the mitigation of this problem.</p> <p>Teach the variety of areas in which environmental education is applied: formal education, citizen initiatives, business world, legislation, administrative competences, as well as various examples of international experiences.</p> <p>Provide a solid base for students to be able to consider in its full extent the reality of environmental education in all areas of human life, from education, environmental projects, daily work in institutions or various initiatives of civil society.</p> <p>Promote awareness of environmental issues through real knowledge of our responsibilities and capabilities.</p> <p>Know the environment in which environmental education is inserted in society, as well as the different professional opportunities offered.</p>
25236 Radioactive contamination, acoustic and vibration pollution	6	
25238 Analytical technology for the detection of contaminants	6	
25241 Biotechnology and resource conservation	6	
25245 Soil and land evaluation	6	
25248 Classified activities	6	
25260 Waste application on soil and fertility	5	
25261 Accreditation and quality standards in environmental	5	

laboratories		
25262 Environmental hydrology	6	
25263 Environmental and sustainable chemistry	6	This course is designed to go deeper in understanding the properties and reactions of substances (especially anthropogenic chemicals) in the environment and to introduce students to the principles of sustainable chemistry. In addition, students are expected to become familiar with the experimental work of chemistry laboratory and to be able to independently and critically search for information related to the area of study and present it in an appropriate manner, both orally and writing.
25264 Internships	5	The external practices are optional (5 credits). Through these practices, it is intended to offer direct training appropriate to the needs of companies. The external internships are managed through Universa, the Orientation and Employment Service of the University of Zaragoza, operating through an agreement with the Aragonese Employment Institute of the Government of Aragon. Universa establishes collaborative relationships with numerous companies and institutions, in order to organise internships for students. The follow-up of the practices is done through the figure of the tutors: an academic tutor belonging to the faculty of the Degree and a professional tutor within the company or institution.
25265 Environmental remote sensing	6	This 6 ECTS course gives a solid theoretical and practical basis in environmental and planning remote sensing. It is focused on the analysis of satellite images and other remote sensors data using SNAP and ARCGIS softwares. It provides the students with the required knowledge to deal with and solve environmental problems in development planning, geohazards, pollution, wildfires, man-made disasters and other natural topics.
25266 Ecosystem restoration	6	
25267 Bio-geography and geobotany	5	
25268 Aquatic ecosystems	6	
25269 English for environmental sciences	6	Global and detailed understanding of spoken English (especially presentations and lectures) and efficient interaction on the course topics at the expected level. Fluent, clear presentation in class of an idea from their field of study, prepared in advance, using appropriate grammar and terminology. Global and detailed understanding of various types of expositive or argumentative texts written in general or scientific English about topics connected to their studies, from which the student is expected to extract or infer relevant information. Writing of messages and short essays in acceptable English about a topic of their interest, with textual and lexical coherence at an intermediate level, using appropriate style and conforming to academic or technical conventions.

URL of the detailed description:

<http://eps.unizar.es/en/degree-environmental-sciences>

For courses descriptions and further information, see:

<https://estudios.unizar.es/estudio/ver?id=100>

For a list of active courses, see:

<https://documenta.unizar.es/share/s/cW989eIQ9yzocVaSvF6BQ>

For a list of courses included in the English Friendly Program, see:

<https://eps.unizar.es/subjects-asignaturasef>

Teaching material for registered students is available on a Moodle platform:

<https://moodle2.unizar.es>

Technological College. Agri-food and Environment: <https://eps.unizar.es/>