MASTER IN ENVIRONMENTAL SCIENCE AND MANAGEMENT

Main Language of Instruction:
French ☑ English ○ Arabic ○

Campus Where The Program Is Offered: CST

OBJECTIVES

The Master in Environmental Science and Management is a high-quality multidisciplinary program that allows for the consideration of environmental issues in their entirety, integrating contribution from the natural and social sciences. Addressing environmental needs requires broad competencies, combining an understanding of the environmental phenomenon under study with its integration into society from a sustainable development perspective. This master's program aims to tackle environmental challenges and train environmental experts with the scientific skills necessary for analysis, prevention and treatment of pollution. They will be able to conduct studies on the environmental impacts of development projects, take into account environmental constraints on human activities, and propose strategies in compliance with current regulations. They will also be trained to address local governance issues through a consultation/decision-making process.

PROGRAM LEARNING OUTCOMES (COMPETENCIES)

- Analyzing an environmental problem in its scientific, technical and nontechnical dimensions
- Communicate environmental solution proposals to stakeholders
- Negotiate a consensual environmental solution among the different stakeholders
- Solve an environmental issue, taking into account its technological and nontechnological dimensions.

ADMISSION REQUIREMENTS

Students holding a bachelor's degree from the Saint Joseph University of Beirut (in chemistry, geography, physics, life and earth sciences - biochemistry), a Bachelor in Medical Laboratory Analysis, or an engineering degree.
Students holding a bachelor's degree or a first-year scientific master's degree from outside USJ, deemed equivalent by the USJ Equivalence Commission.

COURSES/CREDITS GRANTED BY EQUIVALENCE

Any course completed and validated, deemed equivalent to one of the courses in the curriculum of this master's program, can be awarded by equivalence.

PROGRAM REQUIREMENTS

Required courses (112 credits)
Foundations for Quality Approach (2 Cr.). Climatology and Microclimatology (4 Cr.). Communication (4 Cr.). Biodiversity Conservation: From Genes to Ecosystems (4 Cr.). Law and Legislation (2 Cr.). Water and Hydrology (2 Cr.). Environmental Economics (2 Cr.). Terrestrial and Marine Ecosystem (4 Cr.). Developing Professional Projects in Environments (2 Cr.). Entrepreneurship (6 Cr.). Environment and Health (2 Cr.). Impact Assessment (4 Cr.). Environmental Management of Businesses and Communities (3 Cr.). Geographic Information System (3 Cr.). Applied Metrology in the Environment (3 Cr.). Database Modeling (2 Cr.). Atmospheric Physics (2 Cr.). Environmental Policies and Strategies (3 Cr.). Urban, Industrial, and Agricultural Pollution (2 Cr.). Preparation for Professional Life (4 Cr.). Presentation of the Geosystem (2 Cr.). Project Management (4 Cr.). End-of-Study Project (30 Cr.). Rehabilitation of Contaminated Sites (5 Cr.). Resource Efficiency and Cleaner Production Industry (2 Cr.). Soil (2 Cr.). Remote Sensing in the Environment (3 Cr.). Data Processing and Analysis (6 Cr.).

Institution's elective courses (6 credits)
Atmospheric Chemistry (4 Cr.). Waste and Treatment (2 Cr.). Population Genetics and Phylogenetics (4 Cr.). Molecular Markers (2 Cr.).

SUGGESTED STUDY PLAN

Semester 1

Code	Course Name	Credits
048COMTM1	Communication	4
048TADTM1	Data Processing and Analysis	6
048DRLTM1	Law and Legislation	2
048BDQTM1	Foundations for Quality Approach	2
048POCPM1	Urban, Industrial, and Agricultural Pollution	2
048EACPM1	Water and Hydrology	2
048CBEPM1	Biodiversity Conservation: From Genes to Ecosystems	4
048GSCPM1	Presentation of the Geosystem	2
048ETMPM1	Terrestrial and Marine Ecosystem	4
048MMCBM1 048DECPM1	Closed Elective Molecular Markers or Waste and Treatment	 2 2
	Total	**30**

Semester 2

Code	Course Name	Credits
048ETPTM2	Entrepreneurship	6
048PRMTM2	Project Management	4
048PVPTM2	Preparation for Professional Life	4
048REITM2	Resource Efficiency and Cleaner Production Industry	2
048MDCPM2	Database Modeling	2
048SGCPM2	Geographic Information System	3
048TDCPM2	Remote Sensing in the Environment	3
048SOCPM2	Soil	2
048GPCBM2 048CACPM2	Closed Elective Population Genetics and Phylogenetics or Atmospheric Chemistry	 4 4
	Total	**30**

Semester 3

Code	Course Name	Credits
048PECPM3	Environmental Policies and Strategies	3
048GECPM3	Environmental Management of Business and Communities	3
048RSCPM3	Rehabilitation of Contaminated Sites	5

048ECCPM3	Environmental Economics	2
048EICPM3	Impact Assessment	4
048CLCPM3	Climatology and Microclimatology	4
048SECPM3	Environment and Health	2
048MAEPM3	Applied Metrology in the Environment	3
048EPCPM3	Developing Professional Projects in Environments	2
048PACPM3	Atmospheric Physics	2
	Total	**30**

Semester 4

Code	Course Name	Credits
048PFETM4	End-of-Study Project	30
	Total	**30**

COURSE DESCRIPTION

048BDQTM1 Foundations for Quality Approach 2 Cr.

The primary objective of this course is to introduce the new requirements of the ISO 9001:2015 standard Quality Management System (QMS) and to apply these requirements through the process approach and the use of performance measurement and continuous improvement tools as a basis for the effective management of the organization.

048CLCPM3 Climatology and Microclimatology 4 Cr.

Climatology is an inherent aspect of the mechanisms of air pollution. It conditions the spatial and temporal distribution of pollution. However, this contribution manifests itself at different spatial scales that need to be defined and understood.

048CACPM2 Atmospheric Chemistry 4 Cr.

The objective of this course is to introduce students to atmospheric chemistry and physics. It allows them to understand the chemical composition of the atmosphere, the origins of the various species present (springs and sinks), and to analyze their variation over time and space following photochemical transformations.

048COMTM1 Communication 4 Cr.

This course aims to develop students' oral, written, and negotiation skills.

Part 1: Oral Communication:
Of all the modes of interpersonal exchange, oral communication stands out as the most frequent activity. It is, therefore, the foundation of good functioning in a team, workgroup, or company.
Knowing how to communicate means:

a) Expressing one's ideas
b) Listening and asking questions
c) Maintaining the relational exchange
d) Providing feedback.

Part 2: Written Communication:
The primary objective of this part is to understand the importance of effective written communication for enhancing an organization's image. This includes an introduction to different written communication situations within the organization, such as the main internal messages (note, minutes, report, letter, etc.)

The second objective of this course is to present to students all the techniques they need to write useful documents in the professional world. From the curriculum vitae to the cover letter, including the application email and unsolicited applications, students will gain a clear understanding of the vocabulary to use depending on the situation they are facing.

048CBEPM1 Biodiversity Conservation: From Genes to Ecosystem 4 Cr.

This course aims to deepen students' knowledge on the three levels of biodiversity (genetic diversity, species diversity, and ecosystem diversity). The course also presents the different methods of biodiversity conservation, including the IUCN Red List, ecosystem restoration, in situ conservation, and ex situ conservation. Moreover, it covers the molecular techniques used to identify species, as well as the different methods for monitoring biodiversity. Finally, the course studies the application of nature-based solutions (NBS) to mitigate the effects of climate change. This course helps students recognize and assess threats to biodiversity, apply appropriate conservation techniques and monitor results. It is intended for students, professionals and anyone interested in biodiversity. It provides participants with the knowledge and skills needed to understand and preserve biodiversity.

048DECPM2 Waste and Treatment 2 Cr.

The objective of the course is to enable students to master the management and treatment of solid waste. It aims to train experts by providing them with the necessary tools and skills in order to:

- Implement methodologies for diagnosing and characterizing waste
- Determine, size and implement appropriate measures and treatments.

048DRLTM1 Law and Legislation 2 Cr.

The first part of this course aims to define intellectual property, which encompasses all exclusive rights granted over intellectual creations: legal rights to an idea, invention, or creation in industrial, scientific, literary, and artistic domains. It seeks to present the interests and benefits of such a notion before detailing the procedures for registering inventions or products.

The second part of this course aims to provide students with a comprehensive understanding of the rules governing interactions with citizens. It covers consumer law, business law, social law, labor law, and environmental law. These rules are codified, and students must be able to identify the relevant texts in each area for orientation. It includes:

- International environmental law and Lebanese environmental law
- Labor law
- Social security law
- Commercial law
- Company law and industrial law

048EACPM1 Water and Hydrology 2 Cr.

This course is a basic introduction to water and pollution problems that have arisen due to human activities. The course aims to establish the scientific principles and concepts that will form the knowledge base on water for appropriate interaction with the natural environment.
On the one hand, it is a matter of providing students a basic training on the biogeochemical processes that govern the quality of aquatic environments and the interactions of these environments in regional contexts. On the other hand, it is about understanding and knowing the instruments of water management, whether they are technical processes for water collection and treatment, or the main water policies implemented in different regions of the world.
Skills targeted: general presentation of environmental issues related to water, at the watershed scale.

048ECCPM3 Environmental Economics 2 Cr.

The objective of this course is to provide students with the concept of economics, economic development and economic thought, thus enabling them to move towards the economic analysis of pollution.

048ETPTM1 Terrestrial and Marine Ecosystem 4 Cr.

This course aims to deepen students' knowledge of the forest ecosystem by addressing the following points:

- The factors governing the geographic distribution of forests.
- The evolution of the forest in relation to geological history.
- The different types of forests and their characteristics.
- The influence of abiotic factors on the forest.
- The feedback of the forest on its environment.
- Forest dynamics.
- Long-term forest development.
- The particularities of the Mediterranean and Lebanese forests.

For the marine and cetology component:
This course is offered to students enrolled in the Master in Environmental Science and Management (SGE). It is taught in the second semester.

Oceanography studies a large number of aspects of the oceans and seas, including: major biogeochemical cycles, ocean currents, marine organisms and ecosystems, and the links between oceans and climate change. These varied fields reflect the multitude of disciplines that oceanographers integrate in order to understand the interdependence between biology, geology, meteorology and ocean physics.

A distinction is made between:

- Marine biology (or marine ecology) which studies the fauna and flora of the oceans and their ecological interactions.
- Chemical oceanography, which studies the chemistry of the oceans.
- Marine geology, which studies the geology of the ocean floor, including plate tectonics;
- Physical oceanography, which studies the physical characteristics of the ocean (such as thermohaline structure, waves, tides, and ocean currents).
- Cetology, which corresponds to the study of marine mammals. Its objective is to improve knowledge of these species in order to reduce the threats to them, in particular through improved knowledge of their life, movement and ecology.

048EPCPM3 Developing Professional Projects in Environments 2 Cr.

An essential aspect of advancing policy is ensuring adequate financial resources, especially in the realm of sustainable development. Without sufficient funding, achieving sustainability becomes challenging. Notably, the environmental sector often faces significant underfunding within the development landscape. Consequently, many developing nations rely on multi and bilateral agencies to provide financial support for environmental initiatives, as these sectors are not prioritized in national budgets. This course aims to equip students with the skills to draft project proposals to secure funding from international agencies for environmental projects.

048ETPTM2 Entrepreneurship 6 Cr.

This course introduces students to entrepreneurship and provides them with the key tools necessary for any entrepreneur to succeed, including concepts in accounting and finance. The first part of the course describes the role of entrepreneurs, analyzes the creation of wealth and/or employment through the creation or takeover of a business, explains the different forms of entrepreneurship, addresses the concepts of creativity, innovation and market benefit, and supports the idea of an entrepreneur taking risks.
The second part provides an overview of the conceptual and regulatory framework underlying financial accounting, as well as an understanding of the content and structure of financial statements in order to read and understand what financial statements can and cannot reveal about a commercial or industrial institution. It also addresses the different types of financial accounting information encountered in managerial life, providing a basic guide to go from accounting to cover all the important accounting concepts and managerial reporting tools that support appropriate managerial decision-making.
The final part aims to familiarize students with finance concepts and explain the basics of financial markets. Examples will help apply the discussed theories in practice.

048SECPM2 Environment and Health 2 Cr.

This course identifies the main chemical, physical and biological hazards that pose risks to the environment and human health. By the end of this course, students are expected to discover the new concept of environmental health.

048EICPM2 Impact Study 4 Cr.

This course aims to provide students with the necessary knowledge to develop an environmental impact assessment (EIA) report. The preparation of an EIA report contributes to the development of the following competencies:

- Mastering the spatial approach.
- Conducting research in environment and sustainable development (SD).
- Dealing and solving environmental problems with scientific rigor.
- Leveraging and applying knowledge.

048GPCBM2 Population Genetics and Phylogenetics 4 Cr.

Population genetics is a discipline aimed at identifying and quantifying the various processes that influence genetic variability and differentiation within populations, forming the foundation of evolution. Understanding these processes is essential for interpreting biological phenomena in an evolutionary context. After acquiring the principles of basic genetics, students are introduced to calculating allele, genotype, and phenotype frequencies within populations. They also study the effects of mutations, migrations, deviations from panmixia, genetic drift, and selection on these frequency variations.

By the end of the course, students should be able to understand the various processes impacting population variability and to apply key models and estimators.

Phylogenetics focuses on studying relationships among related species. By the end of the course, students will grasp the concept of species, the general principles of phylogenetic reconstruction, and the ability to interpret a phylogeny. They will also understand the relationship between evolutionary history, ecology, biogeography, biodiversity, and speciation.

048GECPM2 Environmental Management of Business and Communities 3 Cr.

Since the dawn of human civilization, the availability of natural resources has played a key role in the structuring of these civilizations. Consequently, human beings have always been dependent on the environment for the development of their civilizations and the improvement of their wellbeing. In his book "A New Green History of the World," Ponting (2007, p. 8) states that "human history cannot be understood in the blink of an eye. All human societies have been and remain dependent on complex and interdependent physical, chemical and biological processes." Therefore, the issue of environmental degradation has always been a recurring theme in human civilizations. This is clearly expressed with the example of Easter Island and how environmental degradation led to the demise of an ancient civilization. The case of Easter Island is not the only example of the near extinction of ancient civilizations due to environmental degradation. Jared Diamond (2005), in his book "Collapse," cites similar examples where environmental degradation has led to the collapse of several ancient civilizations, such as the Maya. It is important to note that such "collapses" have mostly occurred in what are now called "developing countries." As human civilizations progressed, culminating in the industrial revolution, in what are now called "developed countries," advancements in political, social, and economic concepts have also progressed. Alongside this progression or what is now called "development," environmental degradation has accelerated at an unprecedented rate. To prevent this environmental degradation, the concept of "environmental management" has evolved.

The objective of this course is to highlight the various issues of environmental management related to the primary objective of environmental protection, improving quality of life and establishing more sustainable ecological development. The course addresses the main concepts of environmental management existing in different contexts in Lebanon, i.e. in the public and private sectors.

048SGCPM2 Geographic Information System 3 Cr.

This course allows students to understand Geographic Information System (GIS) and be able to work with it in the field of the environment.

048MMCBM1 Molecular Markers 2 Cr.

This course is dedicated to the exploration and utilization of DNA sequences as fundamental tools to uncover genetic diversity. Specifically, students will compare various techniques used for the detection and characterization of these markers, evaluating their advantages and limitations. The advancements in these techniques and their applications will be discussed in various contexts, including the characterization of genetic resources, forensic sciences, phylogenetics, and evolutionary biology.

048MAEPM3 Applied Metrology in the Environment 3 Cr.

The objective of this course is to train students on the technical approach that must be adopted in environmental studies by applying the different metrological principles to the different stages of the study, from the definition of the objective of the study to the presentation of the final result.

048MDCPM2 Database Modeling 2 Cr.

This course aims to familiarize students with the design of a relational database.

048PACPM3 Atmospheric Physics 2 Cr.

The objective of this course is to introduce students to the implementation of some basic notions of physics in order to explain atmospheric phenomena. Three different parts are devoted to thermodynamics, mechanics and electromagnetic radiation of the atmosphere.

048PECPM3 Environmental Policies and Strategies 3 Cr.

Despite extensive national and international efforts, environmental stress persists, impacting vital resources like air, water, and biodiversity. Protecting the environment is increasingly crucial for its link to social and economic progress. Sustainable development, linking on long-term vision and inclusive participation, necessitates comprehensive environmental policies at all levels. Key stakeholders including governments, civil society, international bodies, and businesses play pivotal roles in shaping such policies. An interdisciplinary approach is essential, aligning ecological, economic, and social dimensions. Globalization further complicates these challenges, presenting both opportunities and disparities. While it facilitates market integration and investment flows worldwide, its benefits are not equally distributed, particularly burdening developing nations. This course aims to explore environmental policy issues within Lebanon and beyond, focusing on safeguarding the environment, improving quality of life, and advancing sustainable development. Topics will cover core concepts from national and international perspectives.

048POCPM1 Urban, Industrial, and Agricultural Pollution 2 Cr.

In order to better understand the mechanisms of the spatial and temporal distribution of pollution, the aim is to present the factors of environmental degradation (sources and types of pollution).

048PVPTM2 Professional Development 4 Cr.

The research on environmental NGOs aims to show the different addresses and projects carried out by environmental firms. It helps raise awareness among students of environmental professions. In addition, a field internship allows students to carry out a project to measure air pollution and conduct extraction and analysis tests in the research laboratory. At the end of this internship, students will write a detailed report on the personal work carried out and defend it if necessary.

048GSCPM1 Presentation of the Geosystem 2 Cr.

The objective of this course is to present the processes (modifications of the components and the relationships between them) and the factors (interactions) that can be established between human societies and the geosystem.

048PRMTM2 Project Management 2 Cr.

This course is designed to equip students with the skills and knowledge necessary to effectively plan, execute, and manage projects across various disciplines. Through a combination of theoretical concepts and practical applications, students will learn how to navigate the complexities of project management, from start to finish.

048PFETM4 End-of-Study Project 30 Cr.

This course represents the end-of-study project for students, during which they will complete a 4 to 7 months internship in industry or a research laboratory. At the end of this internship, they will write a detailed report on the personal work carried out and defend it before a jury composed of Master's program instructors and representatives from the professional world.
The rules for the defense and grading are as follows:

1. The oral presentation time is limited to a maximum of 20 minutes (plus 20 minutes for questions and 15 minutes for the jury's deliberation).
2. The final defense grade takes into account:
   - The oral presentation, including responses to questions
   - The internship supervisor's report
   - The content and format of the report, as evaluated by the reviewers

048RSCPM3 Rehabilitation of Contaminated Sites 5 Cr.

The course provides a theoretical and practical insight into the rehabilitation of contaminated sites. The diagnosis and treatment of contaminated sites will be detailed, covering the financial and legislative aspects of the problem. The contaminated sites covered mainly include polluted soils, groundwater underlying the pollution and contaminated aquatic ecosystems. The course is structured in 7 chapters.

048REITM2 Resource Efficiency and Cleaner Production Industry 4 Cr.

The course aims to highlight the importance of resource efficiency and cleaner production (RECP) in industry from both the environmental and economic perspectives. It also provides students with key tools for sustainable production that enable industrial companies to use their resources more efficiently, reduce their environmental footprint, and enhance their competitiveness.

048SOCPM2 Soil 2 Cr.

The objective of this course is to show not only that soils are dynamic environments, often in a fragile balance with the surrounding conditions, but also to highlight their role in environmental protection.

048TDCPM2 Remote Sensing in the Environment 3 Cr.

This course is offered in-depth to students enrolled in the Master in Environment and Spatial Planning. It is also offered in an introductory form to students in the professional Master in Environmental Science and Management. The course enables students to acquire the skills to extract information from satellite imagery of the Earth with the aim of solving environmental problems.
It contributes to the development of the following skills: "using geomatics tools" in the field of environmental management.

048TADTM1 Data Processing and Analysis 6 Cr.

This course is structured around three main axes.
The first axis, "Metrology", aims to raise students' awareness of metrology, the science of measurements, by providing them the necessary information for the management and mastery of measurement processes and equipment.
The second axis, "Statistics", aims to sensitize students to the importance of statistics in data analysis, study planning, and understanding scientific literature.
The third axis, "Multivariate Analysis," provides students with the skills necessary to use statistical tools to extract information and create new knowledge from complex databases obtained through analytical methods or other

means. It involves the simultaneous analysis of a set of explanatory variables and the construction of multivariate models that allow the description, comparison, classification, and prediction of the characteristics of individual samples. Multivariate analysis is widely used in all fields of science, engineering, pharmacology, medicine, economics, and sociology.