

## 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 multidisciplinary program that addresses environmental issues comprehensively, integrating insights from both 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)**

- Analyze an environmental problem in its scientific, technical and nontechnical dimensions
- Communicate proposed environmental solutions 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 granted by equivalence.

**PROGRAM REQUIREMENTS**

**Required courses (114 credits), Institution's elective courses (6 credits)**

**Required Courses (114Cr.)**

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 Ecosystems (4 Cr.). Developing Professional Projects in Environments (2 Cr.). Entrepreneurship (4 Cr.). Environment and Health (2 Cr.). Impact Assessment (4 Cr.). Environmental Management of Business 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 (4 Cr.). Soil (2 Cr.). Remote Sensing in the Environment (3 Cr.). Data Processing and Analysis (6 Cr.).

**Institution's Elective Courses (6 Cr.), to be chosen from the list below:**

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
o48COMTM1	Communication	4
o48TADTM1	Data Processing and Analysis	6
o48DRLTM1	Law and Legislation	2
o48BDQTM1	Foundations for Quality Approach	2
o48POCPM1	Urban, Industrial, and Agricultural Pollution	2
o48EACPM1	Water and Hydrology	2
o48CBEPM1	Biodiversity Conservation: From Genes to Ecosystems	4
o48GSCPM1	Presentation of the Geosystem	2
o48ETMPM1	Terrestrial and Marine Ecosystems	4
o48MMCBM1 or o48DECPM1	Institution's Elective Courses Molecular Markers or Waste and Treatment	2
	<b>Total</b>	<b>30</b>

**Semester 2**

Code	Course Name	Credits
o48ETPTM2	Entrepreneurship	4
o48PRMTM2	Project Management	4
o48PVPTM2	Preparation for Professional Life	4
o48REITM2	Resource Efficiency and Cleaner Production Industry	4
o48MDCPM2	Database Modeling	2
o48SGCPM2	Geographic Information System	3
o48TDCPM2	Remote Sensing in the Environment	3
o48SOCPM2	Soil	2
o48GPCBM2 or o48CACPM2	Institution's Elective Courses Population Genetics and Phylogenetics or Atmospheric Chemistry	4
	<b>Total</b>	<b>30</b>

**Semester 3**

Code	Course Name	Credits
o48PECPM3	Environmental Policies and Strategies	3
o48GECPM3	Environmental Management of Business and Communities	3
o48RSCPM3	Rehabilitation of Contaminated Sites	5
o48ECCPM3	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
	<b>Total</b>	<b>30</b>

#### Semester 4

Code	Course Name	Credits
048PFETM4	End-of-Study Project	30
	<b>Total</b>	<b>30</b>

#### COURSE DESCRIPTION

<b>048BDQTM1</b>	<b>Foundations for Quality Approach</b>	<b>2 Cr.</b>
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This course introduces the new requirements of the ISO 9001:2015 Quality Management System (QMS) standard and applies 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.

<b>048CLCPM3</b>	<b>Climatology and Microclimatology</b>	<b>4 Cr.</b>
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This course presents climatology as a key factor influencing the mechanisms of air pollution and its spatial and temporal distribution. It covers the different spatial scales at which climatology affects pollution.

<b>048CACPM2</b>	<b>Atmospheric Chemistry</b>	<b>4 Cr.</b>
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This course introduces students to atmospheric chemistry and physics. It allows them to understand the chemical composition of the atmosphere, the origins of the various species present (sources and sinks), and to analyze their variation over time and space following photochemical transformations.

<b>048COMTM1</b>	<b>Communication</b>	<b>4 Cr.</b>
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This course covers oral and written communication. It presents oral communication as the most frequent form of interpersonal exchange and essential for effective teamwork and collaboration. It addresses expressing ideas clearly, listening and asking questions, maintaining relational exchanges, and providing feedback.

The course also explains the importance of effective written communication in enhancing an organization's image. It introduces various organizational communication situations, including internal messages such as memos, reports, and letters. Students will learn essential techniques for drafting professional documents, from resumes and cover letters to application emails and unsolicited applications, and will gain a clear understanding of the appropriate vocabulary and format for each situation.

<b>048CBEPM1</b>	<b>Biodiversity Conservation: From Genes to Ecosystems</b>	<b>4 Cr.</b>
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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, ecosystems 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 students with the knowledge and skills needed to understand and preserve biodiversity.

<b>048DECPM1</b>	<b>Waste and Treatment</b>	<b>2 Cr.</b>
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This course enables students to master the management and treatment of solid waste. It aims to train experts by providing them with the necessary tools and skills to:

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

<b>048DRLTM1</b>	<b>Law and Legislation</b>	<b>2 Cr.</b>
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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

<b>048EACPM1</b>	<b>Water and Hydrology</b>	<b>2 Cr.</b>
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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 with 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 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.

<b>048ECCPM3</b>	<b>Environmental Economics</b>	<b>2 Cr.</b>
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This course provides students with the concept of economics, economic development and economic thought, thus enabling them to move towards the economic analysis of pollution.

<b>048ETMPM1</b>	<b>Terrestrial and Marine Ecosystems</b>	<b>4 Cr.</b>
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This course aims to deepen students' knowledge of forest ecosystems 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.

<b>048EPCPM3</b>	<b>Developing Professional Projects in Environments</b>	<b>2 Cr.</b>
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This course presents the importance of financial resources in advancing sustainable development policies, particularly in the environmental sector, which is often underfunded. It covers the reliance of developing countries on multi- and bilateral agencies for funding environmental initiatives. Students will learn to draft project proposals to secure financial support from international agencies for environmental projects.

<b>048ETPTM2</b>	<b>Entrepreneurship</b>	<b>4 Cr.</b>
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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 help them apply the discussed theories in practice.

<b>048SECPM3</b>	<b>Environment and Health</b>	<b>2 Cr.</b>
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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 will understand the emerging concept of environmental health.

<b>048EICPM3</b>	<b>Impact Assessment</b>	<b>4 Cr.</b>
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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 with and solving environmental problems with scientific rigor.
- Leveraging and applying knowledge.

<b>048GPCBM2</b>	<b>Population Genetics and Phylogenetics</b>	<b>4 Cr.</b>
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This course presents population genetics and phylogenetics. It covers population genetics as the study of processes influencing genetic variability and differentiation within populations, forming the basis of evolution. It addresses calculating allele, genotype, and phenotype frequencies, and the effects of mutations, migrations, deviations from panmixia, genetic drift, and selection. Students will understand these processes and apply key models and estimators.

The course also presents phylogenetics as the study of relationships among related species. It covers the concept of species, principles of phylogenetic reconstruction, and phylogeny interpretation, as well as the links between



evolutionary history, ecology, biogeography, biodiversity, and speciation.

<b>048GECPM3</b>	<b>Environmental Management of Business and Communities</b>	<b>3 Cr.</b>
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This course explains that 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.

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

<b>048SGCPM2</b>	<b>Geographic Information System</b>	<b>3 Cr.</b>
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This course allows students to understand Geographic Information System (GIS) and be able to work with them in the field of the environment.

<b>048MMCBM1</b>	<b>Molecular Markers</b>	<b>2 Cr.</b>
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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.

<b>048MAEPM3</b>	<b>Applied Metrology in the Environment</b>	<b>3 Cr.</b>
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This course trains 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.

<b>048MDCPM2</b>	<b>Database Modeling</b>	<b>2 Cr.</b>
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This course aims to familiarize students with the design of a relational database.

<b>048PACPM3</b>	<b>Atmospheric Physics</b>	<b>2 Cr.</b>
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This course introduces 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.

<b>048PECPM3</b>	<b>Environmental Policies and Strategies</b>	<b>3 Cr.</b>
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This course examines persistent environmental stress and its impact on vital resources such as air, water, and biodiversity. This course highlights the importance of environmental protection for social and economic progress and emphasizes sustainable development based on long-term vision and inclusive participation. This course





explores the roles of key stakeholders, including governments, civil society, international bodies, and businesses, in shaping comprehensive environmental policies. This course adopts an interdisciplinary approach, integrating ecological, economic, and social dimensions, while addressing the challenges and opportunities presented by globalization, including its unequal effects on developing countries. This course aims to explore environmental policy issues in Lebanon and beyond, focusing on safeguarding the environment, improving quality of life, and promoting sustainable development. This course covers core concepts from both national and international perspectives.

<b>048POCPM1</b>	<b>Urban, Industrial, and Agricultural Pollution</b>	<b>2 Cr.</b>
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This course presents the factors of environmental degradation, including the sources and types of pollution, to provide a clear understanding of the mechanisms behind the spatial and temporal distribution of pollution.

<b>048PVPTM2</b>	<b>Preparation for Professional Life</b>	<b>4 Cr.</b>
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This course examines environmental NGOs, highlighting their activities and projects to raise students' awareness of environmental professions. This course includes a field internship where students will carry out a project to measure air pollution and perform extraction and analysis tests in the research laboratory. This course requires students to write a detailed report on their work and defend it if necessary.

<b>048GSCPM1</b>	<b>Presentation of the Geosystem</b>	<b>2 Cr.</b>
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This course presents 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.

<b>048PRMTM2</b>	<b>Project Management</b>	<b>4 Cr.</b>
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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.

<b>048PFETM4</b>	<b>End-of-Study Project</b>	<b>30 Cr.</b>
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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

<b>048RSCPM3</b>	<b>Rehabilitation of Contaminated Sites</b>	<b>5 Cr.</b>
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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.

<b>048REITM2</b>	<b>Resource Efficiency and Cleaner Production Industry</b>	<b>4 Cr.</b>
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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.

<b>048SOCPM2</b>	<b>Soil</b>	<b>2 Cr.</b>
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This course demonstrates that soils are dynamic environments, often in a fragile balance with the surrounding conditions, and highlights their role in environmental protection.

<b>048TDCPM2</b>	<b>Remote Sensing in the Environment</b>	<b>3 Cr.</b>
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This course is offered 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 skill: “using geomatics tools” in the field of environmental management.

<b>048TADTM1</b>	<b>Data Processing and Analysis</b>	<b>6 Cr.</b>
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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.