Environmental protection and sustainable development have become societal major issues. It is now also acknowledged that we must take advantage of our expertise in physico-chemistry and microbiology to identify, assess and manage the anthropogenic contamination of air, water, soils and waste. This program trains multidisciplinary managers who will be able to offer and implement solutions to solve environmental problems.

The Chemistry and Life Sciences program aims at training specialists able to analyze, manage and process environmental issues. The program offers common core courses which train students in both Chemistry and Life sciences as related to the environment.

The Chemistry and Life Sciences program trains managers in the field of environment. Job prospects are the following:

* Research engineer
* Environmental engineer
* Research and Innovation engineer

The Chemistry and Life Sciences is a 2-years course. It offers 4 “parcours”. The “parcours CMCEI” is opened only for the second year and all courses are taught in English.

- M2 Chemical and microbiological characterization  
  for environmental issues (Master degree in  
  microbiology, molecular biology and analytical chemistry for  
  the environment)  
- M2 Molecular Biology and Environmental Microbiology
Collège Sciences et Technologies pour l’Énergie et l’Environnement (STEE)

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Pau

| PERSON IN CHARGE |
M2 Chemical and microbiological characterization for environmental issues (Master degree in microbiology, molecular biology and analytical chemistry for the environment)

PRESENTATION

Applications are now open here
APPLY

Applications will be closed on April 24th, 2020

Strongly increasing societal demand in the fields of Environment, Sustainable Development and Health, implies a synergy of advanced skills in Chemistry and Biology Sciences. In order to be able to effectively respond to this demand and to implement innovative solutions providing efficient answers to these requests, it is essential to perfectly understand the interaction of contaminants with living organisms and particularly their structures, properties, reactivities/activities in natural ecosystems. The “Chemical and Microbiological Characterization for Environmental Issues” (CMCEI) second year course of the Master in Chemistry and Life Sciences aims to train specialists with knowledge in the most recent advances in analytical chemistry, physico-chemistry, molecular biology and environmental microbiology.

OBJECTIVES

Entirely taught in English, the first semester is devoted to the knowledge of contaminants cycles and to the application of different techniques for the analysis of chemical elements and species of interest in various compartments of environment, the identification of microorganisms presenting a risk for the
environment or public health, but also quality assurance, critical evaluation of scientific publications and/or technical documentation.

The second semester consists of a six-month research internship in the field of chemical and/or biological analysis applied to the environment in IPREM teams.

The course is mainly taught through project-based scenarios. This helps students understand scientific approach in research. It also makes them put into practice various techniques and reflect further on their professional project.

**SKILLS**

At the end of this program, the students in the "Chemical and Microbiological Characterization for Environmental Issues Master" will be able to:

* Show expertise in modern techniques in chemistry, molecular biology and microbiology
* Synthesize technical and research documentations to produce a technical study
* Plan and define a research or R&D project in analytical chemistry, molecular biology, microbiology or environmental survey
* Manage and carry out a project
* Manage field experiments to estimate the efficiency of chemical or biological methods for the protection of the ecosystems
* Interpret and validate results of chemical and biological analysis
* Produce summary report describing the experiments done, the applied methods used and the results obtained

**ADDITIONAL INFORMATION**

**TRAINING CONTENT**

<table>
<thead>
<tr>
<th>SEMESTER 1</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>Trace elements in the environment</td>
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<tr>
<td>Trace elements biogeochemical cycles</td>
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<tr>
<td>--------------------------------------</td>
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<tr>
<td>Speciation concepts and analysis</td>
<td>2</td>
</tr>
<tr>
<td><strong>Advanced analytical chemistry</strong></td>
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<tr>
<td>Advanced separation techniques</td>
<td>2</td>
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<tr>
<td>Advanced spectrometric techniques coupling</td>
<td>2</td>
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<tr>
<td>Electrochemical sensors</td>
<td>2</td>
</tr>
<tr>
<td>Biological macromolecules characterization</td>
<td>2</td>
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<tr>
<td>Organic contaminants analysis</td>
<td>2</td>
</tr>
<tr>
<td>Imaging techniques for environmental samples and materials characterization</td>
<td>2</td>
</tr>
<tr>
<td><strong>Statistical tools, chemometrics and quality</strong></td>
<td></td>
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<tr>
<td>Analytical methods performances evaluation</td>
<td>2</td>
</tr>
<tr>
<td>Quality assurance for analysis</td>
<td>2</td>
</tr>
<tr>
<td>Statistical tools project</td>
<td>4</td>
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<tr>
<td><strong>Microbiology and molecular biology for Environmental applications</strong></td>
<td></td>
</tr>
<tr>
<td>Microbial biotransformations and environmental applications: project</td>
<td>4</td>
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<tr>
<td>Microbial biotransformations</td>
<td>2</td>
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</table>
and environmental applications: conferences

<table>
<thead>
<tr>
<th>Molecular biology, Technological applications</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td><strong>Research tools and applications</strong></td>
<td></td>
</tr>
<tr>
<td>Scientific papers and documentation critical evaluation</td>
<td>2</td>
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<tr>
<td>Environmental Project</td>
<td>4</td>
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<tr>
<td><strong>Language</strong></td>
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<tr>
<td>French as a Foreign language</td>
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<tr>
<td><strong>SEMESTER 2</strong></td>
<td></td>
</tr>
<tr>
<td>Internship in an academic or industrial research project</td>
<td>30</td>
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</table>

**ACCESS CONDITIONS**

Applicants must hold at least a 4-year university level in chemistry and/or biology fields.

The **M2 CMCEI** is open to students who have completed an M1 (4-year degree) in "Chemistry and Life sciences" (SAVE), "Molecular Biology and micro-biology for the environment" (BME) or an equivalent level.

For students outside the UPPA, integration in the second year is subjected to a selection on curricula with equivalent training level and with sufficient skills in biology, chemistry and environment (Molecular biology, bioinformatics, microbiology, environmental microbiology, ecotoxicology, biostatistics, field...
sampling and data processing, physico-chemistry, analytical chemistry, environment).

**English Language requirements**

Applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English has to take a recognized international English test.

**Minimum required score:** CECRL B2 level in English

**French Language Requirements**

**None:** French language courses are included in the formation.

For any additional information or questions related to application, please contact:

florence.pannier@univ-pau.fr
or christine.cagnon@univ-pau.fr

**EXPENSES**

Concerning the registration fees, the ministerial decree of 19 April 2019 sets the annual amount for non-European students enrolling in a Master’s degree at €3770.

However, each French higher education institution has the possibility to partially exempt its students from these tuition fees.

For the year 2020-2021, the UPPA will apply this **partial exemption** to all non-EU students. Students benefiting from this partial exemption will pay an annual registration fee of **243** euros (2019_2020 price list as an indication)

**PROFESSIONAL INSERTION**

**Sectors:**

* Environment
* Agribusiness
* Analytical chemistry
* Chemical industries
* Biotechnology

**Fields:**

* Research and Development, quality control

**Positions:**

* Academic positions
* Researchers (public institutes or private companies)
* Research and Innovation Engineers
* PhD students

**ORGANIZATIONAL UNIT**

Etablissement

**PLACES**

Pau

**PERSON IN CHARGE**

PANNIER Florence
florence.pannier@univ-pau.fr

Responsable Master BME CAGNON Christine
christine.cagnon@univ-pau.fr
Increasingly strong societal demand in the fields of the Environment, sustainable development and health now calls for a synergy of cutting-edge skills involving Chemical and Biological Sciences.

The Master's degree in Molecular biology and Environmental Microbiology trains specialists with a mastery of modern molecular biology and environmental microbiology, with a solid background in chemistry, capable of grasping environmental issues related to:

* The protection of ecosystems,
* The ecotoxicology of soils, sediments and water,
* The identification of microorganisms representing a risk to the environment or public health,
* The bio-rehabilitation of sites affected by anthropogenic (industrial and agricultural) pollution.

The Molecular Biology and Environmental Microbiology Master's degree is at the heart of this technological and socio-economic evolution. At a meeting point between the professional world and the University in a region that is home to large-scale facilities of several industrial companies concerned by bio-depollution (Total, Arkema, chemical industries at the Lacq site) and a strong agricultural activity.
the Master's degree in **Molecular biology and Environmental Microbiology** also offers an international outlook through both internships and the possibility of obtaining a **double degree** with the "**Master in Biotechnology of Environment and Health**" from the University of Oviedo (Spain).

Biological methods developed for the remediation of contaminated sites, the treatment of effluents, the control of the use of phytosanitary products or the search for pathogens in natural waters and cooling or water distribution systems are increasingly in demand and proposed as necessary alternatives for the sustainable improvement of environmental problems.

The implementation of these methods as well as the development of molecular analysis tools and techniques (quantitative PCR, DNA chips, high-throughput sequencing, bioinformatics analysis, microbial biosensors, GMOs, protein engineering) is one of the challenges for industrial and environmental policies in the coming years.

An orientation towards research may be envisaged, depending on the choice of options and especially internships. It is based on the major research axes of the Environment and Microbiology Team (EEM) of **IPREM** (UMR CNRS 5254), recognised for its expertise in microbiology and the environment. The continuation of studies in doctoral thesis predisposes to jobs as teacher-researchers in higher education, researchers in public research organisations (CNRS, INRA) or industrial R&D departments.

### OBJECTIVES

At the end of this course, graduates will develop the following skills according to their choice of optional courses:

* Identify the concepts and approaches of modern microbiology and biology,
* Understand the complexity and importance of microbial processes in the environment,
* Master modern biochemical, molecular and genetic methodologies, as well as mathematical, statistical and computer tools,
* Search for pathogens in natural environments and industrial installations or select micro-organisms likely
to degrade contaminants of biotic or abiotic origin in the laboratory or in the natural environment,
* Conduct experiments to evaluate the effectiveness of biological or chemical methods of environmental remediation,
* Conduct studies and formulate opinions to solve practical problems posed by the protection of ecosystems: assessing the benefit-risk of the methods used, setting up field study protocols,
* Master the tools of statistical analysis and integrating the knowledge necessary to respect the environment within the framework of sustainable development,
* Conduct field experiments to evaluate the effectiveness of chemical or biological methods for the protection of eco- and agrosystems.

**SKILLS**

The theoretical, methodological and practical teaching must lead students to acquire the necessary bases for effective integration into the world of business or research, but also for communication with representatives of the socio-professional world.

**The 2nd year of the Master "Molecular biology and Environmental Microbiology" includes :**

* Theoretical and practical teaching by teacher-researchers, supplemented by conferences in which professionals from the sector share their experience on the field, as well as visits to companies,
* An internship of 4 to 6 months in a company, a professional organization or a research laboratory.

The courses are oriented towards the acquisition of scientific and technical skills as well as knowledge of professional concerns so that students can be operational to meet the demands of the sector but also be a source of innovative perspectives in the context of the missions they will be assigned.

During the first semester, the emphasis is placed on carrying out personal work, in groups of one to four depending on the course, covering bibliographical research, analysis of bibliographical articles and/or papers in the field of expertise,
writing scientific papers, oral presentations, lab work including the development, implementation and analysis of the results of an experimental protocol.

**ADDITIONAL INFORMATION**

**TRAINING CONTENT**

**SEMESTER 1 from September to January**

<table>
<thead>
<tr>
<th>Field</th>
<th>ECTS</th>
<th>Course</th>
<th>ECTS</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Langage</td>
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<td>English or French as a Foreign Language</td>
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<tr>
<td>Data analysis</td>
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<td>Statistical tools-project</td>
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<td>Quality</td>
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<td>Quality assurance for analysis</td>
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<td>Optional</td>
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<tr>
<td>Molecular biology and environmental microbiology</td>
<td>12 to 14</td>
<td>Molecular biology technological applications</td>
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<td></td>
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<td>Microbial biotransformations and environmental applications</td>
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<td>Molecular ecology</td>
<td>2</td>
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<td>Environmental Chemistry</td>
<td>0 to 8</td>
<td>- Trace element</td>
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<td>Optional</td>
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<td>Groups / project</td>
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<td>Course title</td>
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<tr>
<td>0 to 4 Group project</td>
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<td>Environmental engineering project</td>
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**SEMESTER 2 From January to June**

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<th>Fields</th>
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<tbody>
<tr>
<td>Internship</td>
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<td>Internship</td>
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</tr>
<tr>
<td>Bibliography</td>
<td>10</td>
<td>Bibliographic research</td>
<td>10</td>
</tr>
</tbody>
</table>
CONTROL KNOWLEDGE

* Final exams
* Ongoing assessments
* Oral presentations

ACCESS CONDITIONS

Apply here

English Language Requirements

Applicants must be fluent in English, both in writing and speaking. An applicant whose native language is not English has to take a recognized international English test.

Minimum required score: CECRL B2 level in English

EXPENSES

Concerning the registration fees, the ministerial decree of 19 April 2019 sets the annual amount for non-European students enrolling in a Master's degree at €3770.

However, each French higher education institution has the possibility to partially exempt its students from these tuition fees.

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ORGANIZATIONAL UNIT

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Pau

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