SCIENCE, TECHNOLOGY, HEALTH

Master's degree Bio-Inspired Materials (BIM)

Master Materials Science and Engineering

ECTS
120 credits

Duration
2 years

Component
Collège Sciences et Technologies pour l'Energie et l'Environnement (STEE)

Language(s)
English

VAT (%)
20.0

Presentation

Check our FAQ HERE

The 2022 class was sponsored by L'Oreal.

This master's degree aims at offering an educational background connecting the laboratory environment and the living world while responding to ecological and sustainable transition challenges. Mimicking strategies elaborated by Nature represents infinite scientific and technological challenges. These challenges will be taken up through bioinspiration and biomimicry angles keeping in mind environmental awareness and ethics.

We offer our students a unique opportunity to explore and get inspired by living systems to develop novel materials. Our biomimetic approach focuses on cross-disciplinary courses that will make students reconsider how they elaborate syntheses, formulations, and processing of tomorrow's materials as needed by the industrial partners to build our future society

In both the first and the second year of the master's, the students will be trained to draw inspiration from Nature through a biomimetic approach. This multidisciplinary approach, which resorts to both fundamental science and materials engineering, is based on the observation and comprehension of living organisms within their ecosystems. To succeed in this course, students will have to grasp abstract concepts to design biological models adapted to scientific and technological developments.

The teaching program, comprising lectures, supervised and practical work, and case studies, is primarily centered around student-based teaching strategies including Project-based learning. Entirely in English, teaching is performed by university lecturers and researchers as well as socio-professional stakeholders. The practical works and case studies take place in the laboratories of the Multidisciplinary Research Institute for the Environment and Materials (IPREM CNRS UMR 5254), using high-performance and cutting-edge equipment. Lectures are scheduled at the beginning of the training course to harmonize the basic knowledge of students originating from various educational backgrounds (biology, physics, and chemistry). Through this approach, we wish to develop the student's soft skills to encourage autonomy and stimulate curiosity, creativity, and emotional intelligence. The primary objective is to train future young researchers with special know-how in collaborative thinking and able to drive bio-inspired research projects.

Objectives

- Prepare students at an advanced specialized level to meet present and future challenges by adopting the biomimicry philosophy
- Obtain basic and requisite knowledge in physics, chemistry, and biology
- Awake curiosity and inspire respect for living systems
- Develop environmental awareness
- Develop collaborative and open working skills
- Adhere to the principles of the living world in their scientific approach
- Adopt a biomimetic approach with materials from concept to development
- Develop engineering research skills to engage in quality and successful research,
- Prepare students for leading positions in industry and government Research and Development departments

Your university

Skills

At the end of this program, the students in the «**Materials Science and Engineering: Bio-Inspired Materials master's degree**" will be able to:

- Prepare innovative bio-inspired materials,
- Use surface and volume analytical techniques to achieve a sound command of materials characterization,
- Validate, interpret and model experimental results,
- Write a report and communicate appropriately with experts,
- Produce quality research,
- Carry out a research project.

Additional information

Scholarships

- EIFFEL Scholarship of Excellence
- Talents' Academy Grants
- Catalogue des Bourses Campus France

The International Master Programs Admission Office

master.programs@univ-pau.fr

Organisation

Trainings

Intership : Mandatory

Intership duration : 4-6 months

Master 1

A Minimum of 2 to 4 months of immersion in an academic or private research lab, in France or abroad

Master 2

Applied research project of at least a 6-month duration in an academic or private research lab

Admission

Admission requirements

Requirements

- Applicants must hold at least a bachelor's degree in chemistry, biology, and physics for the Master 1 level.

- Applicants must hold at least a 4-year university level in chemistry, biology, and physics for the Master 2 level

> ***In 2022-2023, the UPPA is opening a 5-year integrated Master's/PhD program that provides research-intensive training in multiple fields, called the Graduate Program GREEN (GRaduate school for Energetic and Environmental iNnovation). Several courses of study taught entirely in English are part of this program. The Graduate Program GREEN is open to high-potential students from a variety of scientific backgrounds who have completed their undergraduate training with the highest honors. To be selected, candidates must explicitly indicate in their letters of motivation their desire to integrate the Graduate Program GREEN, providing reasons for why they wish to participate in this research-focused PhD-Track.***

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**

How to apply

Apply here from October to March

Target

International and French students

Tuition Fees and partial exemptions

Go to the Tuition fee page

> ***The school partially exempts non-EU students from the differentiated fees for initial training enrolling in the Master's program.***

Student capacity

12

Prerequisites

Requirements

- Applicants must hold at least a bachelor's degree in chemistry, biology, and physics for the Master 1 level.
- Applicants must hold at least a 4-year university level in chemistry, biology, and physics for the Master 2 level

And after

Further studies

Prospects for employment or further study

Sectors

• Chemistry
• Energy (photovoltaic, batteries, fuel cells, artificial photosynthesis ..)
• Environment (non-polluting materials, pollution control materials and storage…)
• Aeronautics (composite materials, surface treatments ...)...
• Building (thermal and sound insulating coatings ...)
• Cosmetics & life science

Fields

- Research and Development

Positions

- Project Manager
- Senior manager in design and development (design engineer)
- Senior manager in production (process engineer, production engineer)
- Senior manager responsible for quality operations or even production management
- Technical Director (R & D)
- Teacher-researcher (possible at the end of a doctorate.)

Professional insertion

Positions

- Research and Innovation Engineer, PhD students
- Project Manager
- Senior manager in design and development (design engineer)
- Senior manager in production (process engineer, production engineer)
- Senior manager responsible for quality operations or even production management

Useful info

Contacts

Administration contact

Secrétariat physique

secretariat-physique@univ-pau.fr

Place

Pau

Campus

Pau

Program

1st semester

	Nature	CM	TD	TP	Crédits
Different kinds of materials and their properties	Teaching Unit				2 credits
Elaboration of materials 1	Teaching Unit				4 credits
Organic polymers	CE				2 credits
Inorganic materials	CE				2 credits
Environmentally sustainable chemistry	Teaching Unit				3 credits
Environmentally friendly design of materials	CE				2 credits
Green chemistry	CE				2 credits
Polymer science in the lab	Teaching Unit				2 credits
Biomimetism	Teaching Unit				4 credits
Modeling	Teaching Unit				4 credits
Language to choose	Choice				2 credits
English	Teaching Unit				2 credits
French for foreigner semestre impair	Teaching Unit				2 credits
Magnetic properties of materials	Teaching Unit				2 credits
Characterization methods 1	Teaching Unit				2 credits
X-ray diffraction	CE				2 credits
Structural analysis, scattering techniques	CE				2 credits
Coupling experience and theory	Teaching Unit				2 credits
Biomimetic peptide self-assembly for functional materials	Teaching Unit				2 credits
Cell Biology	Teaching Unit				2 credits

Biomimetism introduction and awarness	Teaching Unit	4 credits
Corporate world	Teaching Unit	2 credits
Projects managment and intellectual property	CE	2 credits
Composite materials 1	Teaching Unit	2 credits
Introduction to composite materials	CE	1 credits
Mechanical properties of composite materials 1	CE	1 credits
Intro to polymer physics	Teaching Unit	2 credits
Main polymer families and recycling	CE	2 credits
Electrochemical kinetics	Teaching Unit	2 credits
Computer programming (visio)	Teaching Unit	
Statistical thermodynamics (visio)	Teaching Unit	

2nd semester

	Nature	CM	TD	TP	Crédits
Physical chemistry of macromolecular solutions	Teaching Unit				2 credits
Academic and industrial internship	Teaching Unit				5 credits
Project	CE				1 credits
Industrial or academic internship	CE				3 credits
Materials chemistry in the lab	Teaching Unit				2 credits
Characterization methods 2	Teaching Unit				6 credits
Nuclear magnetic resonance (NMR)	CE				2 credits
Microscopies	CE				2 credits
Elaboration of materials 2	Teaching Unit				4 credits
Polymer chemistry	CE				2 credits
Sol-gel chemistry	CE				2 credits
Language to choose	Teaching Unit				2 credits

English	Teaching Unit	2 credits
French for foreigner semestre pair	Teaching Unit	2 credits
Electronic properties of materials	Teaching Unit	4 credits
Li-ion battery project	Teaching Unit	2 credits
Global Climate change (Climate Economics, Risk, Anthropocene)	Teaching Unit	2 credits
Project Biomim'expo	Teaching Unit	2 credits
Material corrosion	Teaching Unit	2 credits
Electronic and vibrational spectroscopies	CE	2 credits
Remarkable properties materials	Teaching Unit	2 credits
Theoretical spectroscopy	Teaching Unit	2 credits
Inorganic materials	Teaching Unit	4 credits
Metals and alloys	CE	2 credits
Ceramics	CE	2 credits
Composite materials 2	Teaching Unit	1 credits
Thermoset matrices	CE	1 credits

3rd semester

	Nature	CM	TD	TP	Crédits
Materials For Energy Storage And Conversion	Teaching Unit				4 credits
New materials	Teaching Unit				4 credits
Surface Chemistry And Int	Teaching Unit				4 credits
Multi-Scale Description of Complex systems	Teaching Unit				4 credits

Optical Properties Of Materials	Teaching Unit	4 credits
Language to choose	Teaching Unit	2 credits
English	Teaching Unit	2 credits
French for foreigner	Teaching Unit	2 credits
Methods And Techniques For Polymer-based Materials Synthesis	Teaching Unit	2 credits
Methods And Techniques For Polymer-based Materials Synthesis	CE	2 credits
Nanomaterials : from the laboratory to the application	Teaching Unit	1 credits
Polymers and the environment	Teaching Unit	2 credits
Natural Polymers - Biomass Valorization	CE	2 credits
Adhesion & Adhesives	Teaching Unit	4 credits
Theoretical Chemistry and Spectroscopies (RCTF)	Teaching Unit	4 credits
Theoretical chemistry applied to the study of materials (RCT)	Teaching Unit	4 credits
Polymers for living systems	Teaching Unit	2 credits
Introduction to biological soft matter	CE	2 credits
Imaging techniques for environmental samples and materials	Teaching Unit	2 credits
Industrial copolymers	Teaching Unit	1 credits
Industrial copolymers	CE	1 credits
Nanocomposites	Teaching Unit	1,5 credits
Nanocomposites	CE	1,5 credits
Nanomaterials	Teaching Unit	1,5 credits
Nanomaterials	CE	1,5 credits
Numerical methods	Teaching Unit	3 credits

Quantum reactivity	Teaching Unit	3 credits

4th semestre

	Nature	CM	TD	TP	Crédits
6 weeks - Introduction to laboratory research	Teaching Unit				6 credits
4 months - Internship in research in the fields of pol	Teaching Unit				24 credits
Professional itinerary 6 months Internship in industry	Teaching Unit				30 credits