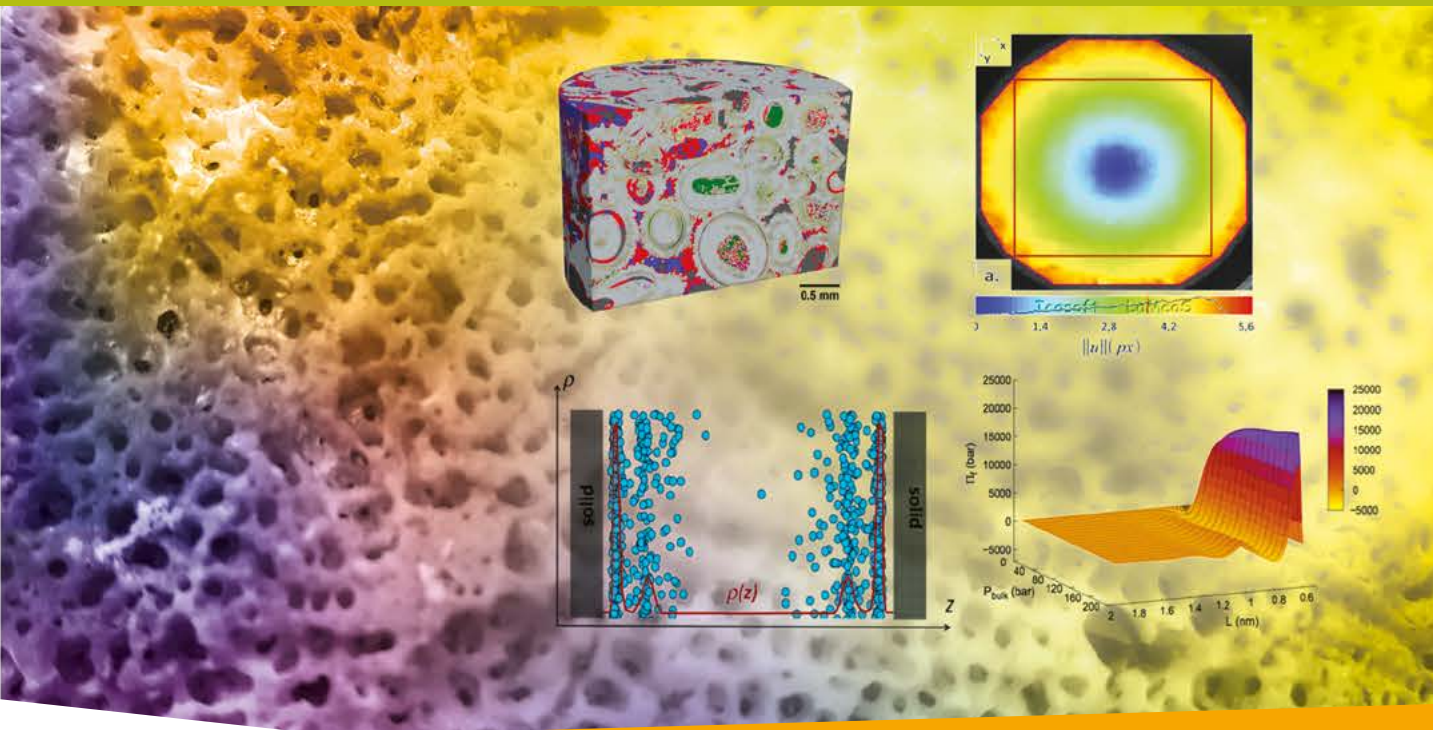


# Master's degree in Physics and Simulation in Civil Engineering

## Mechanics and Physics in Porous Media (MPPM)



<http://formation.univ-pau.fr/m-mppm>

## Overview

Understanding the mechanics, the physics and their couplings appearing in fluid-filled porous media is a key stone for solving forthcoming challenges in Energy and Environment. Indeed, porous media are ubiquitous in many natural and industrial systems of interest in various field of engineering such as: Civil Engineering, Mechanical Engineering, Chemical Engineering, Material Engineering, Petroleum Engineering, or Food Industry, to mention only a few.

The MPPM course focuses on the Mechanics and Physics in Porous Media. It encompasses their experimental characterisation by indirect porosimetry and direct imaging, the poromechanical behaviour modelling, the transport properties estimation, the fluid-solid couplings and the properties of confined fluids in porous media.

This international master's degree offers multidisciplinary key courses to achieve an advanced specialist level in all areas involving porous media such as geomechanics or physics of porous materials. It is suited for students planning both an academic or an industrial career and provides the theoretical basis and the practical expertise required to pursue in research, in R&D structures or in companies.

## Student Learning Outcomes

At the end of this program, the students in the Master of Mechanics and Physics in Porous Media will be able to:

- Justify a solid expertise in mechanics or physics of porous materials,
- Design and conduct experiments, analyze and interpret data,
- Review, analyze, and interpret the body of scientific literature, contemporary issues and innovations in physics and mechanics area,
- Plan and define a research or R&D project to understand a physical phenomenon pertaining to mechanics or physics of porous media.

## Prospects for employment or further study

### SECTORS:

- Civil engineering
- Mechanical engineering
- Material engineering
- Chemical engineering
- Petroleum engineering

### FIELDS:

- Research
- R&D structures

### POSITIONS:

- PhD student
- R&D Engineer



ISA-BTP - Anglet



Anglet coast

## Program objectives

- Prepare students at an advanced specialized level to meet present and future challenges in (geo)mechanics or physics of porous media,
- Develop engineering research skills to engage in quality and successful research,
- Prepare students for leading positions in industry and government Research and Development departments.

### SEMESTER 1 (SEPTEMBER – JANUARY)

#### Statistical thermodynamics, adsorption & interfaces

6 ECTS

- Statistical Thermodynamics and Thermodynamics of adsorption
- Practical approaches of adsorption properties

#### Characterization of porous media by direct and indirect techniques

6 ECTS

- Gas and mercury porosimetry
- X-ray spectroscopy and microscopy
- X-ray and neutron imaging techniques

#### Advanced mechanics and computational modelling

6 ECTS

- Non linear behaviour of materials : Plasticity, damage
- Numerical methods for non-linear problems

#### Poromechanics, fracture and transport

6 ECTS

- Effective stress, poromechanics and fracture mechanics
- Permeabilities. Reactive transport

#### Poromechanics, fracture and transport

6 ECTS

- Effective stress and poromechanics
- Fracture mechanics

#### Language

3 ECTS

- French (or Spanish) as a Foreign Language

#### Bibliography

3 ECTS

### SEMESTER 2 (JANUARY – JULY)

#### Research internship

30 ECTS

**Examples of internships proposed in 2018-2019 :** Use of sea-shells for environmental-friendly concretes and high-performance cement-based grouts, Hydrogen storage in innovative hybrid materials, Size effect on strength and fracture energy, Crystallisation-induced damage in heterogeneous rocks - Application to haloclasty.

The program is carried out in close collaboration with LFCR and SIAME laboratories where numerical and experimental tutorials will be performed. Students are integrated in the local research environment. They benefit from the G2MP facilities (laboratories) and assist to the scientific seminars of the research teams.

## Detailed Program Facts

**ACADEMIC YEAR :** Our full academic year runs from September to June

**APPLICATION DEADLINE :** Applications are opened from November to April

**HOW TO APPLY :** The application documents must be uploaded on the website : <https://aap-e2s.univ-pau.fr>

**PROGRAM INTENSITY:** Full-time

**DURATION:** 1 year

**CREDITS:** 60 ECTS

**LANGUAGE:** Fully taught in English

**TUITION FEES:** European: 256€/year  
Extra-european: 4200€/year

**LEVEL OBTAINED:** Master

**HEAD OF THE MASTER PROGRAM:**  
Professor David Grégoire

**HEAD OF THE MPPM COURSE:**  
Dr. Christelle Miqueu

**LOCATION:** College of Sciences and Technology for Energy and Environment on the Basque coast campus (Anglet, France)



## Admission requirements

### ENGLISH LANGUAGE REQUIREMENTS

Minimum required score CECLB B2 level in English

### ACADEMIC 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 CECLB B2 level in English.

Applicants must hold a M1 or a 4-year Bachelor of Engineering, Bachelor of Science or equivalent.

## Contact

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

**master.psce@univ-pau.fr**

**More information :**

**<https://formation.univ-pau.fr/m-mppm>**

**International Welcome Desk :**

**<http://univ-pau.fr/en/welcome-desk>**