

FICHE

FORMATION

Master 2 Biomedical Engineering M BIOS



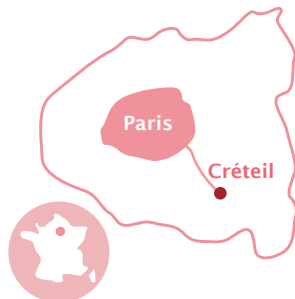
2022-2023



Mention Biologie-Santé



Créteil



only 20 minutes from
the heart of Paris



<https://sante.u-pec.fr/formation-initiale/master2-bio-sante-mbios>





Presentation

MBIOS meets the researchers' needs of joining multi-disciplinary *Research & Development* teams, in both “life sciences” and “engineering”.



Bioengineering is a growing field of *Research & Development*. MBIOS is concerned with

- Biomechanics
- Biomaterials
- Bioimaging

In each case, the association of “life sciences” and “engineering” is at the heart of innovation and new discoveries. This association has impacted the development of new fields such as regenerative medicine (which includes tissue engineering and the use of numerical simulation tools.)



Admission

The selection process is open to:

- holders of a four year university degree in sciences ;
- engineering students from “Engineering school” with “integrated preparatory classes” having successfully completed their first 4 years ;
- holders of an equivalent foreign diploma in accordance with the existing international agreements

Final date of enrolment: May 31st, 2023

Selection process: interviews in early June 23

Application process: ‘Admission’ tab
(top of MBIOS webpage)
<https://sante.u-pec.fr/formations/master/masters-2/master2-bio-sante-mbios>

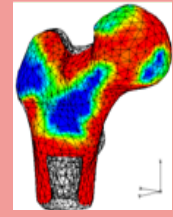
Head of MBIOS

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Engineering and Life Sciences - *field*

From an economic, industrial and research point of view, biomedical engineering is a scientific and technical sector with considerable value, considered to be vital to the development of many countries like France.



Engineering and Life Sciences - *at the UPEC*

With this in mind, the UPEC chose to unit internal forces in 2015 by creating :

- a new laboratory called “*Bioengineering, Tissues, Neuroplasticity*” whose aim is to bring doctors and engineers together. (<http://biotn.fr/>)
- the Master Biomedical Engineering

Students trained in MBIOS will be able to take part in the development of bioengineering research in medicine.

They will have a higher education research level in life sciences and engineering science. This combination is key issue to the development of medicine and biological sciences. It also has, a significant impact on the development of other related fields from engineering sciences to life sciences.

The complementarity of MBIOS is characterized by a good integration of the educational project based on a coherent set of researches in various complementary areas.

Each of the fields selected for MBIOS training is supported on the research level by a set of laboratories.

Hospital and research centers are well equipped with means, researchers and research professors who are accustomed to interdisciplinary work (biomechanics, biomaterials, bioimaging, tissue engineering ...).

Students of MBIOS will be trained for positions such as bioengineering researcher.

They will be ready to work in multidisciplinary teams either in

- public
- industrial laboratories
- hospital wards

The program is organized into 2 six-month periods (30 ECTS worth each)

- Semester 1: courses will be adjusted according to a student’s previous coursework in order to fill any gaps in training.
- Semester 2: MBIOS students will be required to do an internship in a research laboratory.



Course Program

1st semester

Courses in Life Sciences

Specialized coursework for engineering students

Period I

- cellular biology
- biochemistry
- anatomy and physiology

Courses in Engineering

Specialized coursework for life sciences students

Period I

- computing
- mechanics of materials
- mathematics and numerical analysis

Option courses in Bioengineering

Period II

- modelling and simulation in
- biomechanics biomaterials and biomimetics

- bioimaging
- Regenerative medicine engineering
- Biomechanics of movement

Mandatory courses in Bioengineering

Period II

- research project
- research in biomechanics

Mandatory courses in Methodology

Period II

- research methodology
- language and science communication

Period III

• annual organization of the International School in Biomedical Engineering at the end of the 1st semester: 5 days of seminars and conferences held by French and foreign researchers.

Each year, the International School in Biomedical Engineering focuses on topics in the fields of research and training of MBIOS in connection with the work of the host research teams.

Main courses

The main courses offered during the 1st semester concern biomechanics, biomaterials and bioimaging. These courses strongly reflect current research needs and are in agreement with the national and European research priorities of development in bioengineering for life sciences and medicine.

Biomechanics

These courses train students in biomechanics, which includes applications of mechanics and its methods to the biological and medical fields. It focuses on the comprehension of the operation of large physiological systems at a macroscopic scale and on a tissue level as well as their adaptation to damage, remodelling and repairing.

Biomaterials, biomimetics – Regenerative medicine

These courses train students to study different biomaterials and those through biomimetics, which are biologically inspired by studying pre-existing functioning devices in nature. Tissue engineering using cellular or genetic therapies will also be studied in the context of regenerative medicine.

Bioimaging

These courses train students to use dataprocessing software and applications dedicated to the biomedical field. Students will study the contribution of imaging methods (segmentation, classification, modelling, storage, visualization...) and machine learning to help in diagnosis, therapy, telemedicine, and computer-assisted surgery.

Each one of these specific courses is based on the work done in specific laboratories (CNRS, INSERM, University) and hospital departments (AP-HP).



Internship training Program

2nd semester

The 2nd semester is entirely devoted to a research project in a public laboratory (CNRS, INSERM, University...), a hospital ward or an industrial laboratory in France or abroad.

After MBIOS and completing their training with a PhD, students will have the ability to:

- Identify and develop methods of research, data collection and analysis
- Study and analyze the data and research findings
- Write reports, publications, research briefs
- Present and explain the scientific advances and research
- Advise researchers, institutions, and companies scientifically
- Supervise and carry out research and scientific study to explore, deepen and expand knowledge
- Enhance and disseminate the results to the scientific community, institutions or businesses
- Work with private and public research teams in the transfer frame technologies

or research and development projects

- Coordinate a project team, service, laboratory or research department.

The theoretical and procedural expertise is:

- Research methodology
- Statistical analysis
- Use of document management software

Activities and specific expertise is:

- Devise theoretical models (calculation, simulation, modelling...)
- Designing experimental models
- Develop and coordinate a research program
- Define strategic directions of research policy and evaluate scientific research
- Manage service or research laboratory

Industries concerned by MBIOS: l’Oreal, Essilor, Dassault systèmes, Innothera, Septodont, Medtronic, Stryker, Chanel...