



@cmb
@centuri-livingsystems.org

Luminy (Marseille)
Saint-Charles (Marseille)

TARGET AUDIENCE

Bachelor students in mathematics or statistics.
Bachelor students in Life Science

PREREQUISITE

For all, a good level in English.
For the math students, a good bachelor basics in mathematics or statistics.
For the biologists, a good basics in biology including knowledge in mathematics or statistics.

IN SHORT



Length of studies:
2 years



Number of credits:
120 ECTS



International
Mobility



Link with
research



Registration fees:
243€*



Apprenticeship
training



Internship &
projects



Code RNCP :
MAS :28082
BIP : 34271

HOW TO APPLY ?

Students can apply to CMB using either Etudes en France campus france procedure or MonMaster procedure.



* Price for initial training in 2023. Exemption for scholarship holders and work-study students.

Supported by **CENTURI**
TURING CENTRE
FOR LIVING SYSTEMS

MASTER COMPUTATIONAL MATHEMATICAL BIOLOGY

Interdisciplinary formation at the interface of mathematics, statistics, biology leading to careers in public or private research.

OBJECTIVES

The CENTURI Master of Computational and Mathematical Biology (CMB) is an interdisciplinary formation initiated by the Centuri Institute. It aims to teach the analysis and the modelling of complex systems biology to bachelor students with a background in mathematics or biology. While specialising on a major in their own field, students share courses and interdisciplinary projects.

COMPETENCE AND KNOWLEDGE

At the end of their training, future professionals will have acquired solid skills enabling them to :

For all students. Collaborating to a research activity as a part of an interdisciplinary group. Using and mastering the statistical methods and machine learning tools to analyse biological experimental data or help confronting mathematical models and biological systems. Discovering the research world with the research actors.
For the math students. Acquiring the biological concepts required to model living systems. Using and mastering the computational and mathematical methods and tools to elaborate and analyse models of biological systems (Ordinary or stochastic or partial differential equations, discrete dynamical systems). Choosing and implementing the methodology

adapted to the modelling of a given problem / biological system. Evaluating the feasibility and the efficiency of a computational choice for the analysis of a complex system.
For the biology students. Mastering the concepts of biology to model living systems. Using and acquiring the mathematics and computer sciences methods and tools required to simulate the dynamical behaviour of such biological systems (Ordinary differential equations, discrete dynamical systems). Dispose of a practical experience of collaborative research between laboratories of experimental biology and theoretical biology (bioinformatics, computer sciences, statistics).

SPECIFICITIES OF EDUCATION

The formation is deeply interdisciplinary. It gathers students with various background (mathematics, statistics, biology) while specialising on a major in their own field, students share courses and interdisciplinary projects. The formation is oriented towards research. The students discover the world of research through meeting with researchers, engineers, managers. They are initiated to the main actual issues in biology by following the seminars of

the Centuri institute. They are formed to the job as most of the course relies on research projects and presentations. Two internships in private or public research laboratories complete the training. The formation is turned to the international. The courses are totally taught in english. The master welcome students from any countries. Students can do their internship abroad.



CAREER PATH

The Master of Computational and Mathematical Biology leads to an Aix-Marseille University degrees and prepares students for scientific research.

This Master is structured around 2 different 2-year degrees: Statistics and Mathematical modeling or Computational Biology. These 2 majors lead students to address the new challenges of complex biological systems.

A bachelor in Mathematics or Statistics is required for the students applying to the Statistics and Mathematical Modeling path (MAS-CMB). They will receive a Master in Applied Mathematics, Statistics diploma (master Mathématiques Appliquées, Statistiques - parcours CMB)

A bachelor in life sciences (all fields with minimal basis in statistics) is required for the students applying to Computational Biology path (BIP-CMB). They will receive a Master in Biology and Integrative Physiology diploma (master Biologie Intégrative et Physiologie - parcours CMB).

The master can welcome 15 students in MAS-CMB and 10 students in BIP-CMB.

EDUCATIONAL PROGRAM

All students will have a common formation in Biology (Cell structure and function, Evolution, Immunology, Neurology, Dynamics of living systems), Computational issues (Python, R), Statistics (tests, machine learning), Mathematics (continuous and discrete modelling), Integrative biology, and will be prepared to their professional career.

MAS-CMB students will follow courses in Applied Mathematics (Optimization, linear algebra) and Statistics of data science. Students will have the choice to deepen their knowledge in statistics and big data or in theoretical and numerical analysis of deterministic partial differential equations (P.D.E.) or stochastic problems.

Statistics and big data will lead to exploration, analysis, interpretation and prediction of biological data. Courses will be shared with MSc "Applied Mathematics and Statistics" and particularly with the major Data Science.

Mathematical modelling will lead to analysis and prediction of biological systems. Courses will be shared with MSc "Mathematics and Applications" and particularly with the major ANADEAL in the second year.

BIP-CMB students will have a deeper training in biological processes (Development, Neurobiology, Immunology), Evolution, Bioinformatics and Statistical data analysis, Microscopy and image analysis, and the Advanced techniques in eukaryotic transgenesis.

Msc Biology and Integrative Physiology with the major "Integrative approach to life function" during semester 1 and with MSc "Structural biology and genomics" during semester 2 and 3.

OPPORTUNITIES AND PROFESSIONAL INTEGRATION

The master of Computational and Mathematical Biology prepares students for scientific research. With this Master's degree, graduates will be qualified for international research institutes as a PhD student or a Research engineer in data analysis, biological systems modelling, analysis of interaction networks, etc. Graduates also have the opportunity to join private companies' R&D departments in health care, pharmacology, biosystems and more generally to work on big data issues.

TIGER (Transform and Innovate in Graduate Education with Research) Scholarships :

Two scholarships will be awarded to CMB Master students for the University year.
The scholarship consists in 10 000 euros for one academic year and the possibility to get a room in a CROUS university residence.
CMB Scholarships are granted on academic results.
Students can apply to a CMB scholarship for both students using Etudes en France campus france procedure and Mon Master procedure.

Eligibility conditions:

- incoming Master 1 student
- not have been enrolled in a higher education institution in France
- not be French

To apply : <https://centuri-livingsystems.org/application-scholarship/>

