

# Excellence Programme

## STUDY GUIDE

### BIOINSPIRED CHEMISTRY

**Coordinated by  
University of Mons**



## 1. IDENTIFYING DATA.

· Programme Name.	Master in Bioinspired Chemistry (Master 2 level)
· Coordinating University.	University of Mons - UMONS
· Partner University Involved.	Poznan University of Technology (PUT), –University of Catania (UNICT), University of Mons - UMONS
· Programme Field(s).	Bioinspired systems, Biomimetics, Supramolecular Chemistry, Biomaterials, Biophysical chemistry, Functional Macromolecules, Nanomedicine, Biointerfaces, Sustainable & Environmental Chemistry, Smart Materials, Clean Energy, Catalysis
· ISCED Code.	ISCED 0531 (Master level)
· SDG.	Goal 3 Good Health and Well-Being Goal 7 Affordable and Clean Energy Goal 9 Industry, Innovation and Infrastructures Goal 10 Reduced Inequalities within and among countries Goal 12 Responsible Production and Consumption Goal 13 Climate Action

· Mode of Delivery.	On-campus, Hybrid, Summer School, Labs, Seminars, Research internship
· Language of Instruction.	English 100%
· Programme Dates.	September 2024 – August 2025
· Key Words.	Bioinspiration, Sustainable Chemistry

· Prerequisites and co-requisites.	Enrolled in a Master 1 (1 <sup>st</sup> year of Master) Background in Chemistry/Physics/Biology/Engineering
· Number of EUNICE students that can attend the Programme.	From 10 to 20 students

## 2. CONTACT DETAILS.

· Departments.	Poznan University of Technology, University of Catania, University of Mons
· Name of Lecturers.	Prof. Philippe Dubois, Recteur de l'Université de Mons, UMONS, Belgique
· E-mail.	philippe.dubois@umons.ac.be



### 3. PROGRAMME CONTENT.

The Master Program in Bioinspired Chemistry explores and takes inspiration from structures and assemblies found in Nature to design new approaches for facing challenges in health, energy, information technologies, materials, and catalysis. This emerging area implies a multidisciplinary approach gathering domains of (bio)chemistry, (bio)materials, supramolecular systems, macromolecules, nanomedicine, self-organization, and nanosciences. This master's degree aims at offering an educational background connecting the laboratory environment and the living world to mimic complex strategies elaborated by Nature, which represents infinite scientific and technological challenges. These challenges will be taken up through bioinspiration and biomimicry angles keeping in mind environmental awareness and ethics, while responding to ecological and sustainable transition challenges. This program offers a unique opportunity to explore and get inspired by living systems to develop cutting-edge technologies.

Programme Structure: full-fledged to be implemented when all legalities, operations, funding, accreditation, binding, and commitment are in place by EUNICE (60 credits):

A total of 60 credits (on-line and face to face) with:

- **6 credits for the autumn school**

A one-week summer/autumn school will be organized at the beginning of the academic year (September) during which basic seminars in the field of Bioinspired Chemistry and research activities that are developed in each University will be presented. Students will also be involved in a project based on existing literature. At the end of the school, students will be able to choose the topic of their Master thesis and to work on the related SOTA.

- **24 credits of elective courses**

To choose in a EUNICE list constituted by courses from each partner University (see Section 4). Students can customize their course program by choosing 24 credits from this list (at least 12 credits in their home University). Courses will be given during the period from September to December, either face-to-face (local courses) or online (partners courses).

- **30 credits for the Master Thesis**

The Master thesis involves research that must be conducted in one of the partner Universities, with a physical mobility of 3 to 5 months during the period February-June. The research topic should be chosen in agreement between the home institution and the host University.

### 4. LEARNING OUTCOMES.

The Learning Outcomes on each course will be developed on individual Course Study Guides. The learning outcomes will include a methodology process with selected courses in each item, in order to guarantee success for targeted Competence-based learning. Experimental courses in labs as well as industrial internships and/or visits in industries including a deep exchange with specialists in biotechnologies and bio-materials, will be developed to strengthen the bridge between academical knowledge and the private sector, making conditions for potential increase of capacity building.

Exhibition, technology survey with oral defense for evaluation will allow graduate students to valorise their outcomes in a specific field.

The sector of bioinspired chemistry has a potential leading role to play in addressing some of the most important challenges that humanity must solve, such as developing new biomaterials for health, drug-delivery systems, adaptive materials with life-like properties, improved catalysts that function in water, high-density information storage systems, etc. while responding to ecological and sustainable transition challenges. By working in this field, graduates can play a relevant role in social transformation, while developing professionally.

## 5. JOB, OCCUPATION.

Graduates of the Excellence Programme in Bioinspired Chemistry will find employment in both the private and public sectors. They will act as experts or project managers/officers in private companies from different sectors, such as: –R&D engineers, biomaterials, pharmaceuticals, nanomedicine, catalysis, etc. They will also be ready to be employed in the public sector and be ideally prepared for starting PhD studies in the field of bioinspired chemistry and biomaterials after graduation, ideally within the EUNICE consortium.

## 6. PROGRAMME ORGANISATION.

### MODULES.

Institution	Course	ECTS
UNICT	Advanced biochemistry	6
UNICT	Physical chemistry of biological systems and biointerfaces – Nanomedicine and theranostics	6 (3+2+1)
UNICT	Rational drug design	6
UNICT	Sustainable industrial chemistry	9 (6+3)
UNICT	Principles of biological physical chemistry	6 (4+2)
UMONS	Bioinspired supramolecular chemistry	4
UMONS	Physical chemistry of the living organisms	4
UMONS	Biomacromolecular engineering	4
UMONS	Macromolecular biochemistry	4
PUT	Environmental protection and green chemistry	2
PUT	Accidents in the process industry or Risk analysis in the chemical industry	1



PUT	Characterization techniques of materials (biomaterials)	3
PUT	Biomaterials	3
PUT	Introduction to biotechnology	5
PUT	Modeling and simulation	2
PUT	Selected aspects of modern chemistry	2
PUT	Technological project	2

## 7. ASSESSMENT METHODS AND CRITERIA.

- Students' assessment:

The evaluation of students will be course dependent. The modalities will be described in the related study guide at the beginning of each academic year, and be shared on the EUNICE Moodle platform. Internal rules shall be flexible considering the potential differences between assessment methods and timelines between IES universities.

The courses evaluation may comprise different components:

- An exam organized in-session or out-of-session by the University delivering the course, preferably in a synchronous mode (i.e. students following the course but staying at different Universities take the exam at the same time) or in asynchronous mode in case of agenda issues (this situation should be avoided as much as possible in order to prevent the increase of the burden for teachers). This exam shall be organized in hybrid mode (students taking the exam in F2F, others remotely): this could be done by favouring oral exams, or by using Digital tools such as Quizizz, Kahoot, Wooclap, or similar ones.
- A deliverable to be submitted by the students during the semester, or by the end of the semester: a report, an online presentation, etc. These deliverables could be related to lab sessions, projects, challenges, etc.

The Summer School could be evaluated through a short-term on-site challenge, during which the students could work by teams. The evaluation would be based on a pitch presentation by each of the student teams, in front of a jury made of the staff of the IES universities participating to the Summer School. Another possibility could be to grant the 6 ECTS of the Summer School to students based on active participation only (without evaluation per se).

Master Theses would be prepared at the University of the main supervisor and evaluated according to the University rules. Co-supervision between partner Universities is very welcome: one supervisor for the main supervising University and a co-supervisor from another partner University to boost collaborations.



Given the differences between evaluation and teaching regulations in the respective Universities, a Pedagogical Workshop Preparation for the team members will be organized before the first intake of students.

- Programme assessment:

We will develop our assessment based on the learning objectives, outcomes of planned units, and programme Key Performance Indicators or KPIs (such as number of enrolled students from within the EU or outside the EU, number of applicants, number of scientific publications authored by our students, etc.). A board in charge of the internal quality monitoring of the programme will be established and will take care of these aspects. It will comprise representatives of each of the IES universities.

## OBSERVATIONS.

- > Selection procedure:

The Master is open to all European students. However, priority will be given to students from partner Universities and from Universities of the EUNICE network. Candidates shall provide the following documents when applying to the programme:

- a copy of the bachelor diploma/certificate
- a proof of enrolment in a Master program of a European University
- a transcript of records (ToR) of Bachelor level
- an English-Language certificate attesting their proficiency
- a one-page (A4) motivation letter

The access to the Master's program will be granted upon selection by a committee composed of teachers from partner Universities. The selection criteria will include proficiency in English (B2 level). The certification in English could be provided by the applicant's home University or based on an external evaluation such as TOEFL or Cambridge English Certificate.

- > Diploma

After having successfully completed the Master in Bioinspired Chemistry, students will be granted Master with a diploma from their home University (i.e. where the student is enrolled), together with a certificate of success from this specific Excellence Program.

- > Mobility

The program should be covered by an ERASMUS+ mobility agreement between the 10 EUNICE institutions to allow all EUNICE students to participate. For each student, a learning agreement will be generated following the ERASMUS+ rules allowing for a diploma in the home institution of the student.

Depending on the student enrolment two situations can appear:



1. The student is enrolled in one of the partner Universities: the learning agreement should cover the 12 ECTS of elective courses that will be provided by the other institutions + 30 ECTS research internship.
2. The student is enrolled in a EUNICE university which is not partner of the program or is coming from outside the EUNICE network: the learning agreement should cover a 60 ECTS mobility in one of the partner universities. In that case, it will not be compulsory for the student to realize his/her Master thesis in another university since he /she will already be in a mobility program.

#### 8. BIBLIOGRAPHY AND TEACHING MATERIALS.

Provide a list of the (most important) literature that students are required or recommended to read.

