Erasmus+

BIOPHAM

Bio & Pharmaceutical materials science
EUROPEAN MASTER

SCAN ME !

Università di Pisa

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

UNIWERSYTET ŚLĄSKI
W KATOWICACH

Université de Lille

http://master-biopham.eu

5/12/2025

Frédéric Affouard frederic.affouard@univ-lille.fr

Professor at University of Lille (France)
Physics Department – Faculty of Sciences and Technologies

Research activities on Pharmaceuticals:
Physical states (crystal/amorphous) & Transformations
Small molecules, polymers and proteins

Team leader "Therapeutical Molecular Materials"
laboratory http://umet.univ-lille.fr

Coordinator of several European INTERREG 2-Seas projects
IMODE:Innovative multi-component drugs and medical devices
http://www.project-imode.eu/
Multidisciplinary (Materials science, Pharmacy, Medecine)
11 partners (academics, industries, hospital) in France/UK/Belgium

Coordinator of several research projects with Industries
(AstraZeneca, Janssen Pharmaceutica, Servier, Roquette, +SMEs)

Coordinator of the Erasmus Mundus Master BIOPHAM
Bio&Pharmaceutical Materials Science since 2020
http://master-biopham.eu

BIOPHAM → A worldwide unique training programme in materials science (physics-chemistry) focusing on pharmaceuticals

BIOPHAM JOINTLY OPERATED BY 4 PARTNERS UNIVERSITIES

BIOPHAM 1 [2020-2026] : 4 cohorts recruited
86 students total from 33 different countries

France	Albania	Algeria	Bangladesh	Iran	Cameroon	Brazil	Georgia	Russia
Ireland		Egypt	China		Ghana	Columbia		
Italy		Jordan	Philippines		Nigeria	Costa Rica		
Spain		Syrian	India		Uganda	Cuba		
Turkey			Indonesia			Ecuador		
			Kazakhstan			Mexico		
			Pakistan			Salvador		
			Mongolia			Venezuela		

https://erasmus-plus.ec.europa.eu/programme-guide/part-a/eligible-countries

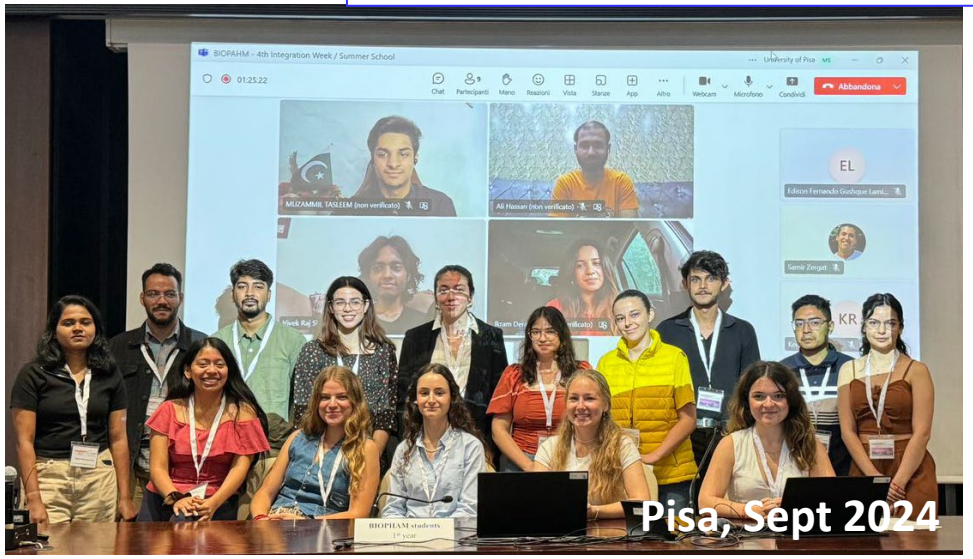
BIOPHAM has just been renewed

BIOPHAM 2 [2025-2031] : 4 cohorts to be recruited ☺

Pisa, Sept 2021


Pisa, Sept 2022

The BIOPHAM programme starts by an INTEGRATION WEEK



Pisa, Sept 2024


Pisa, Sept 2023

It continues with memorable moments

…

Have a look to testimonies on the BIOPHAM website ☺

https://www.master-biopham.eu/testimonies

It concludes with a very emotional graduation ceremony

GRADUATION CEREMONY COHORT 3
Barcelona, July 2025

What students are doing after the BIOPHAM training programme ?
Based on Alumni from Cohort 1 and 2
Statistics made in February 2025 (to be updated)

1st cohort [2021 – 2023]
15 students total

- 80% PhD
- 20% Not performing a PhD
  (job in a company, research fellowship in Academia)

2nd cohort [2022 – 2024]
26 students total

- 62% PhD
- 38% Not performing a PhD
  (job in a company, Research Engineer/Research fellowship or lecturers in academia)

WHAT IS BIOPHAM EXACTLY ?

BIOPHAM

Bio & Pharmaceutical materials science

EUROPEAN MASTER

This is the important word !

BIOPHAM is basically a Master in Materials Science
(physics-chemistry of materials)
focusing on pharmaceutical and biopharmaceutical materials

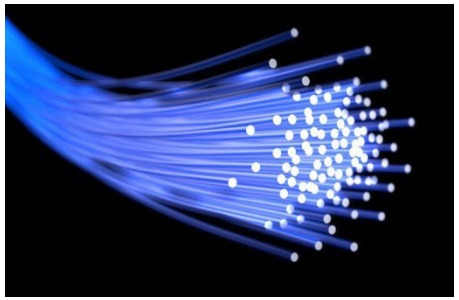
BIOPHAM IS NOT a Master in: **Bio**logy, **Bio**chemistry, **Bio**technology, **Bio**medical sciences, **Pharma**cy, **Pharma**ceutical sciences,…
(in which one may have some Materials science courses)

Targeted students: Bachelor in Physics, Chemistry, Materials Science, Biomaterials, Nanosciences,…or related fields

Materials science: the science that is interested in materials :o)

Interdisciplinary field : Physics + Chemistry

"materials" is usually associated to metals, polymers (plastics), glass, ceramics,…

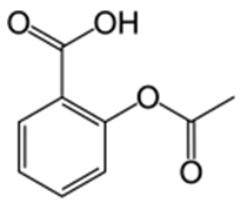


Drugs are materials (small organic molecules, polymers and bio-polymers)

One can apply « materials science » approaches to drugs

Bringing a drug to market is a long and costly process…

New Chemical Entity (NCE)



Early stage development

Pre-clinical Phase

Clinical Phase

Regulatory Approval

Marketed product

MATERIALS SCIENCE MATTERS !!!!

solubility, physical states, crystal, polymorphism, polyAmorphism, glass, stability, molecular mobility, out-of-equilibrium, mechanical properties, small molecules, polymers, proteins, biomaterials,…

It is better to identify "problems" at start
Than after 10 years of development and after spending 2 billions $ ☹

Pharmaceutical companies have understood it and are supporting BIOPHAM

BIOPHAM
Bio & Pharmaceutical materials science
EUROPEAN MASTER

21 large and small partners companies are BIOPHAM associated partners

Specialized seminars & lectures
Work placements – Short & Long internships

AKERN Italy

Farmigea Italy

Servier France

ALMIRALL Spain

UCB Pharma Belgium

Janssen Pharmaceutica Belgium

Xedev Belgium

Zentiva Czechia

Minakem France

Roquette France

IBI Italy

Lattice Medical France

MyBiotech Germany

Linari Engineering Italy

AstraZeneca Sweden

Spartha Medical France

BioZoon Germany

Physiolution Germany

Audio Technologies Italy

Lusochimica Italy

Cellbox Lab Latvia

What is the initial training of some scientists working in Pharma industries ?

- Associate Principal Scientist AstraZeneca
- Senior scientist AstraZeneca
- Head of Solid State Department Technologie at Servier
- Global Head Technical R&D at Novartis
- R&D scientist at Evotec
- R&D scientist at Johnson & Johnson
- Manager of the Functional Properties Analytical Laboratory R&D at Roquette
- Head of Section at Sanofi Solid State

Master in Physics, Chemistry or Material Sciences

Not in Pharmacy !

They just learn "pharmacy " on the job !

Quote from a scientist (with a background in chemistry) working in a big pharma company:

"Pharmaceutical development is far too serious to be left only in the hands of pharmacists"

BIOPHAM

Bio & Pharmaceutical materials science

EUROPEAN MASTER

It exists many Masters in Materials Science & Masters in Pharmacy

→ No Master at the interface between Materials Science and Pharmacy !

BIOPHAM → A very unique specialized training

Survey of the existing Masters worldwide:

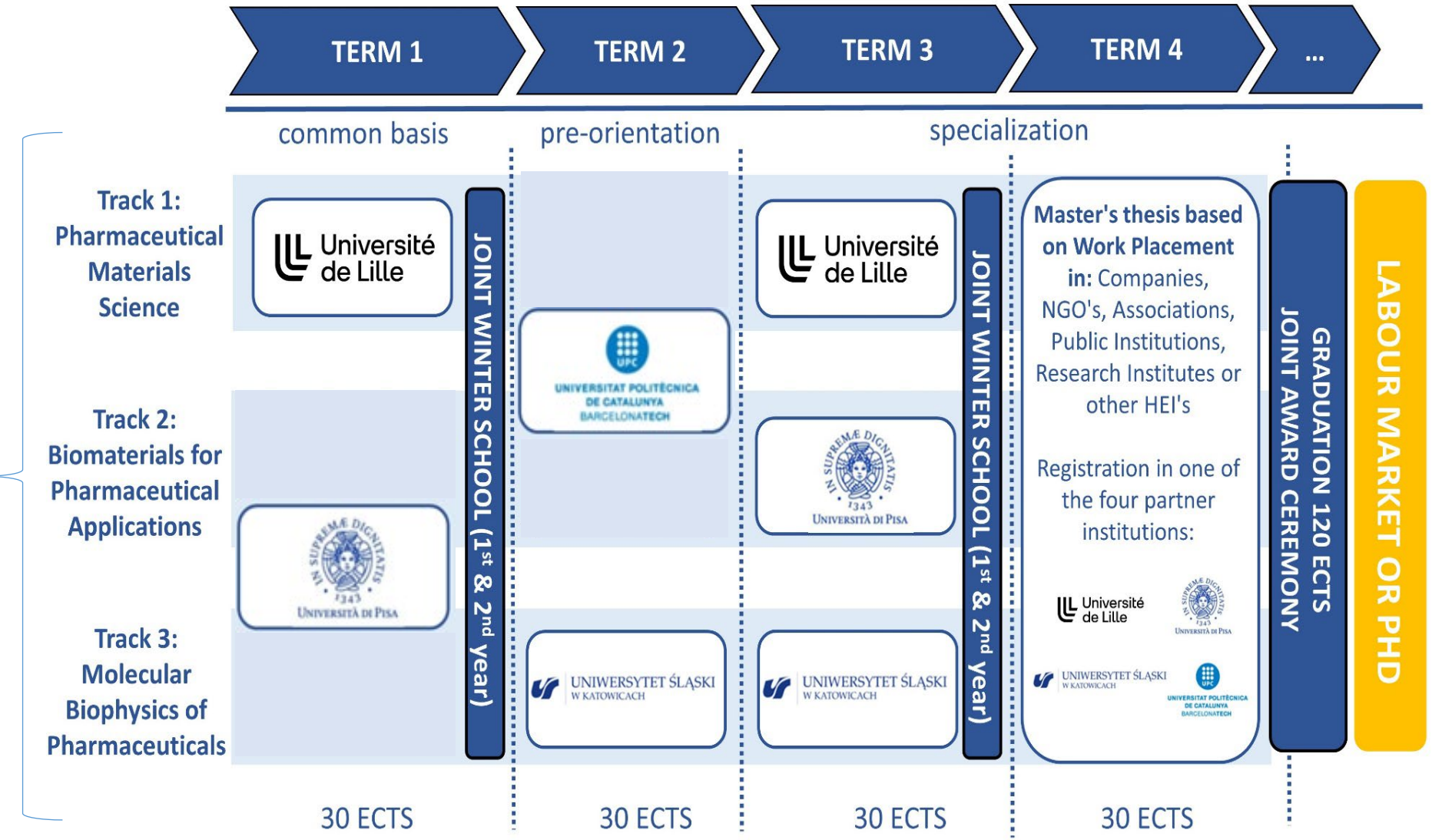
https://eacea.ec.europa.eu/erasmus-plus/library/

https://www.findaMasters.com

https://www.Mastersportal.com

…

Mobility scheme
3 specialised Tracks

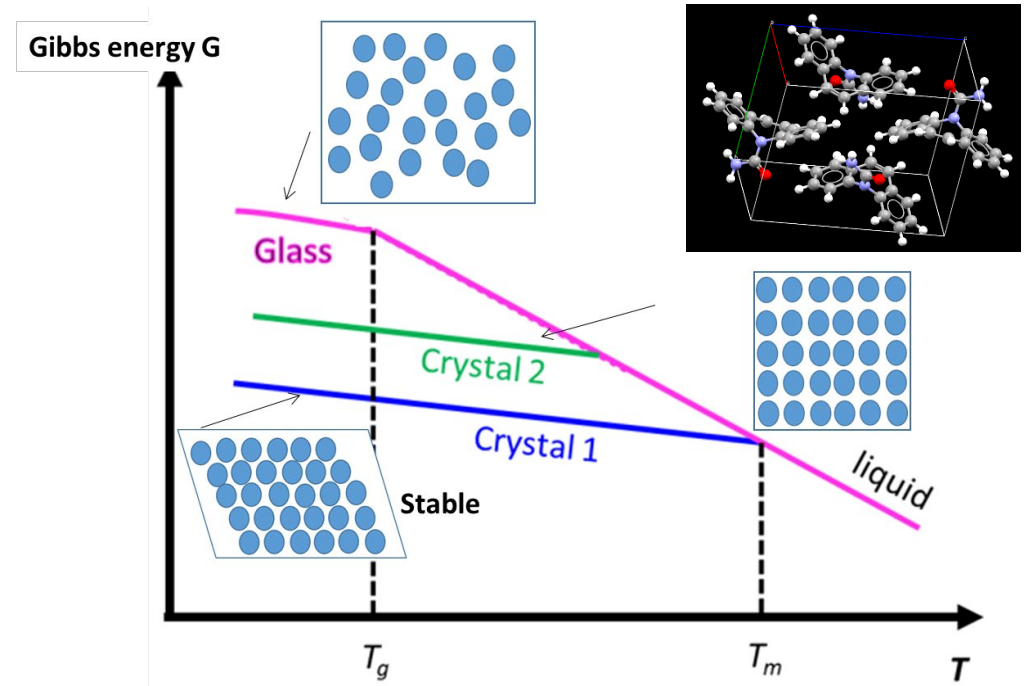


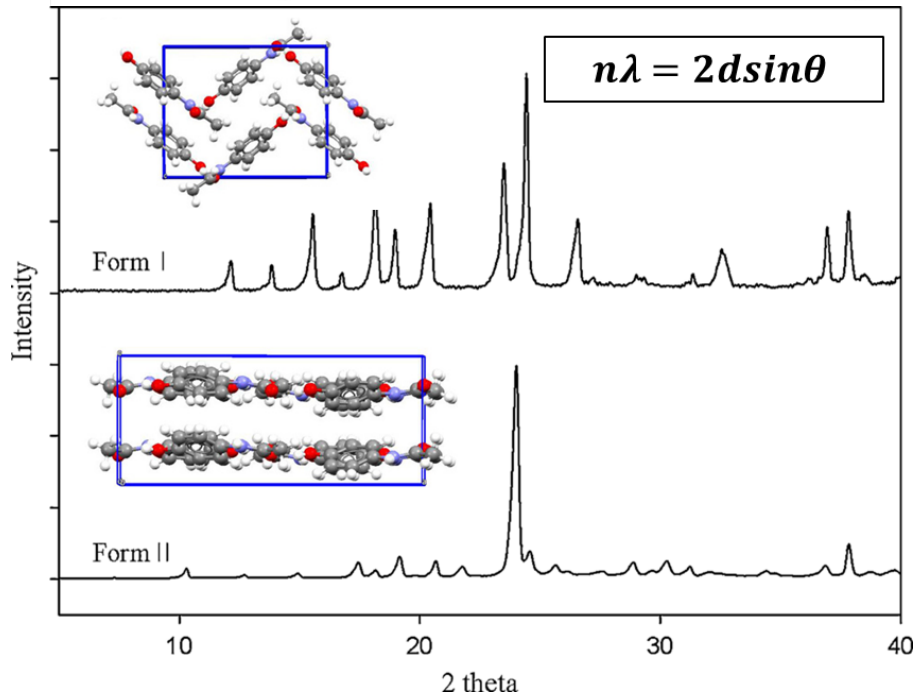
Track 1: Pharmaceutical Materials Science

TERM 1 | TERM 2 | TERM 3

Université de Lille — UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH — Université de Lille

- Specialized training focused on the core of "**materials science**"
- **Physical states** (perfect and imperfect crystals, nanocrystals, and amorphous states)
- **Phase transformations** (crystallization/melting, vitrification)
- **Structural, Dynamical, Thermodynamical properties**
- **Solid-state physical characterization**: X-ray powder diffraction, thermal analyses (DSC, TGA), Raman, infrared and THz spectroscopies, optical microscopy, electron microscopies (TEM, SEM)
- **Molecular modelling** (Molecular Dynamics & Quantum calculations) and **Artificial Intelligence**





Université de Lille

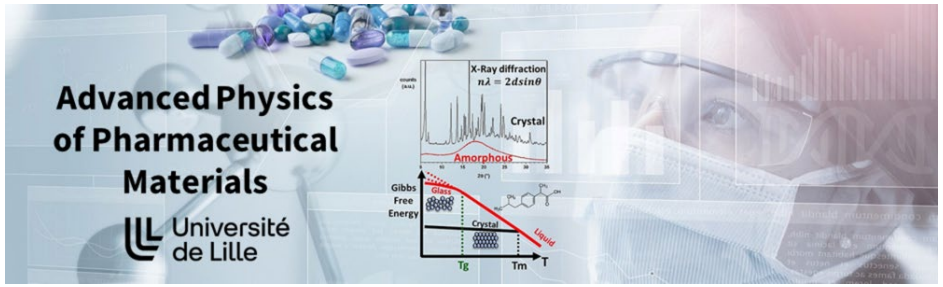
Master of fundamental and applied physics
Physics Department (Faculty of Sciences & Technologies)
College of Pharmacy

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master of Engineering Physics
Department of Physics

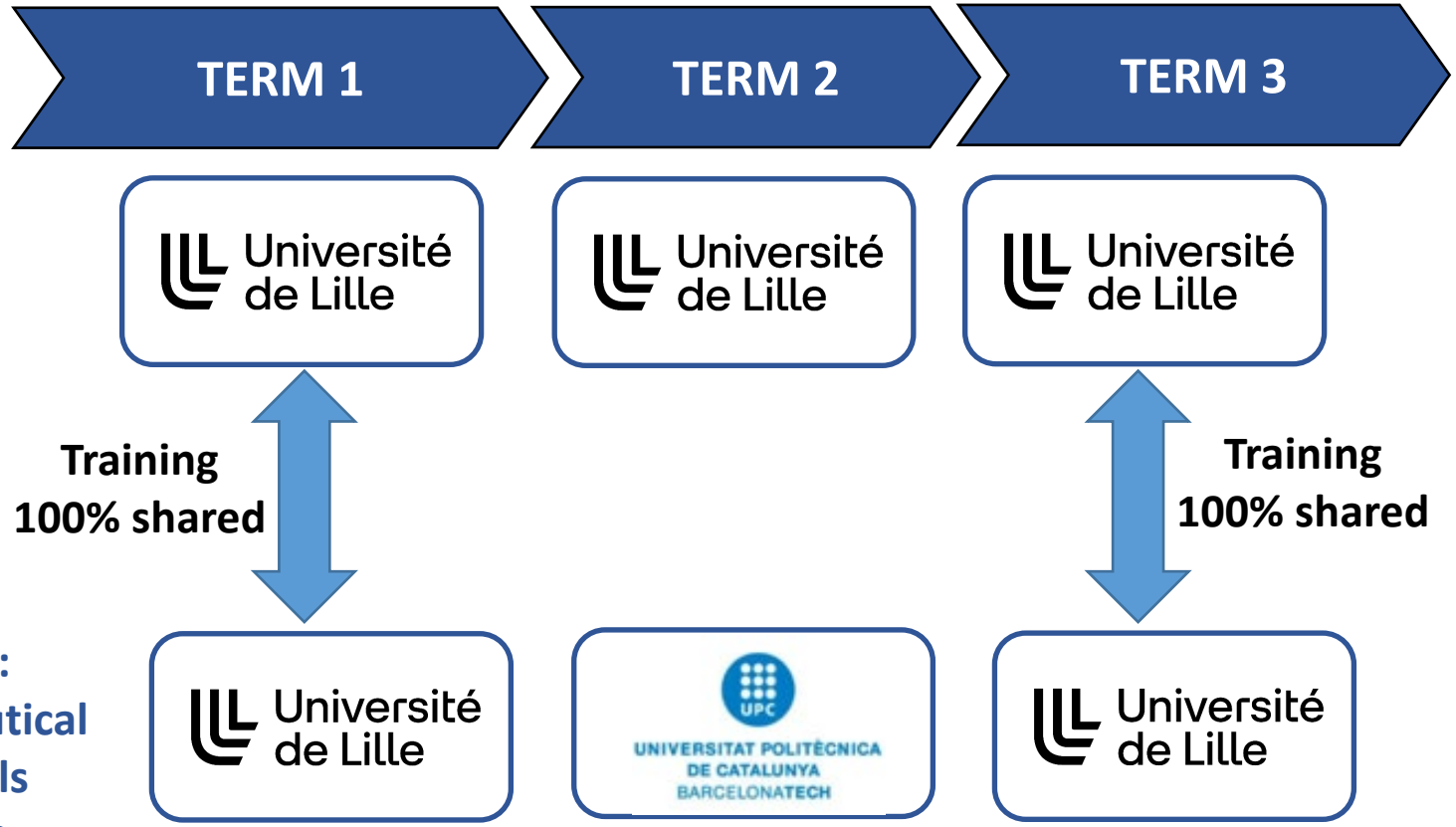
An alternative to BIOPHAM at University of Lille (France)

https://master-physique.univ-lille.fr/en/master-tracks/a2pm-advanced-physics-of-pharmaceutical-materials



BIOPHAM
Bio & Pharmaceutical materials science
EUROPEAN MASTER

Track 1: Pharmaceutical Materials Science

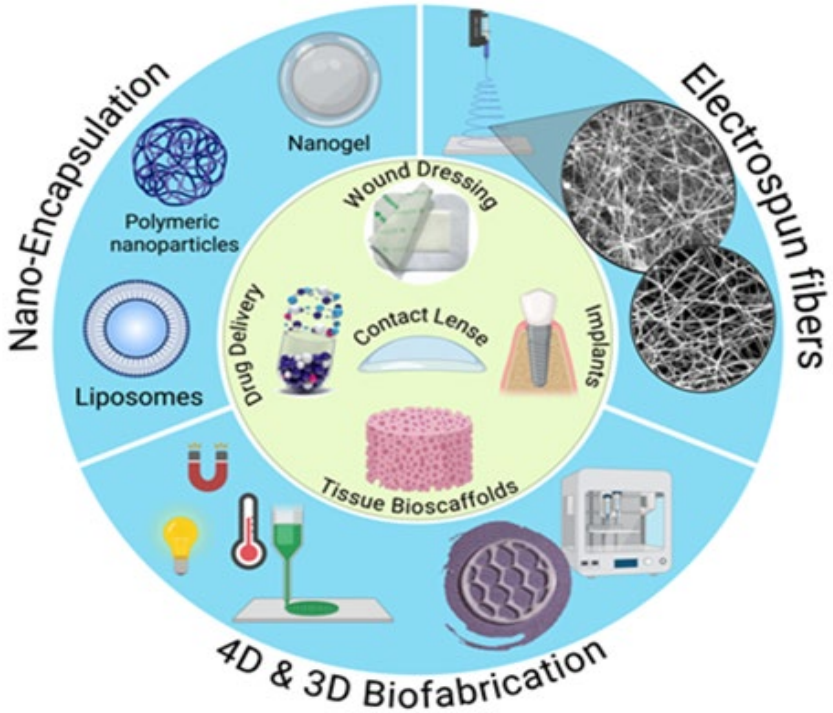


Track 2: Biomaterials for Pharmaceutical Applications

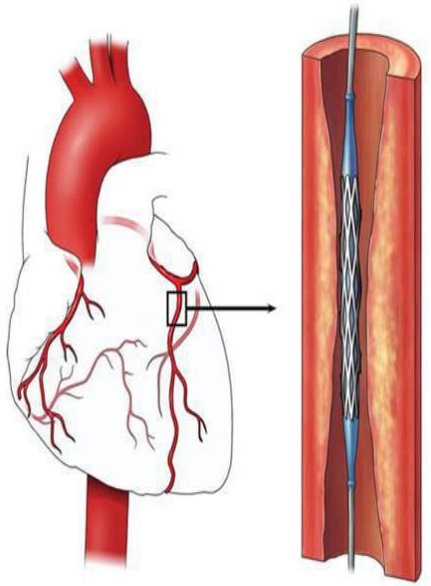
TERM 1 — Università di Pisa

TERM 2 — Universitat Politècnica de Catalunya BARCELONATECH

TERM 3 — Università di Pisa



- Specialized training on the fundamental principles of **biomaterials**
- **Advanced (bio)fabrication techniques** (from macro-to-nanoscale), **modern analytical, structural and imaging techniques for characterization of biomaterials** & **Modelling techniques**
- Understand the **key properties of biomaterials** and their relevance to **biomedical applications**
- Explore the **applications in drug delivery, regenerative medicine, and pharmaceutical technologies**



Università di Pisa

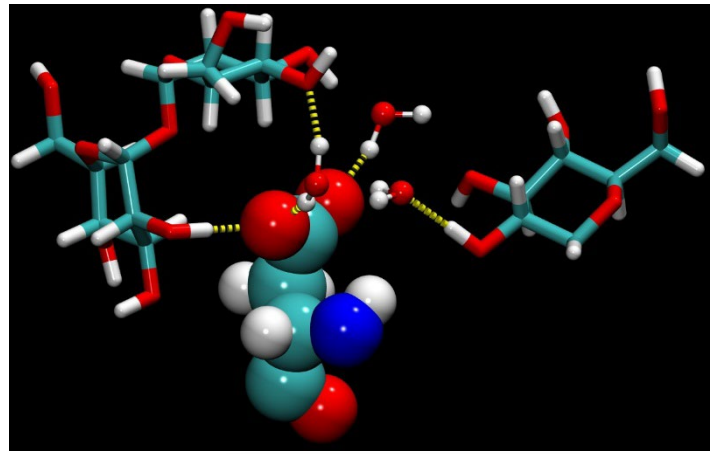
Universitat Politècnica de Catalunya BARCELONATECH

Master's Degree in Materials and Nanotechnology
Departments: Physics, Chemistry, Information Engineering and Civil & Industrial Engineering
Scuola Normale Superiore of Pisa

Master of Engineering Physics
Department of Physics

Track 3: Molecular Biophysics of Pharmaceuticals

TERM 1 | TERM 2 | TERM 3



- Structure, dynamics, and interactions of **biomolecules and biopharmaceuticals**.
- Expertise on **advanced techniques** such as freeze-drying, spray-drying, supercritical fluid drying, and hot melt extrusion techniques.
- **Solid understanding of processes** like freezing, thawing, interfacial stress, and interactions with specific solvents; rheological properties.
- **Knowledge of stabilization mechanisms by bioprotectants** (sugars, polymers)
- **Experimental techniques**: microcalorimetry, infrared spectroscopy, and Raman scattering.
- **Numerical techniques**: Stochastic dynamics, Machine learning and data-driven techniques

UNIWERSYTET ŚLĄSKI W KATOWICACH

Master (Field: "biophysics")
Institute of Physics, Faculty of Science and Technology

UNIVERSITÀ DI PISA

Master's Degree in Materials and Nanotechnology
Departments: Physics, Chemistry, Information Engineering and Civil & Industrial Engineering
Scuola Normale Superiore of Pisa

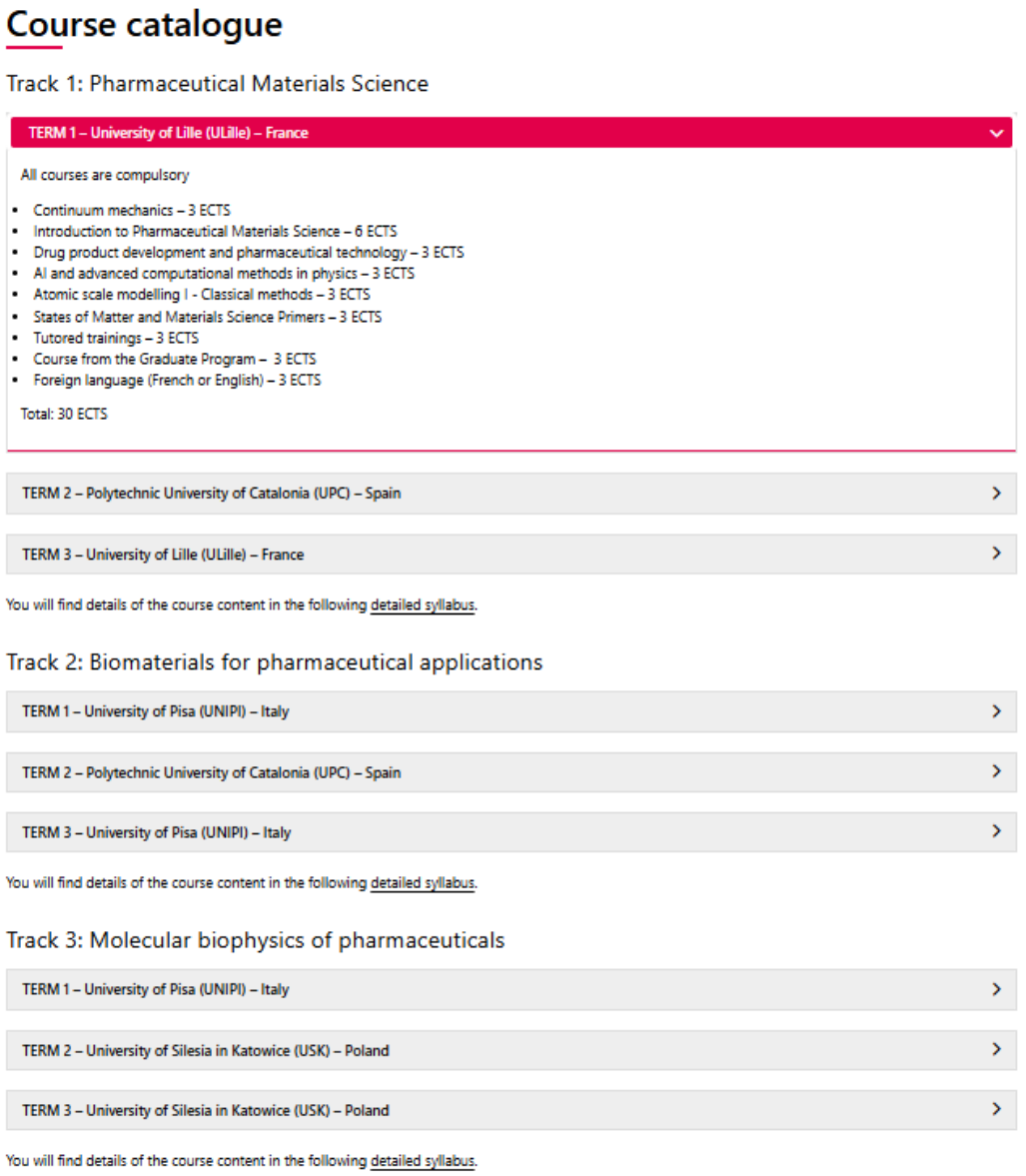
BIOPHAM

Bio & Pharmaceutical materials science
EUROPEAN MASTER

SCAN ME !

http://master-biopham.eu

The list of courses and syllabi are available on the BIOPHAM website



Course catalogue

Track 1: Pharmaceutical Materials Science

TERM 1 – University of Lille (ULille) – France

All courses are compulsory

- Continuum mechanics – 3 ECTS
- Introduction to Pharmaceutical Materials Science – 6 ECTS
- Drug product development and pharmaceutical technology – 3 ECTS
- AI and advanced computational methods in physics – 3 ECTS
- Atomic scale modelling I - Classical methods – 3 ECTS
- States of Matter and Materials Science Primers – 3 ECTS
- Tutored trainings – 3 ECTS
- Course from the Graduate Program – 3 ECTS
- Foreign language (French or English) – 3 ECTS

Total: 30 ECTS

TERM 2 – Polytechnic University of Catalonia (UPC) – Spain

TERM 3 – University of Lille (ULille) – France

You will find details of the course content in the following detailed syllabus.

Track 2: Biomaterials for pharmaceutical applications

TERM 1 – University of Pisa (UNIPI) – Italy

TERM 2 – Polytechnic University of Catalonia (UPC) – Spain

TERM 3 – University of Pisa (UNIPI) – Italy

You will find details of the course content in the following detailed syllabus.

Track 3: Molecular biophysics of pharmaceuticals

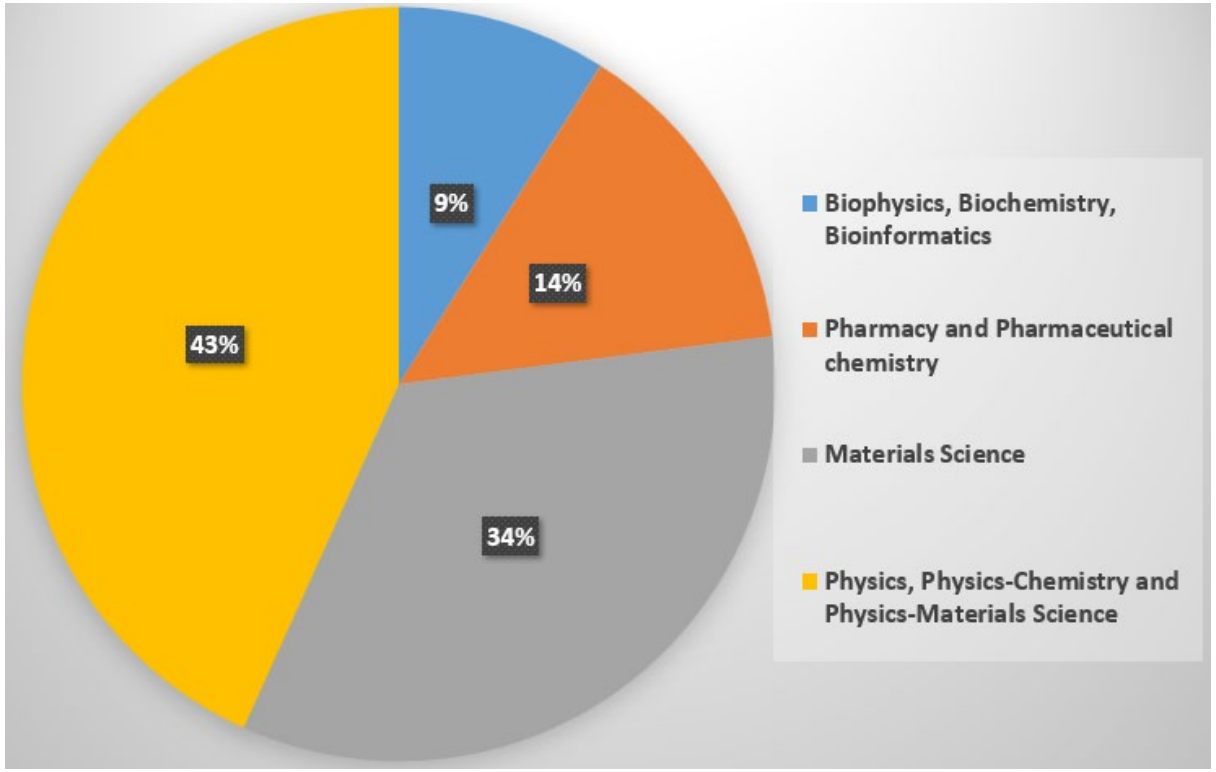
TERM 1 – University of Pisa (UNIPI) – Italy

TERM 2 – University of Silesia in Katowice (USK) – Poland

TERM 3 – University of Silesia in Katowice (USK) – Poland

You will find details of the course content in the following detailed syllabus.

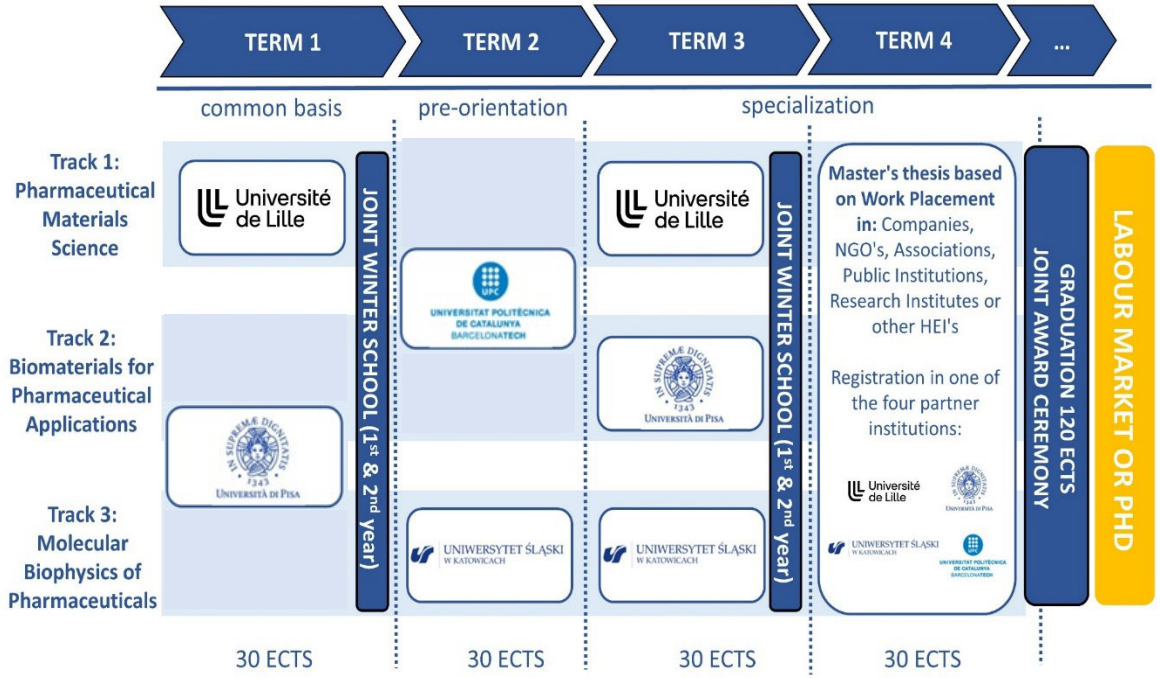
Breakdown of the core fundamental and specialized courses offered in the BIOPHAM training programme



This breakdown does not related to the type of studied systems (small molecules, polymers, proteins, hybrid systems) !
Ex: A course classified in “Physics” or “ Materials Science” can focus on proteins !

1 Master
→ 2 to 3 degrees ☺

Students obtain the degree from all visited universities (Term 1 to 4)



Name of institution	Title of degree awarded in English
University of Lille (ULille) FRANCE	Master of Sciences, Technologies, and Health, specialization in Fundamental Physics and Applications – Track: Bio and Pharmaceutical Materials Science
University of Pisa (UNIPI) ITALY	Master Degree in Materials and Nanotechnology
University of Silesia in Katowice (USK) POLAND	Master (Field: “biophysics”)
Universitat Politècnica de Catalunya (UPC) SPAIN	Erasmus Mundus Master in Bio and Pharmaceutical Materials Science (BIOPHAM)

+ joint diploma supplement: Providing detailed information about the student’s academic programme and achievements

What support BIOPHAM can offer to students ?

All students accepted into the EMJM BIOPHAM programme will benefit from the following support throughout the two years of the programme:

- **Tuition and Registration fee waiver** in all visited universities (University of Pisa, Polytechnic University of Catalunya, University of Silesia in Katowice or University of Lille)
- **Comprehensive health insurance**
- **Financial support** to attend key events (joint winter courses, award ceremony)
- **Additional support for special needs**, available upon request, for students with disabilities or sensory impairments: [€3,000 to €60,000] per student

Scholarships: By applying to the BIOPHAM Master programme, students can also apply for a scholarship of €1,400 / month during the 2 years of the training programme

Financial support for special needs : Contribution to cover the individual needs of students with disabilities (e.g. long-term physical, mental, intellectual, or sensory impairments): assistance such as by third persons, adaptation of work environment, or additional travel/transportation costs…

What are your chances ?

INTAKE	Number of applications received	Number of students recruited	% success
1 [2021 – 2023]	188	15	8 %
2 [2022 – 2024]	200	26	13 %
3 [2023 – 2025]	380	25	7 %
4 [2024 – 2026]	415	21	5 %

Average age
Intake 1 → 23.4
Intake 2 → 23.9
Intake 3 → 24
Intake 4 → 23.6

Gender ratio Male/Female (%)
Intake 1 → 52/48
Intake 2 → 46/54
Intake 3 → 40/60
Intake 4 → 35/65

5 [2026 – 2028]	?	About 20: 12 with scholarship 8 with no scholarship	?

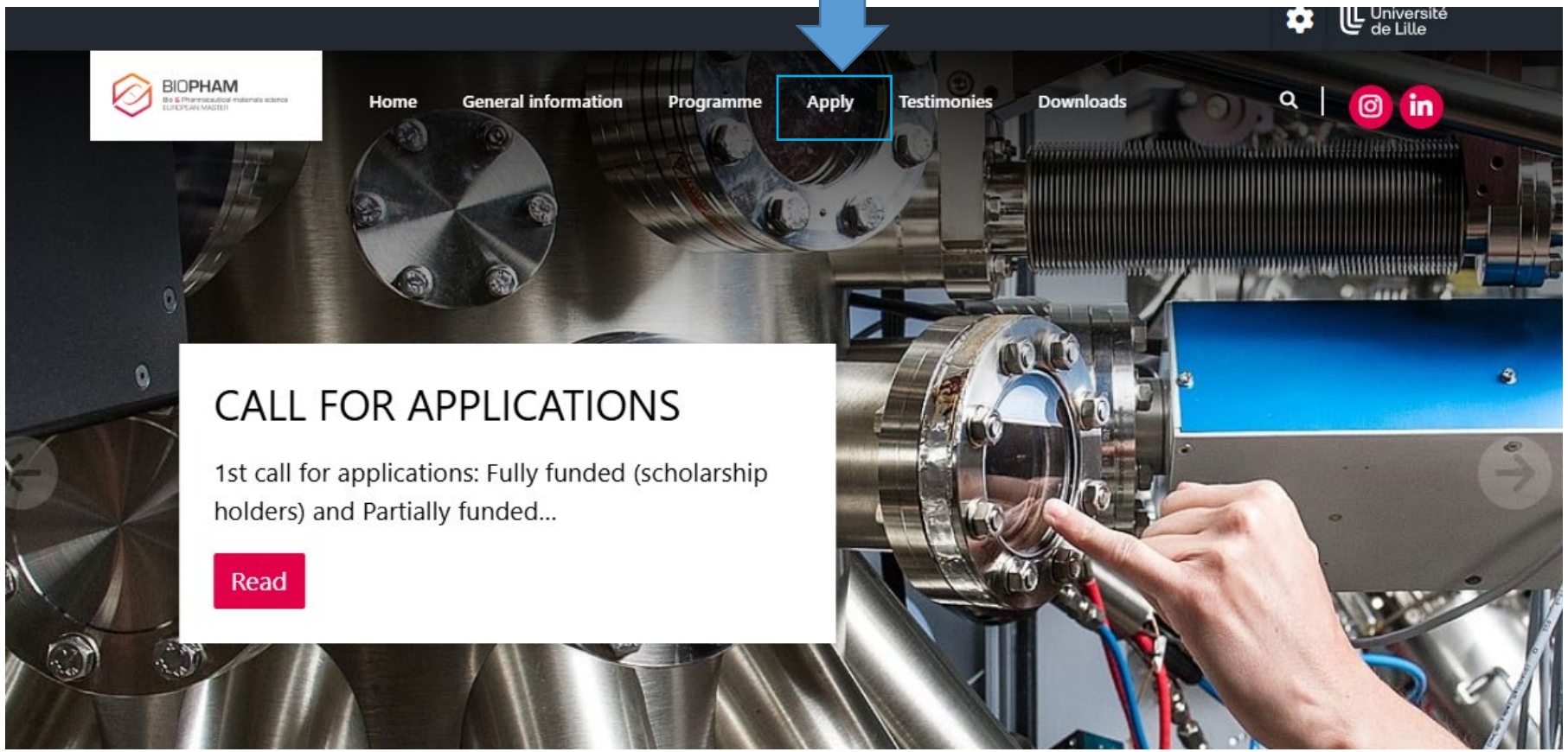
To get a scholarship: very (very) competitive !

To join without scholarship: you just need to be a « good student » !

HOW TO APPLY TO BIOPHAM ?

https://www.master-biopham.eu

Click here !



SCAN ME !

IMPORTANT DATES

2 Calls for admission in Cohort 5 starting in September 2026

Call 1: Fully funded (with scholarship) and partially funded (no scholarship)

- Opening: November 1st 2025 (10:00 Brussels time)
- Deadline for electronic submission: February 1st 2026 (23:59 Brussels time)
- Interviews : March 2026
- Admission decision: Beginning of April 2026

Call 2: Partially funded (no scholarship)

- Opening: February 9th 2026 (10:00 Brussels time)
- Deadline for electronic submission: May 9th 2026 (23:59 Brussels time)
- Interviews : May 2026
- Admission decision: Beginning of June 2026

2 MAIN RECOMMENDATIONS

1. Check if the field of study of your bachelor is eligible or not in the section "Who can apply ? "

The eligible field are the following:

- **Physics** (including Fundamental physics, Engineering physics, Physics-Chemistry, Biophysics)
- **Materials Science** (including Materials science & Engineering, Metallurgy and Materials Engineering, Metallurgical Engineering, Materials Science & Materials Technologies, Polymer Materials and Engineering)
- **Chemistry** (including Chemical Engineering, Chemistry and Food Technology)
- **Biomedical Engineering & Bioengineering**
- **Nano**technology, Nanotechnology Engineering, Nano-engineering, Nanoscience

Examples of some typical non-eligible fields: Biochemistry, Bioinformatics, Biological Pharmaceutical Chemistry, Biomedical Science, Biomedical Technology, Biology, Biotechnology, Botany, Health Science, Industrial Bioprocesses Engineering, Medicine, Medical technology, Medical Laboratory Technology, Medicinal chemistry, Microbiology, Molecular Biology, Nursing, Nutrition and Dietetics, Pharmaceutical and Health Sciences, Pharmaceutical manufacturing technology, Pharmaceutical Sciences, Pharmacy, Reproductive health, Surgery, Textile Engineering, Zoology

2. Do not apply late !

The next deadline is February 1st 2026

In general, 50% of applications submitted the day of the deadline are rejected because some documents (CV, transcripts, motivations or recommendation letters,…) are missing ☹

JOIN US !
We are waiting for you !

BIOPHAM

Bio & Pharmaceutical materials science
EUROPEAN MASTER

SCAN ME !

THANK YOU