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BIOPHAM

Bio & Pharmaceutical materials science
EUROPEAN MASTER



UNIVERSITÀ DI PISA



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



UNIWERSYTET ŚLĄSKI
W KATOWICACH



Université
de Lille

<http://master-biopham.eu>

5/12/2025

AGENDA

- **Presentation of the BIOPHAM programme**
- **Q&A**
- **Testimony #1: Anna**
- **Q&A**
- **Testimony #2: Aaron**
- **Q&A**

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/>
11 partners (academics, industries, hospital) in France/UK/Belgium
Multidisciplinary: Materials science, Pharmacy, Medecine



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



**Co-funded by
the European Union**

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



BIOPHAM

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

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

- « Programme countries » (EU members and 3rd countries associated to the Programme): France, Ireland, Italy, Spain, Turkey
- « Partner countries » (all other countries): Algeria, Egypt, Jordan, Syria, Bangladesh, China, Philippines, India, Indonesia, Kazakhstan, Pakistan, Mongolia, Cameroon, Ghana, Nigeria, Uganda, Brazil, Columbia, Costa Rica, Cuba, Ecuador, Mexico, Salvador, Venezuela, Georgia, Russia

BIOPHAM has just been renewed (July 2025)

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



BIOPHAM JOINTLY OPERATED
BY 4 PARTNERS UNIVERSITIES



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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

- ~ 60% PhD
- ~ 40% Not performing a PhD
(job in a company, Research Engineer/Research fellowship or lecturers in academia)



Pisa, Sept 2021



Pisa, Sept 2022

The BIOPHAM programme starts by an INTEGRATION WEEK



Pisa, Sept 2024



Pisa, Sept 2023

Lille, December 2021



Lille, December 2024



Lille, October 2021

It continues with
memorable moments

...

Have a look to
testimonies on the
BIOPHAM website 😊



Katowice, 2023



Pisa, September 2024

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

Cohort 1, Pisa, Sept. 2023



It concludes with a very emotional graduation ceremony

Cohort 1, Pisa, Sept. 2023



Cohort 2, Pisa, Sept 2024



GRADUATION CEREMONY COHORT 3

Barcelona, July 2025



In between the integration week, the memorable moments (parties, lunches, dinners, ...) and the graduation ceremony:
→ courses, seminars, practical sessions in lab., internships, master's thesis... and many exams!

WHAT IS BIOPHAM EXACTLY ?



BIOPHAM

Bio & Pharmaceutical materials science
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This is the important word !

BIOPHAM is basically a Master in Materials Science

(physics-chemistry of materials)

focusing on **pharmaceutical** and **biopharmaceutical** materials

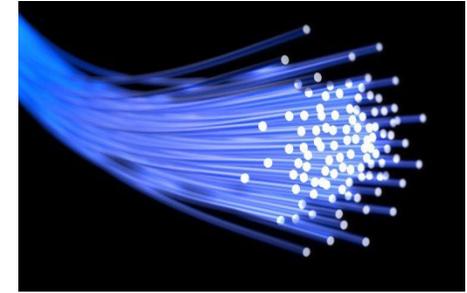
BIOPHAM IS NOT a Master in: **Biology**, **Biochemistry**, **Biotechnology**,
Biomedical sciences, **Pharmacy**, **Pharmaceutical sciences**,...
(in which one may have some Materials science courses)

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,...



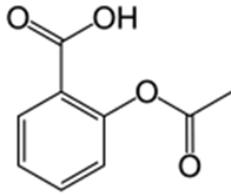
Drugs are materials (small organic molecules, polymers and bio-polymers)

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

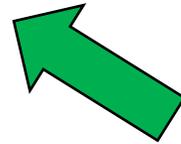
Regulatory Approval

Marketed product



MATERIALS SCIENCE MATTERS !!!!

solubility, physical states, crystal, amorphous, polymorphism, glass, stability, metastability, unstability, structure, dynamics, mechanical properties
→ Applications on small molecules, polymers, proteins



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

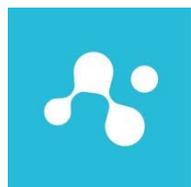


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21 large and small partners companies
are BIOPHAM associated partners

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
MyBiotech Germany



Linari Engineering Italy



AstraZeneca Sweden



Spartha Medical France



BioZoon Germany



Physiolution Germany



Audio Technologies Italy



Lusochimica Italy



Cellbox Lab Latvia

A question : What is the Master training of scientists working in R&D 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”***



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**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/>

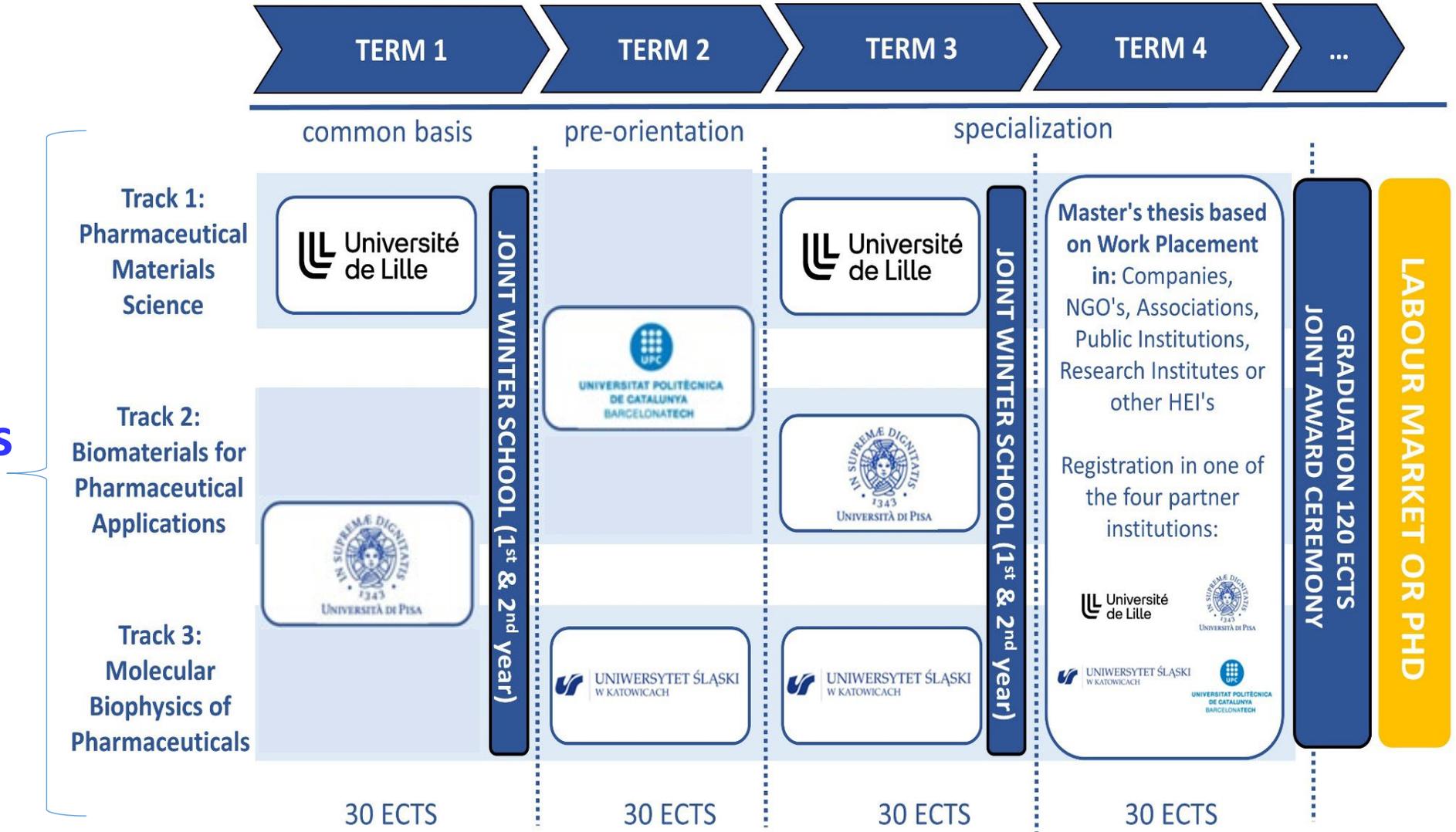
<https://www.findaMasters.com>

<https://www.Mastersportal.com>

...



Mobility scheme 3 specialised Tracks



Track 1:
Pharmaceutical
Materials
Science



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

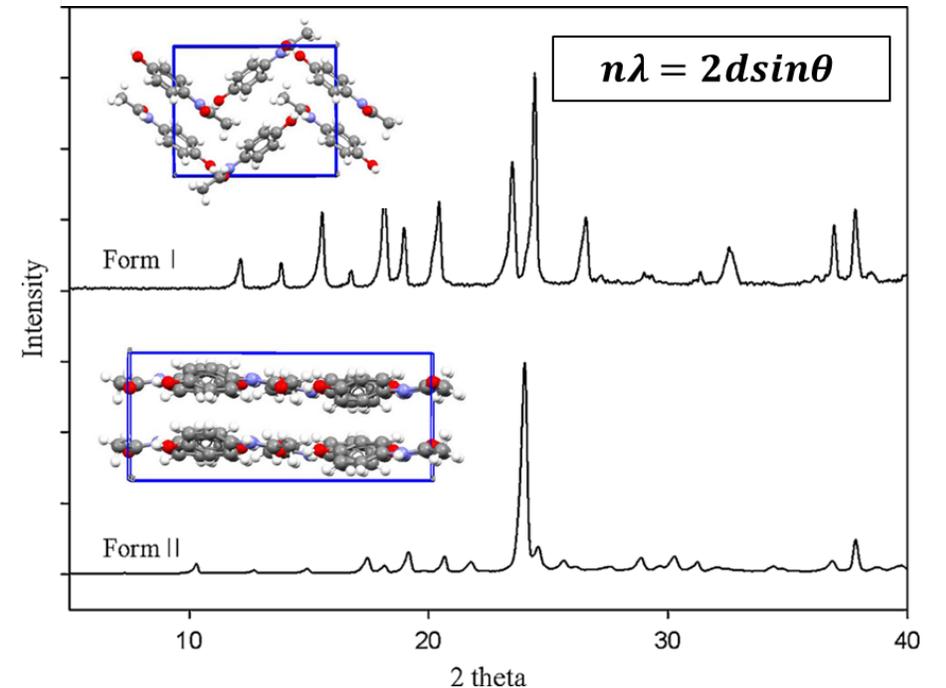
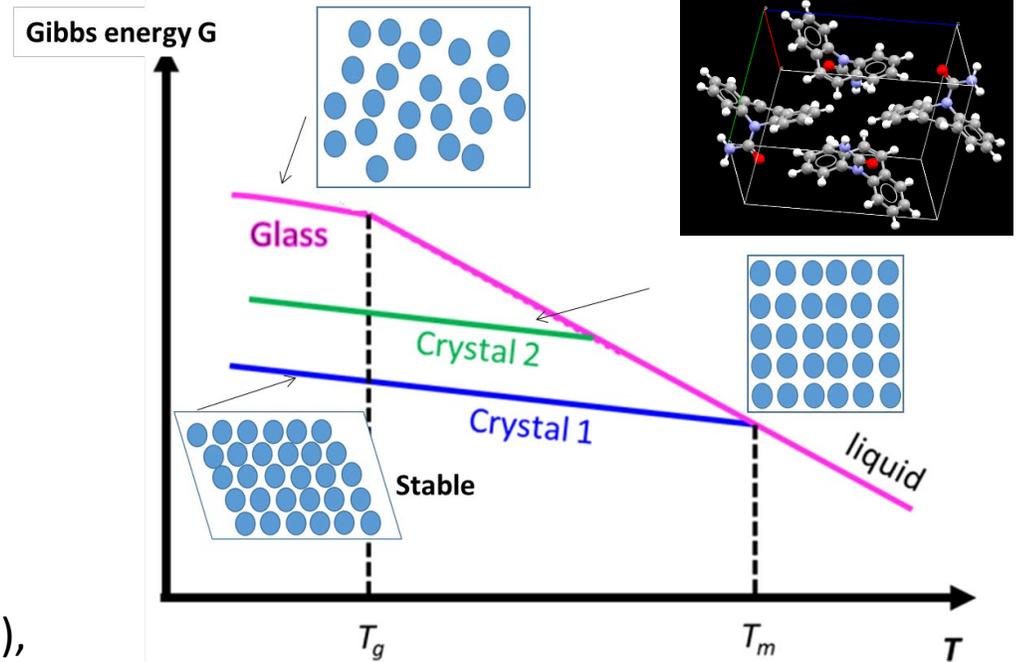


Master of fundamental and applied physics
Physics Department (Faculty of Sciences & Technologies)
College of Pharmacy



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Master of Engineering Physics
Department of Physics

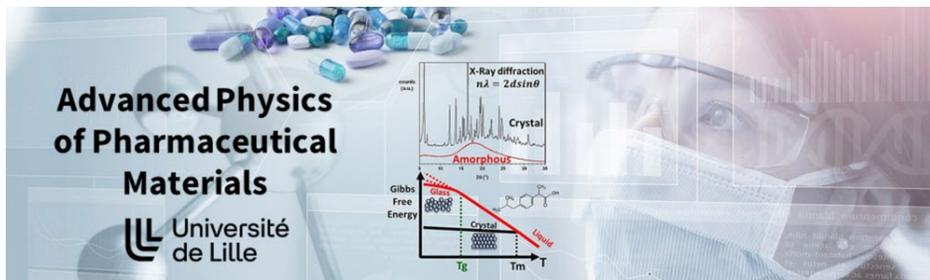




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An alternative to BIOPHAM at University of Lille (France)

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



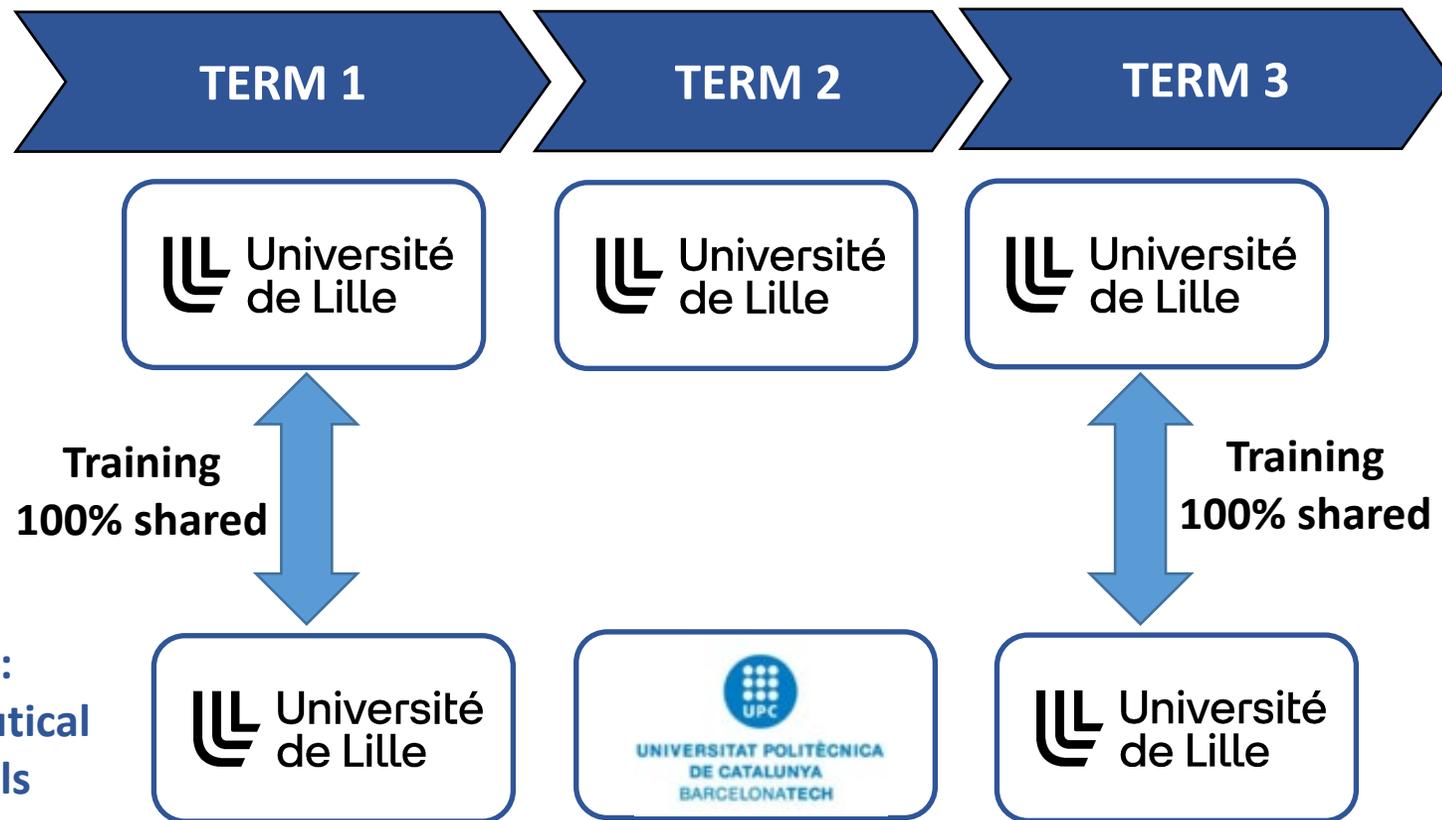
Advanced Physics of Pharmaceutical Materials



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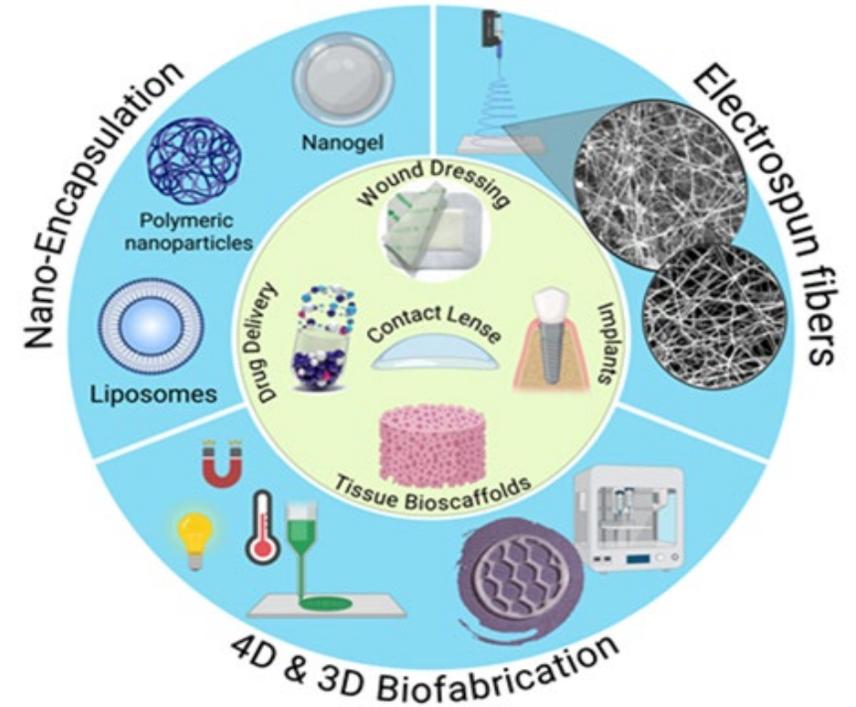
Track 1:
Pharmaceutical
Materials
Science



Track 2:
Biomaterials for
Pharmaceutical
Applications



- Specialized training on the fundamental principles of **biomaterials**
- **Advanced (bio)fabrication techniques** (from macro-to-nanoscale), **modern analytical techniques, 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**



Master's Degree in Materials and Nanotechnology

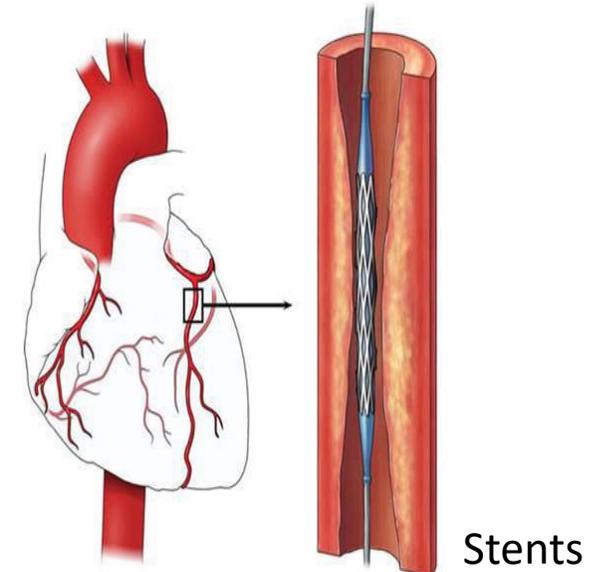
Departments: Physics, Chemistry, Information Engineering and Civil & Industrial Engineering
Scuola Normale Superiore of Pisa



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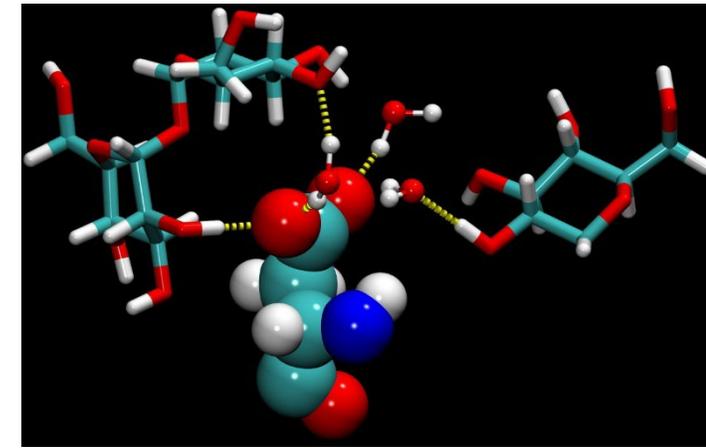
Master of Engineering Physics

Department of Physics

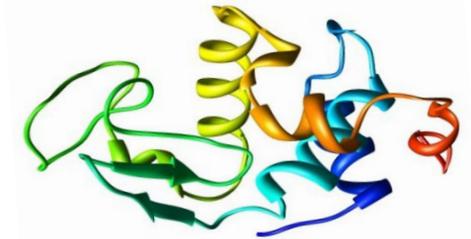


Stents

Track 3: Molecular Biophysics of Pharmaceuticals



- 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



Master (Field: “biophysics”)

Institute of Physics, Faculty of Science and Technology

Master's Degree in Materials and Nanotechnology

Departments: Physics, Chemistry, Information Engineering and Civil & Industrial Engineering
Scuola Normale Superiore of Pisa





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<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
<ul style="list-style-type: none">• 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 1 - 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 (UNIFI) – Italy >
TERM 2 – Polytechnic University of Catalonia (UPC) – Spain >
TERM 3 – University of Pisa (UNIFI) – Italy >

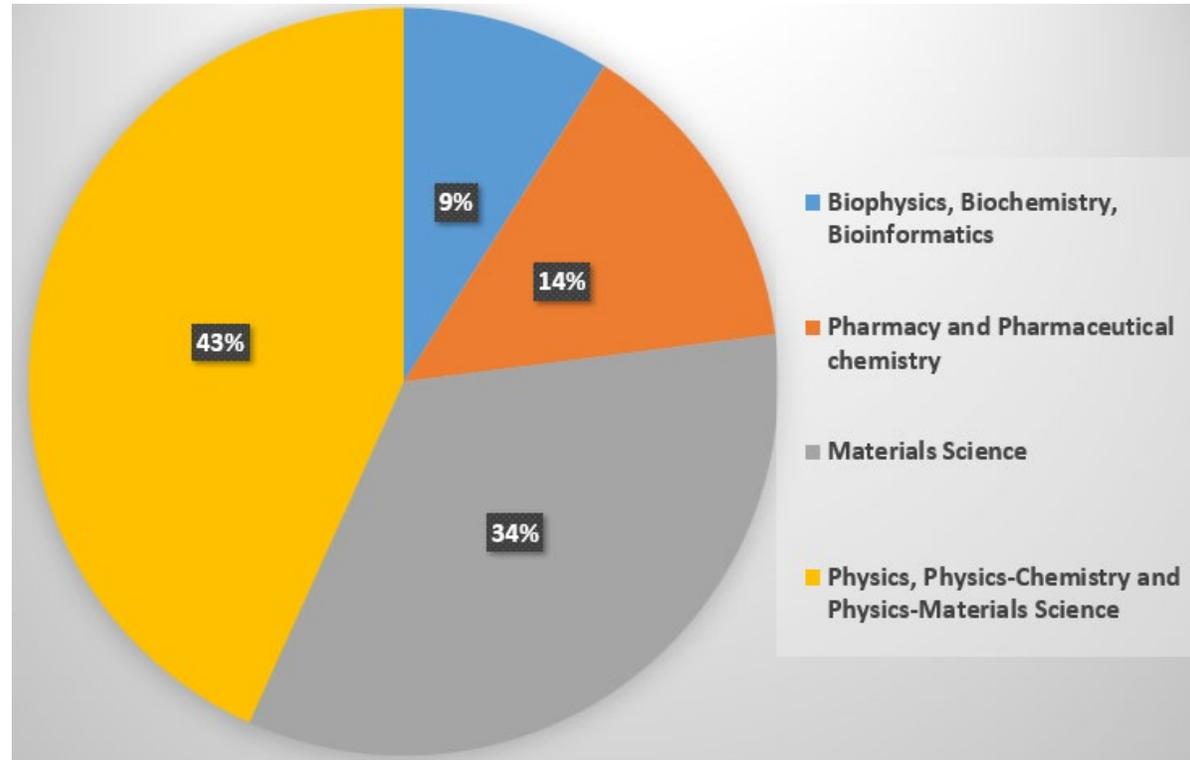
You will find details of the course content in the following [detailed syllabus](#).

Track 3: Molecular biophysics of pharmaceuticals

TERM 1 – University of Pisa (UNIFI) – 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



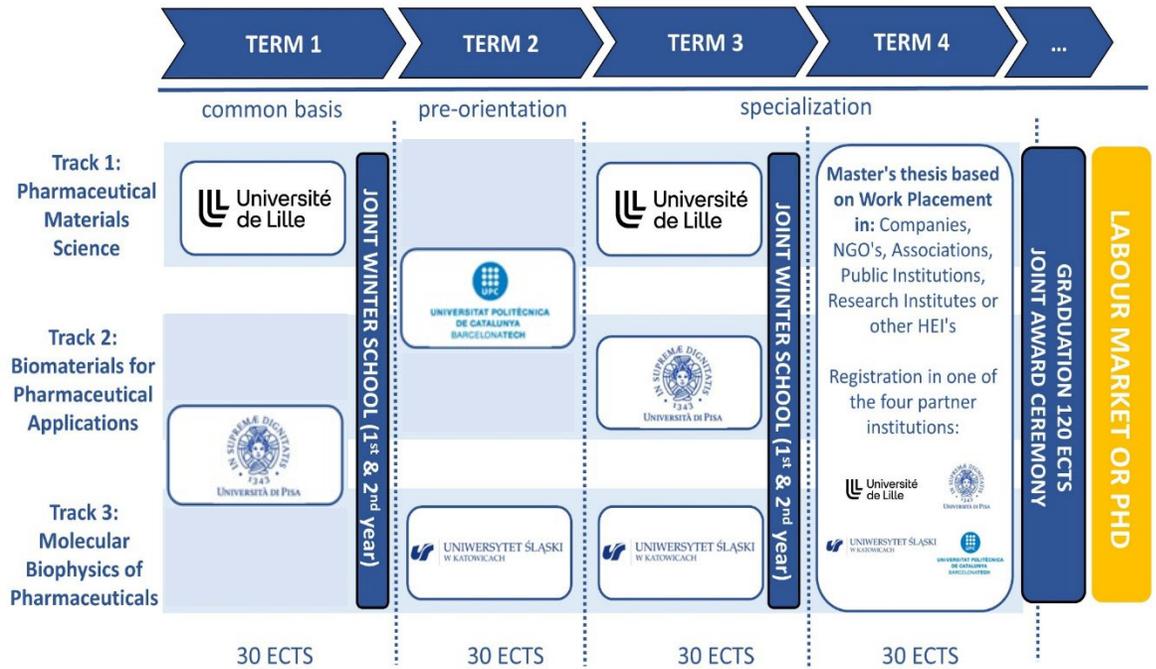
This breakdown does not related to the type of studied systems (small molecules, polymers, proteins, hybrid systems) !

A course classified in “Physics” or “ Materials Science” can focus on proteins !

BIOPHAM 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 in Fundamental Physics and Applications Track: Bio and Pharmaceutical Materials Science
University of Pisa (UNIFI) 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	?
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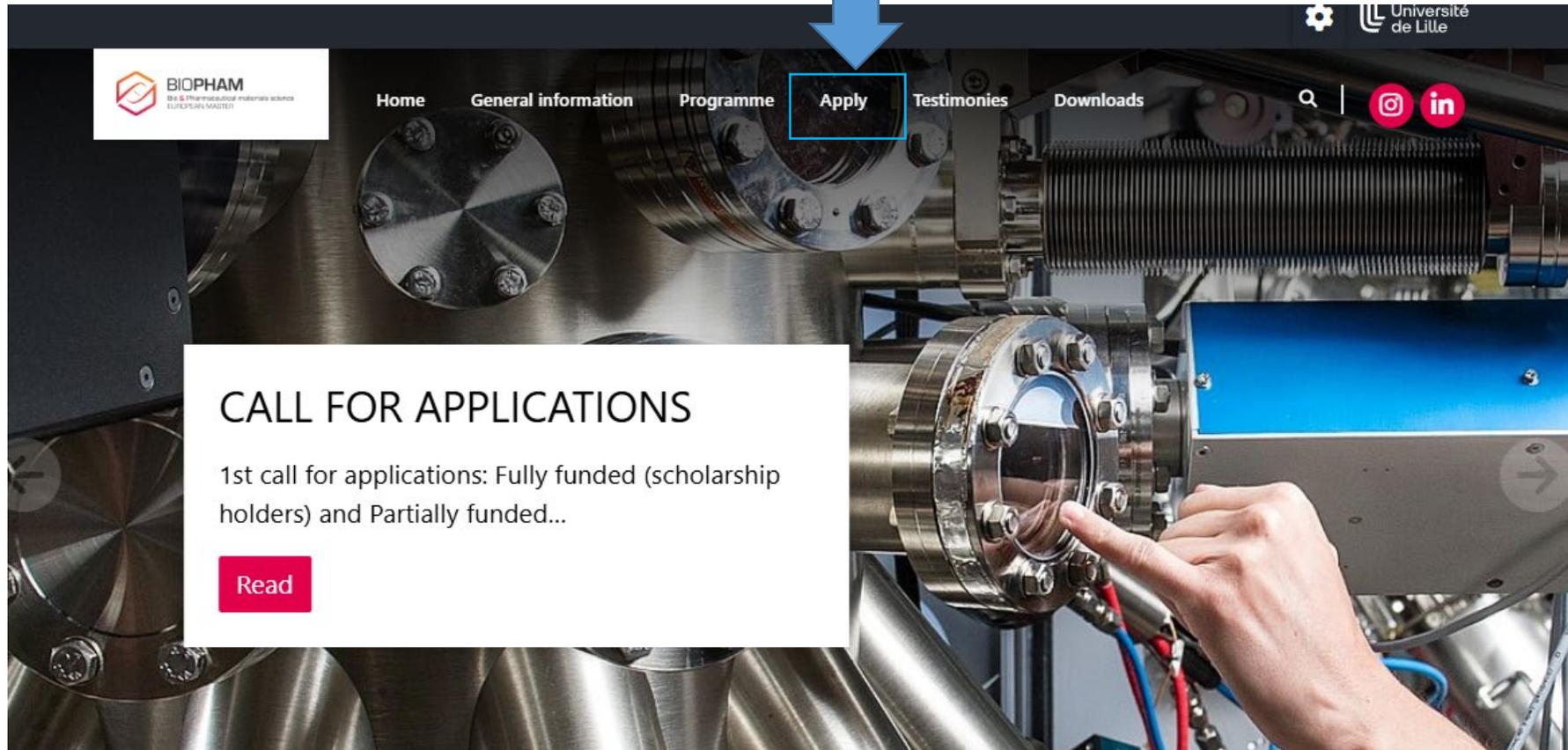
To get a scholarship: very (very) competitive !

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

HOW TO APPLY TO BIOPHAM ?

<https://www.master-biopham.eu>

Click here !



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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 fields 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**
- **Nanotechnology**, 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 !**

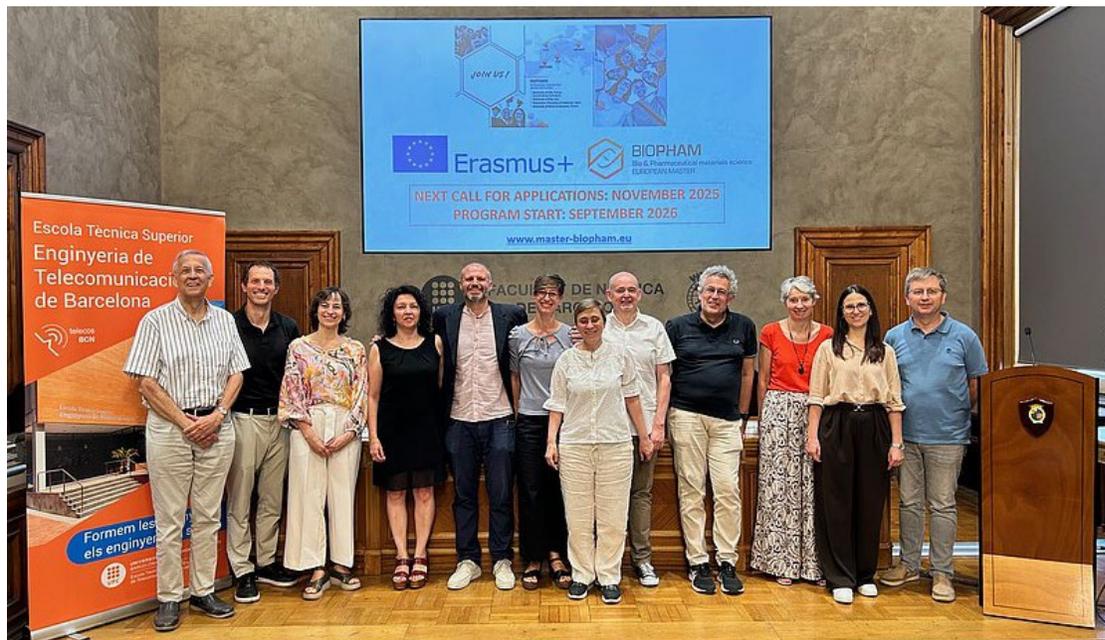


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THANK YOU

