Master Degree in Biomedical Engineering @ PoliMI

Luca Mainardi

Chair of the Biomedical Engineering Programme Council

luca.mainardi@polimi.it

AIMS

The Master Degree track in Biomedical Engineering is designed to provide advanced engineering competency in the field of Biomedical Engineering and it is organized in 5 main subtracks, named «**piani di studio preventivamente approvati» (PSPA)**:

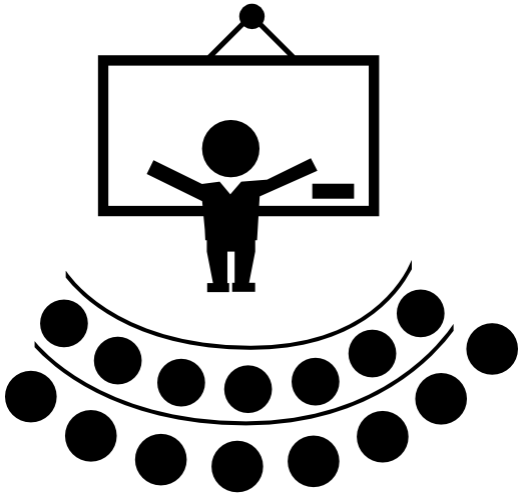
- Biomechanics and Biomaterials (BBB)
- Information Bioengineering (BIF)
- Clinic Engineering (BCI)
- Cells, Tissues and Biotechnologies (BCT)
- Technologies for Electronics (BTE)

MASTER DEGREE IN BIOMEDICAL ENG. IN A NUTSHELL

Courses

>40 courses in biomedical engineering

>15 Laboratory courses



Students (2020-21):

about 500/year new entries

about 400 graduations/year

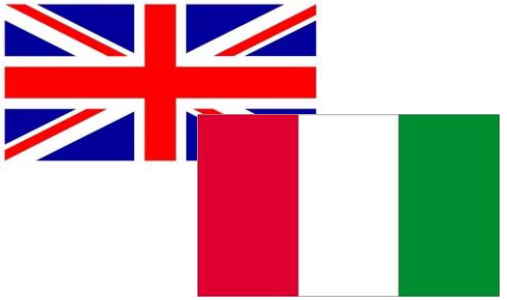
Origin

> 90% Italians - 10% foreign

MASTER DEGREE IN BIOMEDICAL ENGINEERING

Language

The track offers courses in Italian or in English.



Exchange Programme

Exchange programmes available with more than 60 foreign universities (Erasmus, Time, etc...)

Erasmus+

Double Degree

- Double degree program with University of Illinois Chicago
- Double degree program in Mechanical Engineering and Biomedical Engineering
- Double degree program in Materials and Nanotechnologies and Biomedical Engineering

PROGRAMME STRUCTURE

TOPICS	#Corses x CFU
Maths/Chemistry/Biotechnologies	12
Biomedical Engineering (Basic)	3x10
Fisiological systems engineering	2x5
Elective courses	1x10
Biomedical Engineering (Advanced)	2x10
Laboratory courses	1x5
Elective courses	1x10 + 1x5
Thesis	18
Total	**120**

RESEARCH LABORATORY

- **BioCell** – Laboratory of Biocompatibility and cell Culture
- **B-Cube –** Biosignals, Bioimaging and Bioinformatics Lab
- **Biomaterials and Biofabrication Lab –** Biomaterials Laboratory
- **Bioreactors Lab**
- **CART-CAS Lab –**Computer Assisted Radiotherapy and Surgery
- **ISIB CNR -** EMF4Health Lab - Computational Bioelectromagnetics
- **LaBS** - Laboratory of Biological Structure Mechanics
  - LaBS – Artificial Organs; LaBS – Microfluidics; LaBS – Mechanobiology; - LaBS – Prosthesis Biomechanics; LaBS – Micromechanics; LaBS – Tissue Mechanics & Bioprinting
- **LBC –** Computational Biomechanics Lab
- **Luigi Divieti -** “Luigi Divieti” Posture and Movement Analysis Lab
- **MedInfoPoli –** E-Health Lab
- **μBS -** Experimental Micro and Biofluid dynamics Laboratory
- **NearLab** – Neuroengineering and medical robotics
- **TBM –** Biomedical Technologies
  - TBM - Respiratory Analysis Lab; TBM - Movement Biomechanics and Motor Control; TBM - Laboratory of Respiration Technologies

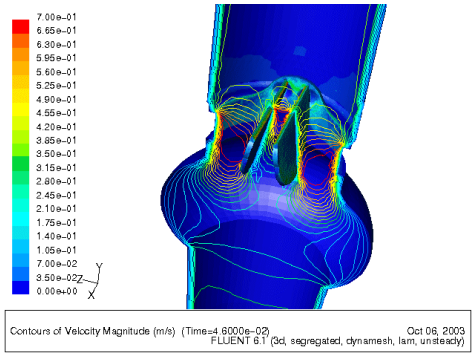
BIOMECHANICS AND BIOMATERIALS (BBB)

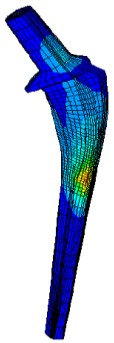
Career Options

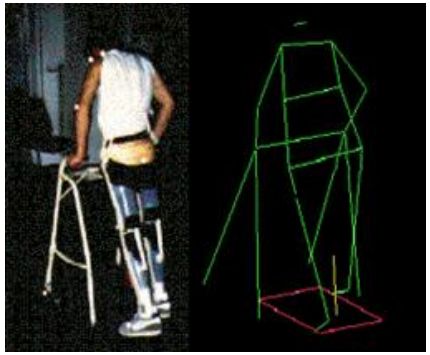
Expert in the fields of mechanics, biomechanics, thermofluidynamics, materials science, focussing biocompatibility, devices design efficiency and efficacy, interaction with the biological system, and their computational analysis and optimisation.

Research Topics

- Design and evaluation of biomed implants/protheses
- Biofluid-dynamics
- Synthesis, testing, characterisation and modification of biocompatible materials
- Posture, movement and gait analysis, and ergonomy.







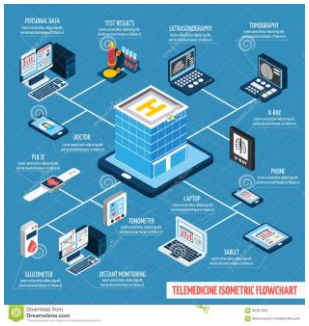
INFORMATION BIOENGINEERING (BIF)

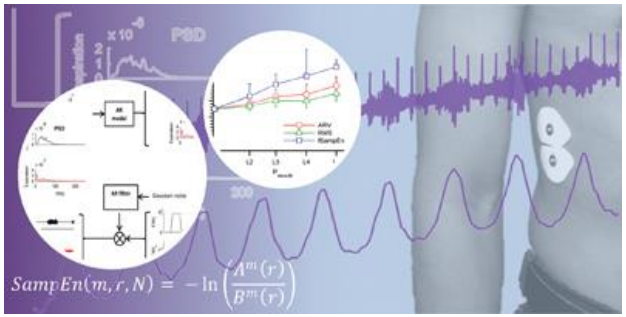
Career Options

Expert in medical devices with strong ICT component.
Engineer in data integration processes, design and customization of interfaces, design and management of biomedical data processing algorithms, bio-inspired intelligent systems.

Research and Topics

- Artificial Intelligence, machine learning e deep learning methods.
- Medical informatics and methods for telemedicine.
- Hospital Information Systems.
- Processing of biomedical signals and images.
- Models of biological systems.





Luca Mainardi luca.mainardi@polimi.it

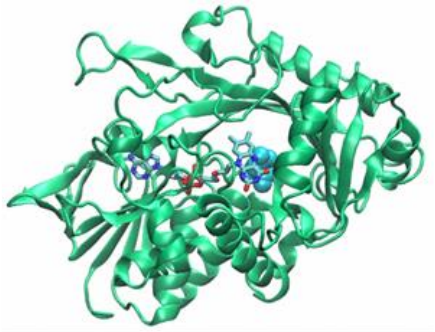
ENGINEERING FOR CELLS, TISSUES AND BIOTECHNOLOGIES (BCT)

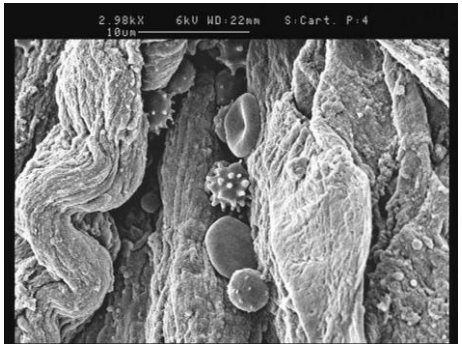
Careers options

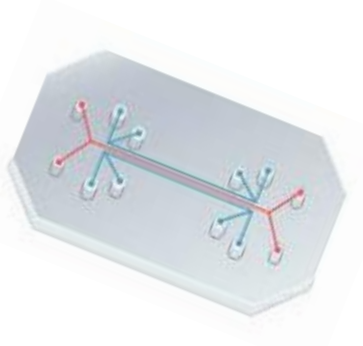
Expert of micro- and nano-technologies, molecular biomechancs, microfluidynamics, methods of data analysis for genomics, for proteomics and for molecular biology, cellular systems, biotechnology, bioartifical tissues.

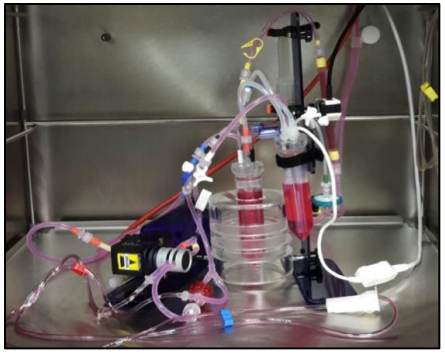
Research topics

- Design and prototyping of bioreactors and microfluidic systems
- Tissue engineering
- Biomaterials
- Molecular biomechanics
- Data analysis of genoma, proteoma, microbioma ....









Luca Mainardi luca.mainardi@polimi.it

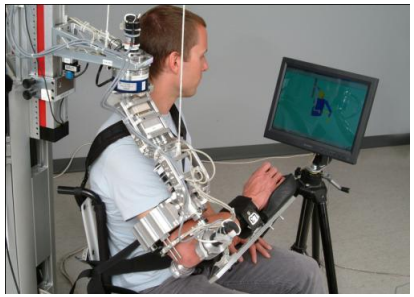
ELECTRONIC TECHNOLOGIES (BTE)

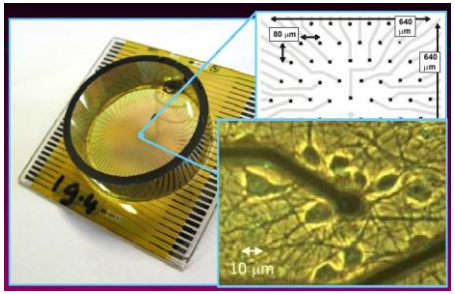
Careers options

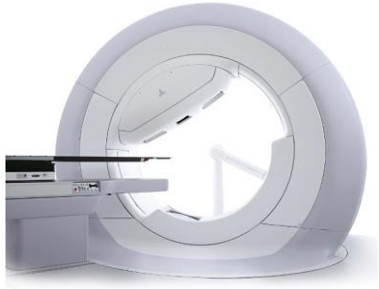
Expert in the methods of electronic bioengineering, applied to the design of sensors, biosensors, micro-technologies and to the development, design, of electro-medical devices and equipment. Expert in modeling biological systems and the artificial-biological interface.

Research and topics

- Biomedical devices
- Implanted devices and neuroprostheses
- Human-machine interfaces
- Computer / Robotic Aided Surgery
- Systems for bio-imaging and radiotherapy







Luca Mainardi luca.mainardi@polimi.it

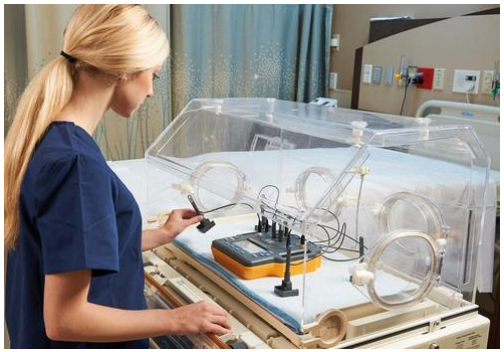
CLINICAL ENGINEERING (BIC)

Careers options

Engineer in manufacturer or suppliers companies of health and clinical devices, instrumentation and technologies; manager of biomedical technologies in public and private hospitals, and in service companies

Research topics

- Health technology management;
- Health system organization and management;
- Health Technology Assessment;
- Health Risk management;
- Health Care Management;
- Standardization; Quality; Safety;



Luca Mainardi luca.mainardi@polimi.it

INTERNAL DOUBLE DEGREE
BIOMEDICAL AND MECHANICAL ENGINEERING

The internal Double Degree in Biomedical and Mechanical Engineering aims at capturing the emerging needs of the Italian and European biomedical industries, that are looking for a new professional figure able to combine the typical skills of a **biomedical engineer** with the key technical competencies of a **mechanical engineer**. The integration of the Biomedical and Mechanical Engineering study programmes results in a **solid technical education well matched with a biomedical vision.**

The DD programme is open to students that earned a Bachelor Degree in Biomedical Engineering or Mechanical Engineering.
No more than 20 students/year.

CONTACTS: BIO	CONTACTS: MECC
Prof. Manuela Galli (manuela.galli@polimi.it)	Prof. Gaetano Cascini (gaetano.cascini@polimi.it)
Prof. Giancarlo Pennati (giancarlo.pennati@polimi.it)	Prof. Roberto Corradi (roberto.corradi@polimi.it)
Prof Maria L. Costantino (marialaura.costantino@polimi.it)	

INTERNAL DOUBLE DEGREE
BIOMEDICAL & MATERIALS ENGINEERING AND NANOTECHNOLOGY

The internal Double Degree in Degree in Biomedical and Materials Engineering and Nanotechnology aims at developing professional experts, with a solid **materials science background**, well matched with a **biomedical vision**, thus being really appealing for the biomedical industries that develop products in the field of biomechanics and biomaterials with all their applications in biomedical field. **The integration of the Biomedical** and **Materials Engineering and Nanotechnology** study offers a unique opportunity to exploit the main benefits from both approaches, thus fulfilling the existing gaps with a synergistic approach

The DD programme is open to students that earned a Bachelor Degree in Biomedical Engineering or Materials Engineering and Nanotechnology.
No more than 20 students/year .

CONTACTS: BIO	CONTACTS: MAT
Prof. Silvia Farè (silvia.fare@polimi.it)	Prof. Pasquale Vena (pasquale.vena@polimi.it)
Prof Luca Mainardi (luca.mainardi@polimi.it)	Prof. Stefano Turri (stefano.turri@polimi.it)

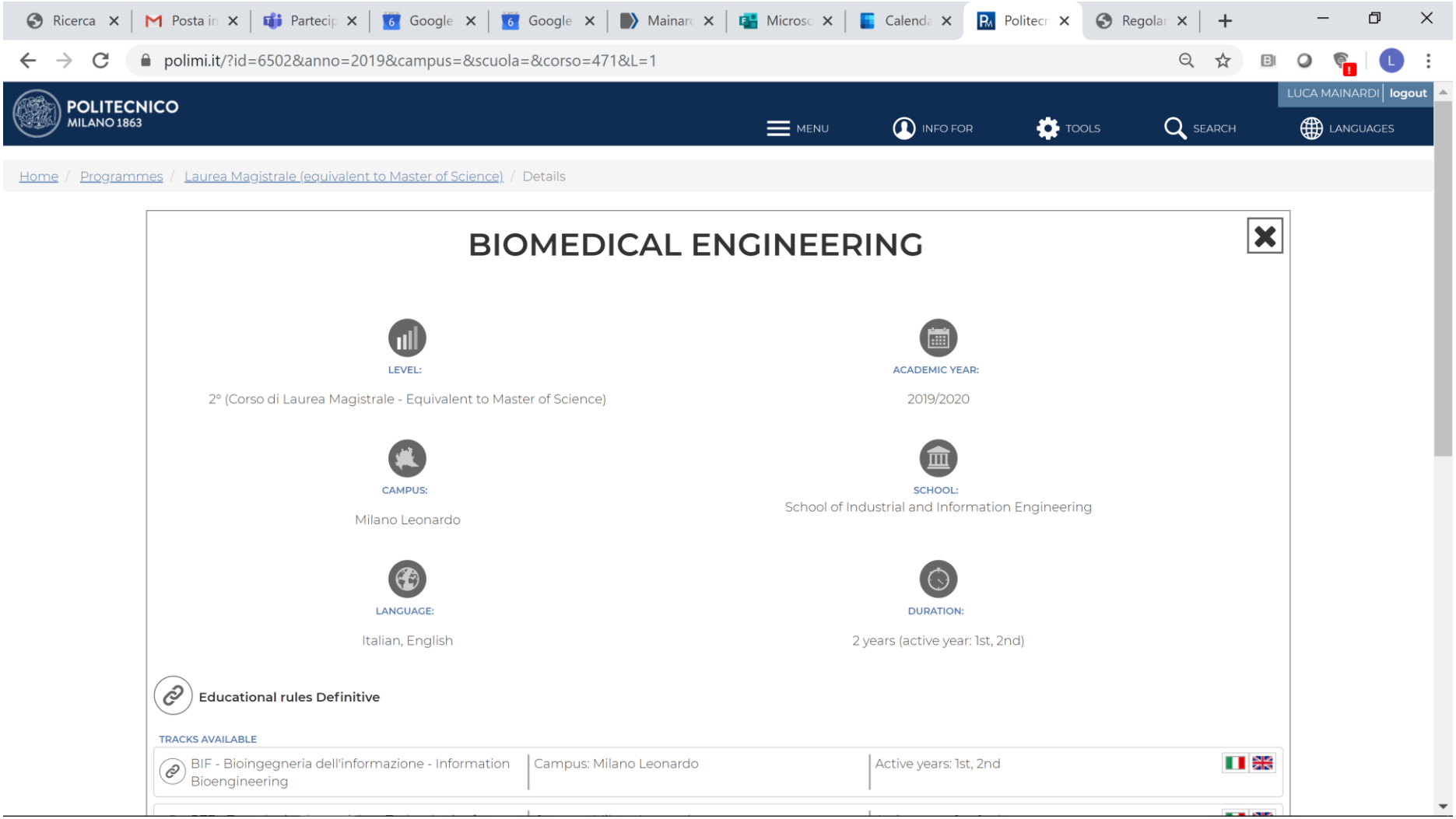
DOUBLE DEGREE PROGRAMME
POLIMI & UNIVERSITY OF ILLINOIS AT CHICAGO (UIC)

Thanks to an agreement with the University of Illinois at Chicago (UIC), it is possible to enroll to the Master program in Bioengineering (or in Bioinformatics) at UIC while enrolled in the degree in Biomedical Engineerign at Politecnico. The program is structured with a first semester at Politecnico (2° semester, I year) with 15 CFU that will be validated also as UIC credits, a semester at UIC (1° semester, II year) where 20 CFU will be validated at Politecnico, and an additional semester at UIC to complete the Master Thesis for UIC, heving the opportunity to carry on the research in specialized Laboratories, in collaboration wiht the medical personnel. Such thesis could then be extended to constitute the final document required for graduation at Politecnico. The POLIMI-UIC program offers the opportunity to **be Master students in an American University**, to be exposed to a **different way of teaching**, and to have a **research experience** in specialized Laboratories, with the possibility to access the **job market in the United States**.

The **program** (pending admission by UIC) requires payment of the **enrollement fees at UIC** for one year, indicatively equal to 20000 $ (plus expenses for travels, accomodations, and food while in Chicago), with the tax exempt for one year at Politecnico. It is open to students with a **Bachelor Degree in Biomedical Engineering** at Politecnico di Milano with average score in the Bachelor exams >24, and with TOEFL (score>80) o IELTS (score>6.5). Students from other Universities or with other Bachelor Degrees could be admitted but after a prior evalution of their curriculum to verify the needed competences for the Master program. **One fellowship/year** is granted by UIC to the best student in the semester at Politecnico.

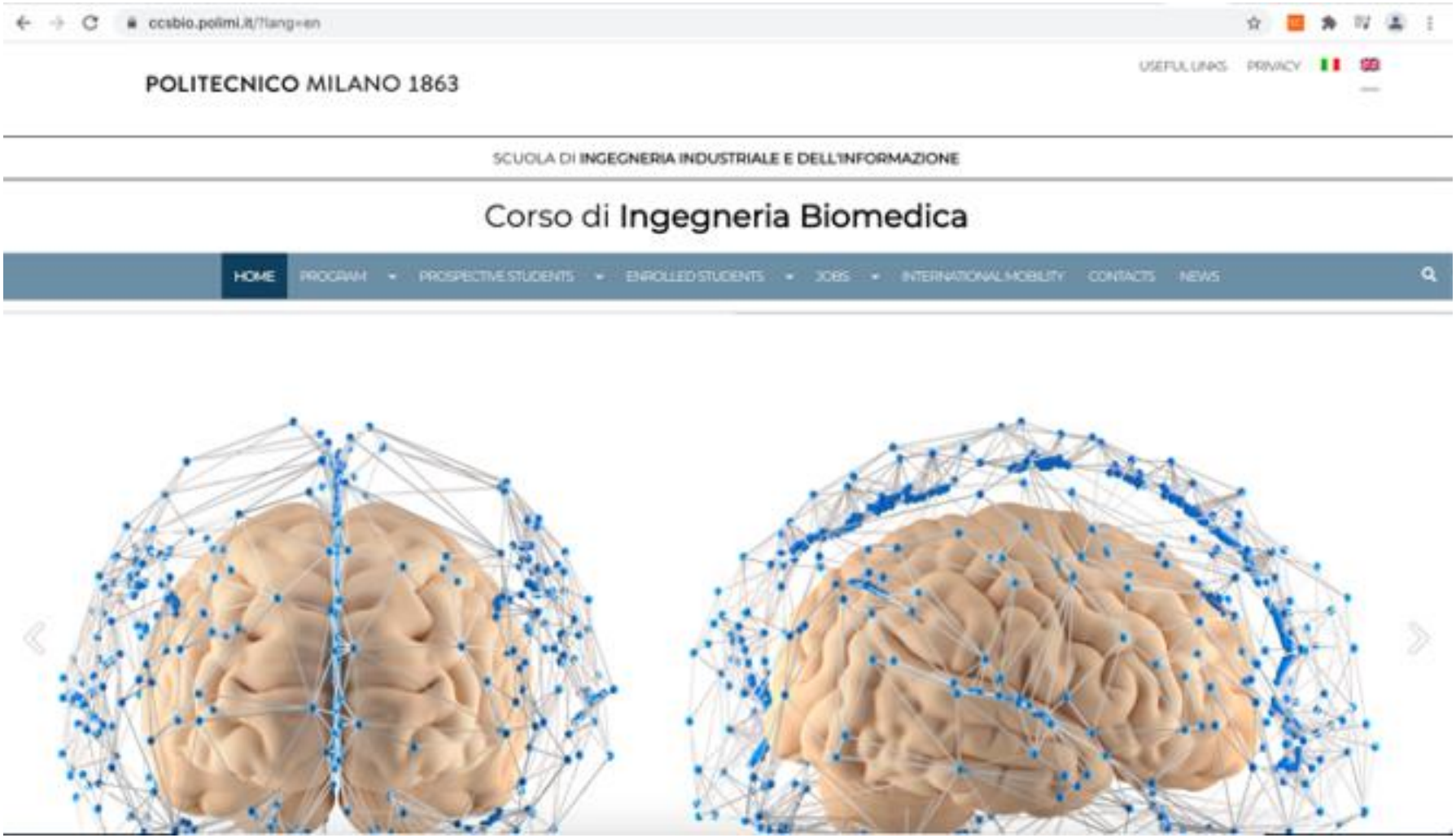
CONTACTS
Prof. Enrico Caiani (enrico.caiani@polimi.it)
Didactic secretary (masteruic-bio@polimi.it)

INFORMATION (PROGRAMMES→ «LAUREA MAGISTRALE»→BIOMEDICAL ENGINEERING)



INFOS (HTTPS://WWW.POLIMI.IT/FUTURI-STUDENTI)

INFOS (ccsbio.polimi.it)



CONTACTS

Prof. Luca Mainardi
Chair

luca.mainardi@polimi.it

Prof. Silva Fare'
Vice-Chair

silvia.fare@polimi.it

Raffaella Gatti
Didactic Secretary

raffaella.gatti@polimi.it

Natascia Passaro
Didactic Secretary

natascia.passaro@polimi.it

Student representative

rappresentantistudenti-ccsbiomedica@polimi.it

CONTACTS: PSPA

BBB
Prof. Maria Laura Costantino
marialaura.costantino@polimi.it

BCT
Prof. Monica Soncini
monica.soncini@polimi.it

BIC
Prof. Anna Maria Bianchi
annamaria.bianchi@polimi.it

BTE
Prof. Pietro Cerveri
pietro.cerveri@polimi.it

BIF
Prof. Maria G. Signorini
mariagabriella.signorini@polimi.it