UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

UPC Virtual Postgraduate Fair

From 3 to 7 March


UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH
UPC Virtual
Postgraduate Fair
Master’s degree in
Neuroengineering and Rehabilitation

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

The UPC

Bachelor's and master's degree graduates

6,556

Doctoral candidates

2,18

Continuing education programmes

141

Agreements with companies and research projects

1,801

54 %

of doctoral

28 %

of master's

2,143

Technical, management, administrative and service staff

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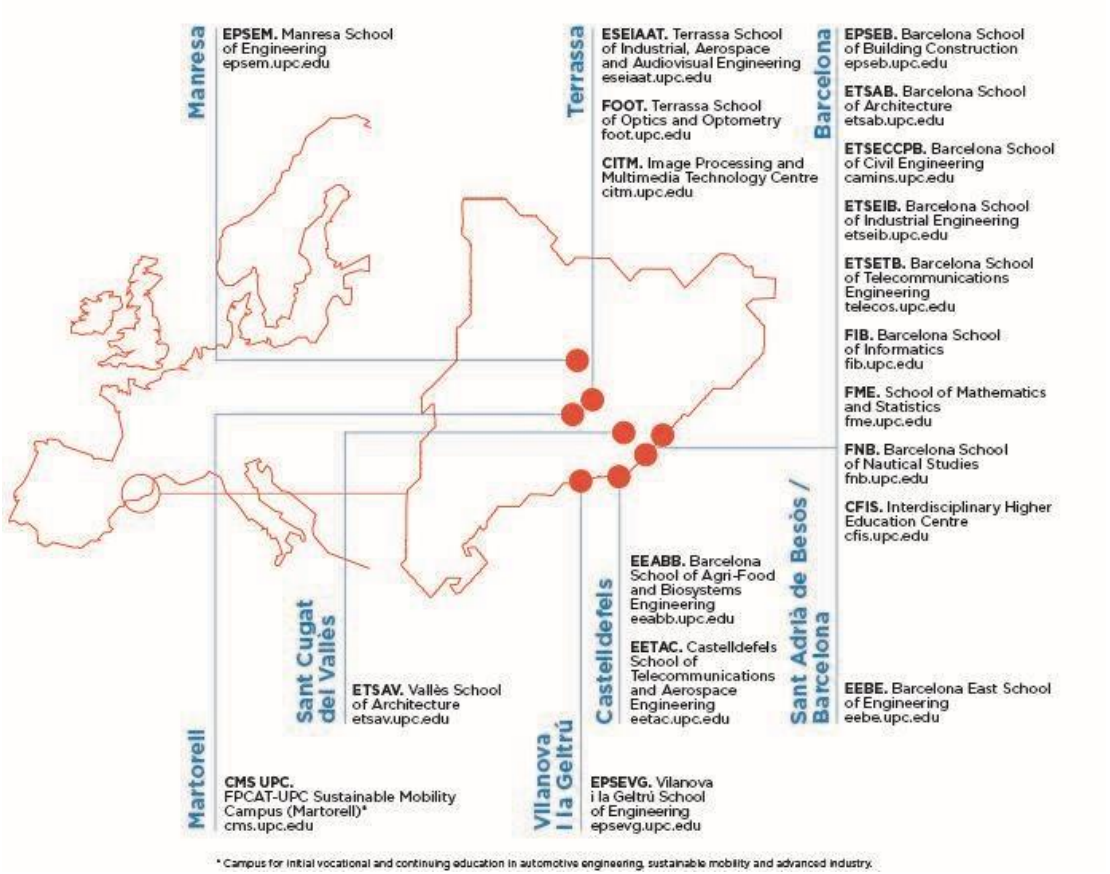
BARCELONATECH

The UPC



Campuses 9

Schools 18

Master's degrees 96

Master's degree in English 50

Doctoral programmes 46

54 international double degree agreements with 11 countries

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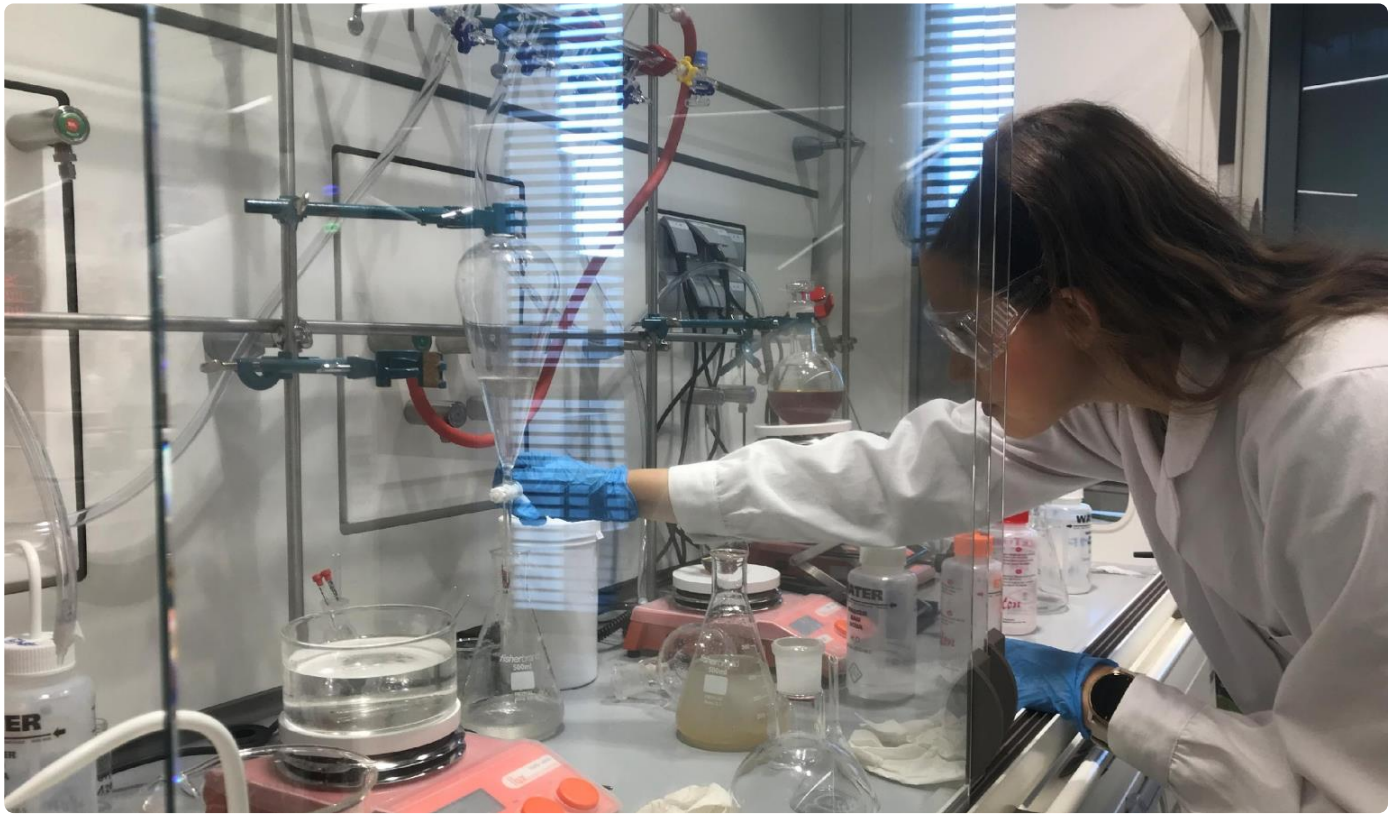
The UPC



94 %

graduate employment

94 %

have full-time jobs

93 %

graduate employment In less than 6 months

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Much more than studying

Students associations

Cooperation projects

Awards and competitions

Sports

Cultural activities

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

INc Institut de Neurociències UAB

CREB

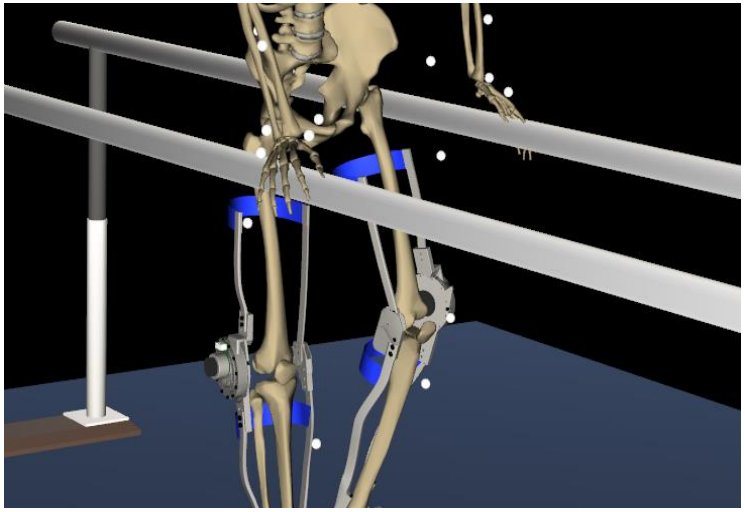
UPC

Coordinator: Miquel Àngel Mañanas (miguel.angel.mananas@upc.edu)

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

Neuroengineering is a discipline to understand, repair or enhance neural systems: restoration and augmentation of human function via human-machine computer interfaces between nervous system and artificial devices.



Rehabilitation is a highly specialized clinical & technical process aimed at restoring and/or compensating for the functional alterations of the person affected by a disability.

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Master's degree in Neuroenginnering and Rehabilitation

The **master's degree in Neuroengineering and Rehabilitation (MNER)** offers an excellent opportunity to bachelor's graduates with basic background on engineering to continue their specialization or to focus their career in this social need with high health and economic impact.

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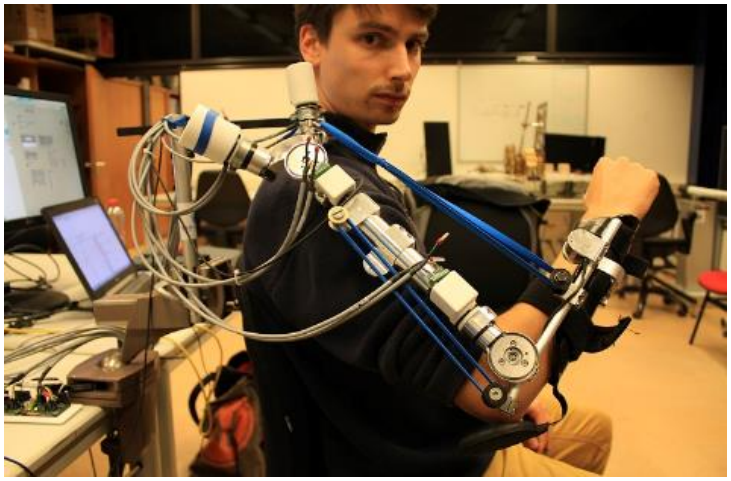

The courses of this master's program provide knowledge and skills related to **neural engineering; sensory, brain and muscle systems; biomechanics; assistive technology; and cognitive, motor and cardiorespiratory therapies**, among others

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Master's degree in Neuroenginnering and Rehabilitation

This is an interuniversity master's degree: it emerged from the long collaboration on research, innovation projects and teaching between

CREB UPC
UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Centre de Recerca en Enginyeria Biomèdica

Institut Guttmann
HOSPITAL DE NEUROREHABILITACIÓ
Institut Universitari adscrit a la UAB

INc Institut de Neurociències UAB

Research Centre for Biomedical Engineering (CREB) from the Universitat Politècnica de Catalunya (UPC)

Institut Guttmann Neurorehabilitation Hospital, an affiliated centre of Universitat Autònoma de Barcelona (UAB).

Neurosciences Institute, from the UAB

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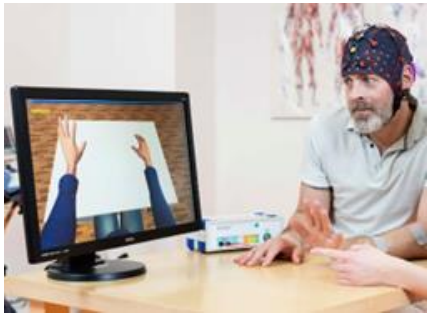
Master's degree in Neuroenginnering and Rehabilitation

2. Neuropsychological rehabilitation

1. Physical rehabilitation

3. Disability management (prevention, comorbidity, care)

4. Brain Health and Aging



5. Social

- **79** Research Projects and Studies
- **8** Clinical Trials
- **>100** Researchers
- **60** Journal Articles

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Master's degree in Neuroenginnering and Rehabilitation

- 90 ECTS (shared with UAB – Guttmann Institute Neurorehabilitation Hospital- Neurosciences Institute)
- 30 places
- **Main backgrounds:** Industrial Engineering, Physics Engineering, Industrial Electronics and Automatica Engineering, Biomedical Engineering.
- **Secondary background:** Electronic Systems, Telecommunications Systems and Electronics, Computer Science, Electrical/Electronic/Mechanical Engineering, Physics, among others (possible Complementary Training).
- **Objective:**

  Train professionals in a multidisciplinary manner with a high level of competencies, which allows them to adapt and facilitate responsibility work groups in hospitals, companies or research centers in the field of neuroengineering and rehabilitation, and the technology that is associated..

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

CURRICULUM

1st semester

Anatomy and Physiopathology	4.5
Rehabilitation Therapies	3
Mobility Assistive Technologies	4.5
Biomedical Signals	4.5
Medical Image	4.5
Biomaterials	4.5
Modelling and Simulation of Biomedical Systems	4.5

2nd semester

Rehabilitation Equipment	3
Human-Machine Interfaces	4.5
Neuromodulation and Neurostimulation	3
Data Analysis in Rehabilitation	4.5
Neuroimage	4.5
m-Health Systems	3
Virtual Reality and Serious Games	3
Biomechanics	4.5

3rd semester

Work Placement	18
Master's Thesis	12

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Master's degree in Neuroenginnering and Rehabilitation

First Semester (September-January)	Second Semester (February-June)
Anatomy and Physiopathology (4.5 credits) Skeletal muscle. Motor nervous system. Somatosensory and Autonomic nervous system. Cardiorespiratory system	***Biomechanics*** (4.5 credits) Kinematics and Dynamics of human movement. Analysis of human gait. Energetics applied to human movement
Rehabilitation Therapies (3 credits) Neurorehabilitation of spinal cord injury, acquired brain lesions & neurodegenerative diseases. Cardiorespiratory rehabilitation	***Virtual Reality and Serious Games*** (3 credits) Fundamentals of 3D graphics. Virtual and augmented reality. Gamification. Collection of results. Examples of serious games
Mobility assistive technologies (4.5 credits) Prosthetic systems. Orthotic systems and exoskeletons. FES systems. Sensors & control strategies. Robot-FES hybrid control	***m-Health Systems*** (3 credits) m-Health systems architecture design. Mobile platforms. Development Tools. Data communication networks. Regulation
Biomedical Signals (4.5 credits) Matched and adaptive filtering. Spectral estimation: nonparametric and parametric methods. TFR	***Data Analysis in Rehabilitation*** (4.5 credits) Feature extraction and selection techniques. Connectivity & Graph analysis. Statistics. PCA & ICA. Machine Learning.
Medical Images (4.5 credits) Creation, reading and visualization of an image. Image filtering, 2D and 3D segmentation. Volume display. Design of GUI	***Neuroimage*** (4.5 credits) Structural (MRI, DTI, TAC) & Functional (fMRI, PET, hdEEG, MEG) imaging. Structural connectivity. Inverse brain modeling
Biomaterials (4.5 credits) Applications in implants & rehabilitation. Traumatology. Tissue engineering. Physical medicine and rehabilitation.	***Human-Machine Interfaces*** (4.5 credits) Endogenous vs. exogenous BCI systems (evoked potentials) Movement intention. Motor imagery EMG-based HMI systems
Modeling and Simulation of Biomedical Systems (4.5 credits) Mathematical modeling. Identification of rehabilitation control Systems. Optimization of systems. Nonlinear system analysis.	***Neuromodulation and Neurostimulation*** (3 credits) Neural Plasticity. Brain and Spinal stimulation and neuromodulation techniques (invasive and non-invasive)
Third Semester (September-January)	***Rehabilitation Equipment*** (3 credits) Medical instrumentation. Cognitive/cardiorespiratory rehabilitation equipment. Normative and regulation. Bioethics
Work placement (18 credits) ***Master's Degree Dissertation*** (12 credits)	

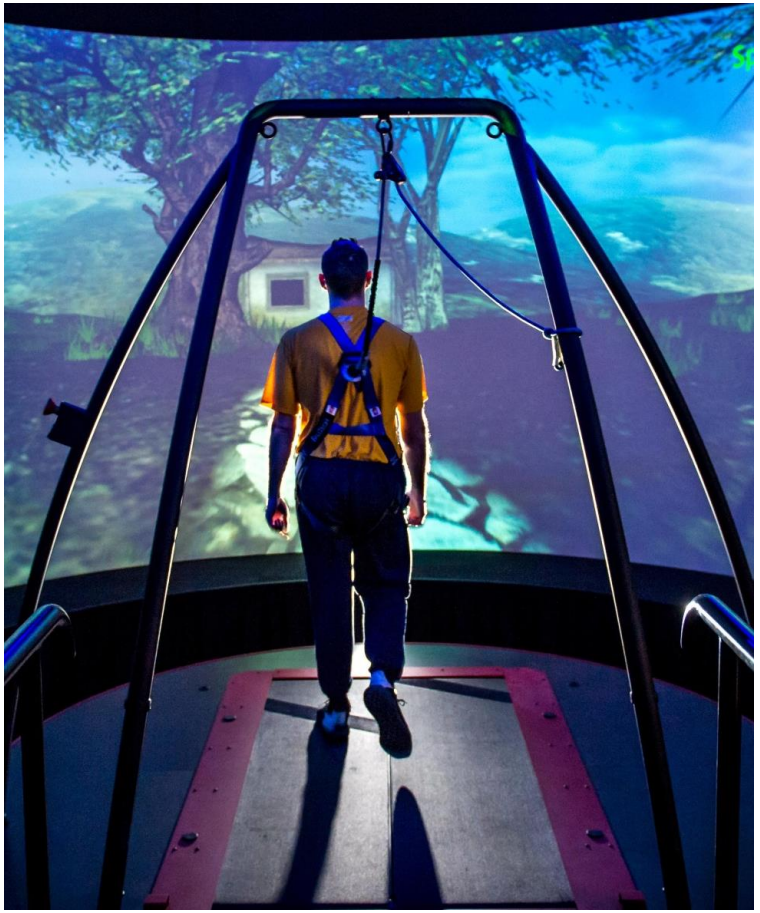
UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

Why choose this Master's Degree?

- This provides **rigorous training in the field of Neuroengineering and Rehabilitation** and responds to the high demand for specialists in this field.

- In spite of existing these studies abroad, mainly in the US and UK, **this official master's degree is the only one in Spain**



UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

Why choose this Master's Degree?

- Researchers and professors at CREB and IG are leaders in their respective sectors, which ensure that this master's degree provides students with **multidisciplinary training and is adapted to new technologies** in the sector.
- This also trains **qualified professionals**, currently still few in the field and with a very high occupancy rate, and enables them to easily adapt to positions of responsibility in **hospitals, companies or research centres**.
- Graduates can also work as **freelancers and entrepreneurs**. There is particularly a high demand in Catalonia, the University's area of influence, which is one of the most dynamic hubs in medical technologies

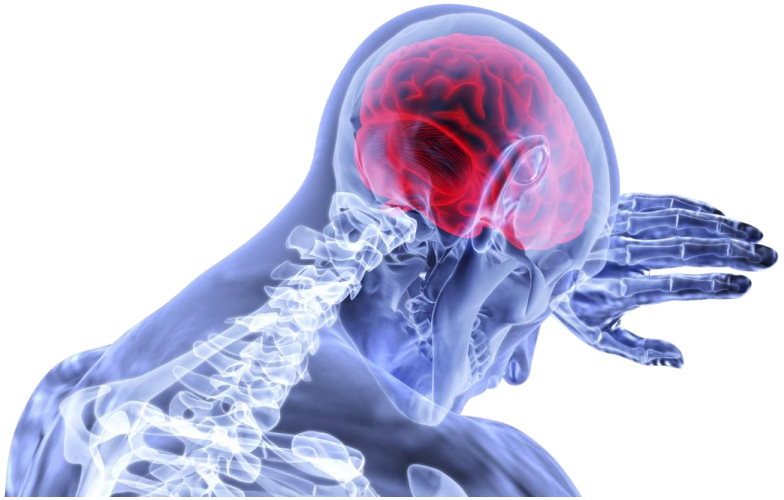
UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

Barcelona School of Industrial Engineering (ETSEIB)

- The headquarters of the CREB are at **the ETSEIB, where most of the lectures will be taught** by experts from many departments who work in exoskeletons, e-walkers, virtual reality, serious games, brain/human-machine interfaces, instrumentation equipment, assistive robotics, m-Health, etc.

- Thus, there are contents of computer graphics, electronics, biomedical signals, deep learning, robotics, vision, electronics, mechanics, etc., oriented towards NER rather than BME in general.



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Master's degree in Neuroenginnering and Rehabilitation

In addition ….

- This master's degree provides the opportunity **to collaborate during the last semester with a company or a hospital in a real environment, with a research group, or other national and international research institutions** completing the Master's Degree Dissertation.

- The ETSEIB allows students to spend a semester abroad, generally through Erasmus program for Europe.
- After completing the master's degree, you can directly access the Biomedical Engineering doctorate program at the UPC (3 years of doctoral thesis, without complementary training). Industrial doctorate is also possible by companies in the sector.

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Master's degree in Neuroenginnering and Rehabilitation

Work Placement and Final Master Thesis

QM Quantium Medical
Braingaze mind tracking technology
DyCare
able human motion
NE neuroelectrics®
INBRAIN NEUROELECTRONICS
GALGOMEDICAL
timeisbrain
mjn·neuro
CoreSys Health when Time is really Critical
CORE-SAFE MEDICAL
Starlab® STARLAB LIVING SCIENCE
bettercare
Bitbrain
eurecat Centre Tecnològic de Catalunya
HOSPITAL NACIONAL DE PARAPLÉJICOS Toledo
Vall d'Hebron Hospital
egarsat
ephion health
HOSPITAL DE LA SANTA CREU I SANT PAU FUNDACIÓ DE GESTIÓ SANITÀRIA
Clínic Barcelona
SJD Sant Joan de Déu Barcelona · Hospital
Institut Guttmann
Massachusetts General Hospital Founding Member, Mass General Brigham
UCI University of California, Irvine
universität wien
KU LEUVEN

How to apply

www.etseib.upc.edu/en → Academic Programmes → **How to apply to ETSEIB'S academic programmes**

- **Application:**
  Round 1 (February 24th to March 23th) **Round 2** (April 21th to May 18th)
  * Recommentation to apply on the first round. In case we don't open second round.
- **Provisional list of accepted people:**
  Round 1: End of April 2025 Round 2: End of June 2025
- **People seat acceptance:** Up to 7 days from the pubication list
- **Definitive list of accepted people:** Mid – July 2025
- **Enrollment:** September 2025

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How to apply

Applications Round 1
February 24th to March 23th of 2025

Applications Round 2
April 21th to May 18th of 2025

https://www.upc.edu/en/masters/access-admission-enrolment/pre-enrolment

General Information, Admission and access requirements and syllabus

Required documentation for the application

https://etseib.upc.edu/en/Academic%20programmes/academic-procedures/acces/documentation

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

How to apply

Contact information

admissions.etseib@upc.edu

https://demana.upc.edu/etseib/