



FIB
MASTERS

Master in Data Science (MDS)

Oscar Romero

Vice-dean of Postgraduate Studies

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FIB:

Facultat d'Informàtica de Barcelona

Universitat Politècnica de Catalunya (UPC-BarcelonaTech)

About UPC

Universitat Politècnica de Catalunya (UPC-BarcelonaTech) is a public higher education and research institution that is specialised in the fields of architecture, science and engineering and one of the leading technical universities in Europe.

Every year, more than 6,000 bachelor's and master's students and more than 500 doctoral students graduate.

UPC values:

Social responsibility

Sustainability

Equal opportunities

Cooperation and solidarity



UPC Main Indicators

Main indicators *



UPC Community

- 23,990 bachelor's students
- 5,822 master's degree students
- 2,107 doctoral degree students
- 3,595 lifelong learning students
- 3,523 teaching and research staff members
- 2,074 administrative and service staff
- 70,151 UPC alumni members
- 231 doctoral theses defended
- 2,232 graduates of master's degrees
- 3,627 graduates of bachelor's degrees

Knowledge

- 65 bachelor's degrees 2022-2023
- 84 master's programmes 2022-2023
- 45 doctoral programmes 2022-2023
- 275 continuing education programmes
- 19 patents
- 38 technology companies in which the UPC has a shareholding
- 99 scientific and technical awards received
- 2,588 articles published in scientific journals
- €72,734,268 turnover for R&D projects (2021)

UPC in the world

- 5,283 students participating in educational cooperation agreements with companies
- 18 company chairs
- 13 companies set up last year
- 2,275 companies and other entities that have signed collaboration agreements with the UPC
- 34 international double-degree agreements with 26 universities
- 2,756 students in international mobility programmes
- 1,315 UPC students (outgoing)
- 1,441 mobility students at the UPC (incoming)
- 53 development cooperation projects
- 15 international networks with the UPC as a member
- 4 UNESCO chairs

* 2021-2022 academic year

About FIB

The Facultat d'Informàtica de Barcelona (Barcelona School of Informatics) belongs to UPC and it is the reference centre for Informatics studies since its inception in 1976, and the beginning of the educational activities during 1977-1978.

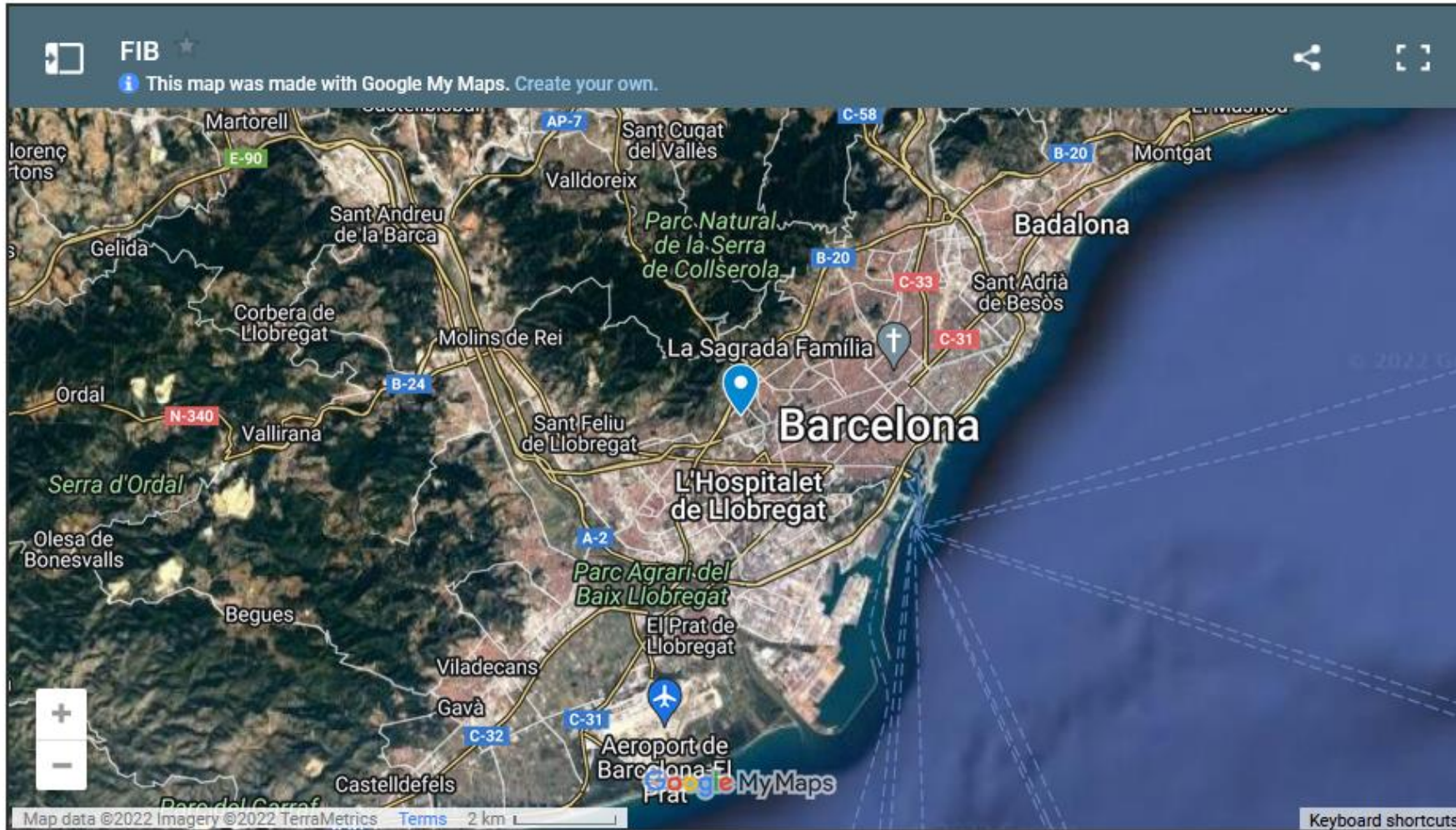
Throughout these 40 years, the faculty has been in charge of the bachelor's degree, diploma courses, technical engineering and master degrees and currently the formal qualifications in the field of Computer Science and related subjects.



FIB: Mission

- Provide education on **informatics engineering**
 - Promote the dissemination of information technologies to contribute to society improvements
 - Provide a strong background to our students that will be used throughout their professional life
- **Prioritizing lasting concepts**
- Promoting **effective working habits and team working**
- Stimulating their students' **ability of self-sufficiency**

FIB: Where?



Address

B6 Building at Campus Nord
Jordi Girona street,1-3
08034 Barcelona

Contact

Email: Info.masters@fib.upc.edu

Web: <http://www.fib.upc.edu/>

Social Networking

<https://www.facebook.com/fib.upc>

https://twitter.com/fib_upc

<https://www.youtube.com/user/mediafib>

<https://www.instagram.com/fib.upc/>

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Master in Data Science

Overview

Data Drives the World!



The role of data in the world economy is out of question

- Data Science is the sector with higher expected growth since 2014 in most developed economies (EU and USA)
- Most optimistic forecasts measure a sustained growth world-wide of around 20% per year
- The most pessimistic measure it around 12%

The European Commission has developed a data-driven economy strategy: Building a European Data Economy.

- In 2019, the data-driven economy whole impact on the economy was valued as 400 Billion Euro (EU+UK), with a yearly growth of 7,6% (much higher than the total IT sector of 4,9%)
- Data professionals represent the 3,6% of the total EU27 workforce, with a 5,5% yearly increase
- The EU identified a gap of 459.000 unfilled positions in the EU27 + UK

The OECD and the European Commission recently stated: *"Big Data and Data Science are key pillars in the 21st century source of growth"* but they also remark *"data-driven innovation is key for growth and well-being"*

sources: IDC, Gartner, Forrester, IBM Quant Crunch Report, Organisation for Economic Co-operation and Development (OECD), European Commission

Will Data Drive the Future World?



The future role of data is also out of question!

The EU Data Market and Data Economy in 2025
(post-covid scenario):

- **Baseline scenario (1,5% GDP cumulative growth):** expected annual growth rate of 5,8% for a total of 550 Billion Euro in the EU27 with a steep increase of its incidence from 2,8% in 2020 to 4% in 2025
- **High growth scenario (+2,1% GDP cumulative growth):** expected annual growth rate of 11,5% for a total of 827 Billion Euro in the EU27 with a steep increase of its incidence from 2,8% in 2020 to 5,9% in 2025
- **Challenge scenario (+0,9% GDP cumulative growth):** expected annual growth rate of 3% for a total of 432 Billion Euro in the EU27 with a steep increase of its incidence from 2,8% in 2020 to 3,3% in 2025

KEY FACT: even in the worst scenario, the unfilled data jobs is estimated to 5,7% of the demand (i.e., 484000 jobs)

In all scenarios, demand will still grow faster than supply

sources: European Commission

<https://data.europa.eu/en/highlights/size-and-trends-eu-data-economy>

Why Data is nowadays so relevant?

- Data Science is instrumental: i.e., traversal to any sector and it will even further affect and accelerate transformation in all sectors:
 - Improve health care
 - Create safer and cleaner transport systems
 - Generate new products and services
 - Reduce the costs of public services
 - Improve sustainability and energy efficiency
 - ... among many other examples!
- New sectors have emerged overriding the prevalence of traditional strategies: *e-health, smart cities, smart spaces, e-banking, new videogame industry, industry 4.0, etc.*

The Bad News...

- Current reports alert about the gap between demand and supply of **skilful data scientists**. Main reports¹ blame the current rigid educative offer as main source of problems and demand:

*A **data scientist** must follow a multidisciplinary education covering all the relevant aspects of data science: **data management**, **data analytics** and basics on **business aspects***

"Data scientists must be able to write code and create systems"

- ¹Sources: European Commission, the Big Data Value Association (BDVA) and the Quant Crunch Report (USA-based), including a statement from Facebook, Google and main data-driven companies

But Again Good News

- The current scenario is also an opportunity for those with a comprehensive education on the field:
 - Harvard Business Report: *"Data Scientist is the sexiest job of the 21st Century"*
 - Salaries in Big Data / Data Science are 50% - 70% (depending on the source) higher than in any other IT sector
 - Inherent innovative and research-oriented work

FIB's Data Science Master

The FIB's Data Science Master fosters students with a multidisciplinary education meeting the skills need to become a successful data scientist

- Learning Outcomes:

- Identify and apply the most suitable data management methods and processes to manage the whole data lifecycle, including structured and unstructured data
- Identify and apply data analysis, knowledge extraction and data visualization of data collected in disparate heterogeneous formats
- Define, design and implement complex systems that cover all phases of a data science project
- Design and execute data science projects in specific domains in an innovative manner

Master in Data Science: Syllabus

<https://masters.fib.upc.edu/masters/master-data-science>

The Data Science master is fully aligned with the Big Data Management and Analytics (BDMA) master funded by the European Commission

<https://bdma.ulb.ac.be/>

Exemplary Master Theses

Building a 4D MRI blood-flow velocity fields statistical model

- **Author:** Hongping Feng
- **Abstract:** *Cardiovascular disease is a major cause of death worldwide. The diagnosis and prognosis is traditionally based on morphology and function; hemodynamic behaviour influences pathogenesis but it is hardly included in current clinical workflow due to lack of insight and standardization. This project aims at building a 4D MRI blood-flow velocity fields statistical model with methods such as PCA on 3D volume dataset*

Wind Pattern Analysis Applied to Coastal Areas

- **Author:** Mouad Moussabbih
- **Abstract:** *In the framework of the Tokyo 2020 Olympic Games Weather Project, a big amount of data have been and are currently collected on the sea through real time sensors during trainings and racings and are being stored into a cloud database. The collaboration with UPC is aimed at developing a data analysis methodology able to support sailors decisions during Olympic Games races*

Traffic Forecasting in Smart Cities

- **Author:** Juan José Vázquez Giménez
- **Abstract:** *For some time now, traffic forecasting has been a well-known problem in the inter-urban context. However, due to the limited amount of available data, researchers have been less focused on solving the problem in urban areas. Currently, we consider that the explosion of data due to increasing ICT (Information and Communications Technology) penetration in Smart Cities provides the suitable framework to exploit the potential of the forecasting methods. Thus, this master thesis will focus on the urban traffic forecast problem through the use of new data sources*

Data Science Tools to Detect the Intention of the User to Perform a Step with a Lower-limb Robotic Exoskeleton

- **Author:** Vicent Pérez Gregori
- **Abstract:** *Detecting the step moment has a key role in providing a more versatile human-machine interaction encouraging patients suffering from spinal cord injuries to use these kinds of devices to walk again.*
- *This challenge has been faced using two approaches, one consisting in an autotuning of the step initiation parameter using the angular velocity signal of the thigh segment. The latter, based on finding an alternative method to detect the user's intention of performing a step using Data Science techniques*

On Explainability of Deep Neural Networks

- **Author:** Álvaro Parafita
- **Abstract:** *Deep Neural Networks have attained state-of-the-art performance in most Machine Learning fields during the recent years. However, it is still hard to ascertain what function each layer of neuron performs or the reasoning behind each prediction. This problem is especially relevant for sensitive applications, such as medical image recognition, where model interpretability is a definite requirement. This project will evaluate the latest advances in deep learning interpretability and aim to find alternatives to the current attribution and feature visualization strategies*

Model-Agnostic Process Modelling

- **Author:** Josep Sànchez Ferreres
- **Abstract:** *Business process management is a widely employed discipline in modern organizations. however, most organizations do not see the benefits of using formal modelling languages to document processes and, thus, are unable to benefit from the most recent advances in the field.*
- *in this master thesis, we will explore the possibility of using natural language descriptions of processes as a formalism-agnostic process modelling language. to that end, a reasoning framework for annotated textual descriptions will be developed, in order to extract rich descriptions of processes from plain text. these annotations can then be automatically derived using natural language processing techniques, with additional human refinement if necessary*

The While and the Afterwards

- Around 80% of the students work or do research while studying
 - Many of them in research centres / research groups
 - Strong connections with companies in Barcelona (regular job offers)
 - 100% of employability after the master
 - Alumni spread all over the world
- Strong internationalisation
 - Less than 45% of the students come from Barcelona or its area
 - Around 30% of students involved in international mobility

Note: Data from the MIRI-DS and BDMA master students

The While and the Afterwards

- Usual positions:
 - Data Scientist
 - Data Analyst
 - (Chief) Data Officer
 - Data Engineer
 - Knowledge Engineer
 - Data Architect
 - Data Researcher
 - Digital Transformation Leader
 - Etc.

Internships

Internships

- *Convenis de col·laboració universitat – empresa (CCE):*
<https://www.fib.upc.edu/en/companies/industrial-practices>

Industrial Practices

Home » Companies » Industrial Practices

Industrial Practices ▾

Offers list

Posting offers

Job Placements ▶

FIB Visiona

Sponsorship ▶



Information for companies



Information for students



Regulations

Internships for students become a training activity under the supervision of the Faculty, the goal of which is to apply and complete the academic formation acquired, encouraging the professional skills that prepare for professional activities which facilitate the employment of them.

The framework of these activities is called educational cooperation agreements, regulated by [Royal Decree 592/2014](#) which regulates the external academic practices of college students.

Internships

CCE can be established with companies to do internships

- Extracurricular Practices:
 - NO Elective credits
 - Except for the Master Thesis: modality B or D

Mobility and Internationalisation

Mobility and Internationalisation

Plenty of options! **202 universities in 42 countries**

- Study abroad (one or two semesters)
 - Conditions (max ECTS): MDS (30+30)
 - Mobility programs (many with scholarships)
 - CERN
 - Erasmus+
 - UNITECH
 - Latin America, USA and Canada
 - National Institute of Informatics (NII) Tokyo and Vulcanus in Japan
 - China
- 1 Double degree (2 more on the making)
- Internship abroad
 - Ever-open calls: Erasmus+, IAESTE, AIESEC, Entrypark
 - Academic institutions
 - Industry
- Other activities (summer schools, short stays...)

Mobility and Internationalisation

<https://www.fib.upc.edu/en/mobility>

Mobility

Home » Mobility

MOVING

Knowing a new university, discovering a new country or improving your language skills are some of the advantages of the mobility programs offered by FIB.

Personal experiences that will allow you to stay in foreign universities and intern at businesses worldwide.



Incoming



Outgoing



Double degrees



International Partnerships

Mobility and Internationalisation

- Mobility calendar: <https://www.fib.upc.edu/en/mobility/outgoing/mobility-calendar>

Mobility Calendar

Home » Mobility » Outgoing » Mobility Calendar

| Mobility Calendar | Calls | Periods |
|-------------------------|--|-----------------------|
| Information Sessions | ✓ Google Summer of Code | 20 Mar 23 - 04 Apr 23 |
| Mobility experiences | ✗ Place application for foreign universities: Erasmus+, Latin America, Russia, Taiwan, China and double degrees | 17 Feb 23 - 01 Mar 23 |
| Study abroad ▶ | ✗ Application for a place at Spanish universities in the SICUE programme | 13 Feb 23 - 27 Feb 23 |
| Internship abroad | ✗ iWeek a Paris | 02 Jan 23 - 15 Feb 23 |
| Other activities abroad | ✗ Application for mobility in the US | 01 Dec 22 - 24 Jan 23 |
| | ✗ Vulcanus programme | 04 Nov 22 - 13 Jan 23 |
| | ✗ Application for the National Institute of Informatics (NII) in Tokyo - 2nd call | 23 Sep 22 - 14 Oct 22 |
| | ✗ Place application for foreign universities: programa Erasmus+, Latin America, CINDA, Canada, Russia, Taiwan and China (2nd call) | 13 Sep 22 - 18 Sep 22 |
| | ✗ Application for the National Institute of Informatics (NII) in Tokyo - 1st call | 25 Apr 22 - 18 May 22 |
| | ✗ Application for a mobility place with the programme UNITECH | 17 Dec 21 - 18 Jan 22 |

Opened ✓ To be open ! Closed ✗

Mobility and Internationalisation

- Information Sessions: <https://www.fib.upc.edu/en/mobility/outgoing/information-sessions>

Mobility information session 2022-2023

For mobility stays during the academic
year 2023-2024

1st semester

Wednesday, 16 November 2022

In this first session we will inform on the various mobility programs, but we will focus on those whose call is in December-January and on the stays at US universities. Information sessions will be recorded.

Place: Sala d'actes Manuel Martí Recober

- Morning session: **12:15 pm**

2nd semester

Wednesday, 15 February 2023

In this second session we will inform on the various mobility programs, but we will focus on Erasmus+, SICUE and double degree calls. Information sessions will be recorded.

Place: Sala Àgora

- Morning session: **12:15 pm**
- Afternoon session: **15:00 pm**

Still have doubts?
Contact us at:
rel.int@fib.upc.edu



Research and Innovation

Research and Innovation

- UPC is a leading research institution
 - Top university obtaining H2020 projects: <https://www.upc.edu/en/press-room/news/the-upc-is-still-the-top-spanish-university-in-obtaining-funds-from-the-h2020-programme>
 - Start-ups, spin-offs, innovation and technology transfer: <https://www.upc.edu/en/r-d-i/innovation>
 - UPC's centre for Development Cooperation: <https://www.upc.edu/ccd/en>
- Complement your time during the masters with added-value tasks!
- One strong aspect of our masters is that our teaching staff are also **researchers** with wide experience on the topics they teach
 - Belong to different departments and research groups
 - Have strong networks with researchers all over the world
 - You may want to do research under international mobility
- Formalise your research experience with **research grants** or **CCE agreements**
- Areas covered by our research groups:
 - Mathematics (MA)
 - Business Administration (OE)
 - Computer Architecture (AC)
 - Physics (FIS)
 - Services and Information Systems Engineering (ESSI)
 - Computer Science (CS)
 - Statistics and Operational Research (EIO)
 - Systems Engineering, Automatic Control and Industrial Informatics (ESAI)

Social Life

Social Life

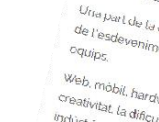
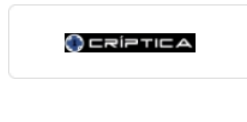
- FIB promotes social activities: <https://www.fib.upc.edu/en/fib/university-life>



Implica't



Viu la FIB



Game Jam Barcelona @ UPC

Una Game Jam és una trobada dedicada al ràpid prototipatge de videojocs. Els participants dissenyen un joc i el desenvolupen en un temps limitat, 48 hores non stop.

La Game Jam Barcelona@UPC és una de les més de 600 Game Jam que formen part de la Global Game Jam. Totes les Game Jam simul·lànies tenen lloc simultàniament el mateix cap de setmana a tot el món. La de Barcelona@UPC va celebrar la seva primera edició el gener del 2011 i cada any omple totes les places disponibles.

El dia d'inici s'acostumen a fer activitats, tallers i conferències. Tot seguit s'organitzen els grups. Una vegada que cada equip ha decidit sobre quina idea treballar, comença una carrera contra rellotge per aconseguir que funcioni el prototip del joc abans que s'exhaureixi el temps.

Organització: Video Games Association d'estudiants de la Facultat d'Informàtica de Barcelona (VGAFIB)
 Web: Game Jam @UPC
 Quan es fa: Última setmana de gener



Hack UPC

Hack UPC ha estat el primer hackathon organitzat per estudiants universitaris a Espanya. La primera edició va tenir lloc el febrer de 2016 i va aplegar més de 500 estudiants internacionals arribats d'arreu del món. A cada edició es programen moltes activitats en paral·lel per aprendre noves tecnologies i divertir-se.

Una part de la diversió d'un hackathon és conèixer gent nova. Al començament de l'esdeveniment es dedica un temps perquè tothom pugui reunir-se i formar equips.

Web, mòbil, hardware, tot està sobre la taula. Els projectes es jutgen a partir de la creativitat, la dificultat tècnica, el poliment i la utilitat per un panell de juges de la indústria i de la Facultat d'Informàtica.



Events

#bitsx
laMarató

Eleventh European Big Data Management & Analytics Summer School (eBISS 2023)
July 3 - July 7, 2023
Barcelona, Spain

HACKATHON

PER LA SALUT CARDIOVASCULAR

16-17-18 desembre 2022

REPTE 2023 Design Thinking

COM T'IMAGINES L'EXPERIÈNCIA DE CONDUIR UN CUPRA EN 5 ANYS?
Cerquem la IDÈA que revolucioni l'experiència de conducció de CUPRA, així com el model de negoci.

INSCRIU-TE AL REPTE



WOMEN IN DATA SCIENCE
BARCELONA

Sala d'actes de la FIB
20 d'abril de 2022, 9:30-14:30



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Enrolment Procedure

Procedure

Interested in one of our masters? This is the procedure to follow

The admission process, step by step



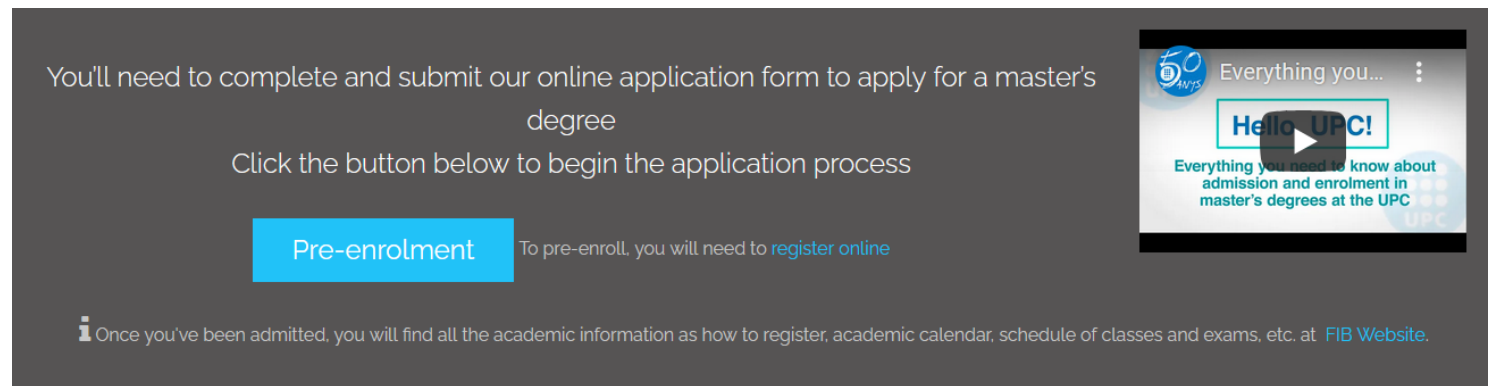
<https://www.upc.edu/en/masters/access-admission-enrolment>

Important Dates

- **Pre-enrolment:** From 27th February to 26th May 2023
- Two (three) **admission** periods:
 - ~~First period:~~
 - ~~Deadline to apply: 21st April 2023~~
 - ~~Tentative admission notification: 28th April 2023~~
 - Second period:
 - Deadline to apply: 26th May 2023
 - Tentative admission notification: 2nd June 2023
 - *Third period:*
 - *Not guaranteed, only if seats available*
 - *Tentative deadline: 30th June*
 - *Tentative admission notification: 7th July*
- Check the specific website of each master to know about its **admission** criteria: masters.fib.upc.edu

Pre-enrolment

- Start the procedure from the masters.fib.upc.edu website. Look for your favourite master, scroll down and look for the **pre-enrolment** button as shown below



- To pre-enrol follow the instructions
 - Provide the required documentation to evaluate your admission
 - Pay 30,21€ (tax) – **Important:** the button to pay does not appear until you enter all required fields

You can learn more about the pre-enrolment process here:
<https://www.upc.edu/en/masters/access-admission-enrolment/pre-enrolment>

Prices

Prices 2022/23 for European Union applicants

- MDS: 27,67€ / ECTS

Prices 2022/23 for Non-European Union applicants

- MDS: 69,17€ / ECTS

Note: prices for 2023/2024 will be published in July. Once published, UPC list the prices here: <https://www.upc.edu/en/masters/fees-grants>

- *Perspectives to be reduced up to 17,69€ / ECTS for European Union applicants at mid-term*

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Grants and Aids

Grants and Aids

- Find all details at: <https://masters.fib.upc.edu/grants-and-financial-aid>

General information

There are multiple ways to fund your studies at the **Universitat Politècnica de Catalunya** - BarcelonaTech (UPC). Grants, scholarships, mobility grants and loans are offered by the University and other bodies.

[Complete information about grants and financial aid at the UPC.](#)

Below you will find information on specific scholarships and grants that you can apply for at the FIB. **It is necessary to have applied for admission in the corresponding Master to qualify for any of them.**

Grants

| | |
|--|---|
| Accenture - Barcelona Digital Talent grants (2021-2022) | ▼ |
| Seidor grants (2021-2022) | ▼ |
| NTT DATA (everis) (2021-2022) | ▼ |
| "Nacho Navarro" grants (2021/2022) | ▼ |
| FIB Visiona - FIB grants (MEI, MIRI and MAI) - 2020-2021 | ▼ |
| Fundació Catalunya-La Pedrera (MAI) | ▼ |
| Fundació Catalunya-La Pedrera (MIRI) | ▼ |

Scholarships

| | |
|--|---|
| ARCO Scholarships for MIRI Students | ▼ |
| CBA scholarships in AI for networking for MIRI Students | ▼ |
| inLab FIB | ▼ |
| McAfee-Medicalia Grants for Catalonia (McA) scholarships for MIRI students | ▼ |

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FAQs

- **If I'm finishing my undergraduate studies this year, can I apply to a master?**

Of course! You can be admitted. You only need to finish on time your registration in September. Indeed, if you finalize your bachelor thesis in October you can yet be admitted in our masters. Contact us for more details.

- **Can I work and study at the same time?**

Of course! there are several opportunities to do extracurricular practices in companies or you can get a job on your own. Part-time enrolment is possible

- **What about next academic course and covid-19?**

Our objective are 100% face-to-face lectures. If not possible due to public health recommendations, we will maximise face-to-face / hybrid lectures.

- **For new incoming students... what about enrolment?**

Registration has been online in the last courses. If you require to hand in some documentation you can do later before the lectures start

Contact Information and Tutoring

- MDS Coordinator (academic): Oscar Romero (fib.vd.postgrau@upc.edu)
- Masters Information (administrative): info.masters@fib.upc.edu

A hand holding a snow globe. Inside the globe, the letters 'FIB' are at the top, and 'MASTERS' is written in large, white, 3D letters across the middle. The background inside the globe is a blue and green landscape with binary code (0s and 1s) falling like rain. Surrounding the globe are several circular icons: a bar chart, the Python logo, a server rack, a line graph, a network diagram with people icons, a gear with 'AI' inside, a database icon, a padlock, and a flowchart with three boxes.

FIB MASTERS

Do you have further questions?
Do not hesitate to contact us at
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