

# Master in Quantum Science and Technology, Barcelona



[Recording of online session Feb 2023](#)

Apply now!! (already accepting students)

[quantummasterbarcelona.eu/](https://quantummasterbarcelona.eu/)



Participating Institutions



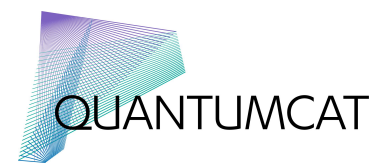
# Master in Quantum Science and Technology Barcelona



## Participating Institutions



**Catalonia Quantum Community:** The Master is embedded in the QuantumCAT Community of Universities, Companies and Research Institutes.



# Master in Quantum Science and Technology Barcelona



**Start date:** September 2023

**Duration:** 1 year, 60 ECTs (24 ECTs Master Thesis)

**Location:** lectures at the Facultat de Física (UB)

**Places:** ~35 students

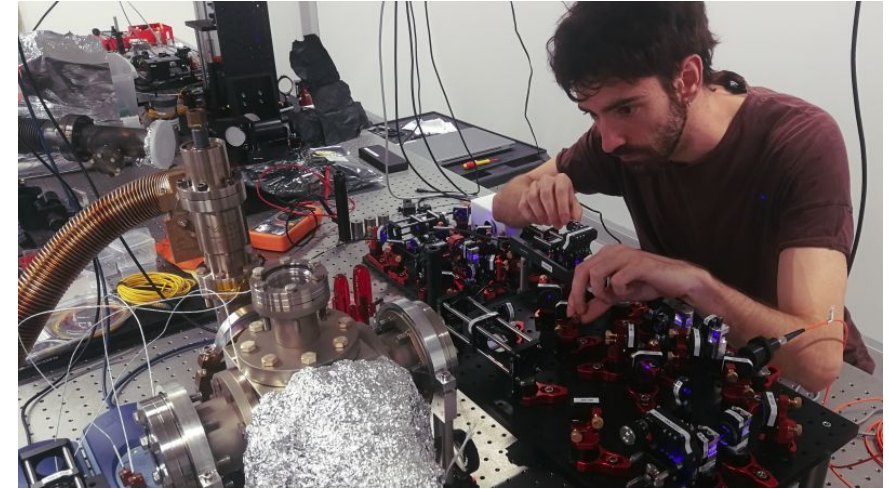
**Fees\*:** €1660 (EU), €4.920 (non-EU)

**Contact:** [master.quantum.bcn@ub.edu](mailto:master.quantum.bcn@ub.edu)

\* orientative matriculation fee



- **Education:** Learn cutting-edge experimental and theoretical techniques in emerging quantum sciences and their many technological applications.
- **Bridging with Industry:** Experience direct contact with companies developing new Quantum Technologies across different sectors.
- **Quantum Pillars:** Choose elective subjects in Quantum Computation, Communications, Materials, Sensing, & Simulation.



A student at work at ICFO Ultracold Atoms Lab

*Our Master program offers a unique combination of strong theoretical and experimental research groups and an ecosystem of spin-off companies and industry partners in all relevant fronts of Quantum Science and Technology*

Prof. Robert Sewell, Head of Academic Affairs, ICFO



- **Learn from Experts:** 30+ expert professors teach courses covering core concepts of quantum science & technology, and practical tool & techniques.
- **Cutting-Edge Research:** 60+ cutting-edge theoretical and experimental research groups across 3 universities and 4 Research centers.
- **Industry Engagement:** high-tech companies actively participate in teaching, offer internships and seminars & a careers symposium.
- **Career Prospects:** gain access to PhD programs at participating institutes, and advance your future careers in academia or industry.



## Syllabus

- **Quantum Core:** adv. quantum mechanics, condensed matter theory, & quantum information theory.
- **Extended Masters Thesis:** in-depth research projects of 6+ months available for Master Thesis
- **Links with industry:** Entrepreneurship & Innovation, Internships, Seminars, and Career Symposium
- **Elective courses** from one or more of the following tracks:
  - **Quantum Theory:** advanced courses on quantum information, communications and sensing.
  - **Quantum Software:** courses on cutting-edge numerical and computational techniques
  - **Quantum Hardware:** experimental techniques and cutting-edge quantum technologies.
  - **Quantum Optics\*:** advanced quantum optics, atom-light interaction, and their applications.

\* Offered through [Master in Photonics](#)



## Career Paths

The MQST program will prepare students for several career paths in Quantum Science and Technology. Depending on your interests and future ambitions, these may guide your choices for an Internship & Masters Thesis, and your choice of elective subjects. Potential paths that might be used to guide your choices are:

- **Engineering path** to enter the “industry”-related ecosystem, including quantum software companies, spinoffs and large industries working on hardware developments of quantum technologies for computation and communication. You may wish to take an **internship** and/or a master's thesis at one of our **industry partners**.
- **Experimental path** to pursue fundamental or applied research on experimental topics and help develop the disruptive, cutting-edge technologies needed in the field, leading to a PhD at one of the participating institutions or internationally. You may wish to do both an **internship + masters thesis with an experimental group**, combined with **electives from the hardware and quantum optics tracks**, and some courses of interest in the software and theory tracks.
- **Theory path** to tackle challenging theoretical problems either related with advanced developments for quantum information theory or towards the search of disruptive paradigms for quantum simulation, computation and communication, leading to a PhD at one of the participating institutions or internationally. You may wish to take electives from the **software, theory and quantum optics tracks**, combined with some courses of interest in the hardware track, along with a **theoretical project** for the masters thesis.



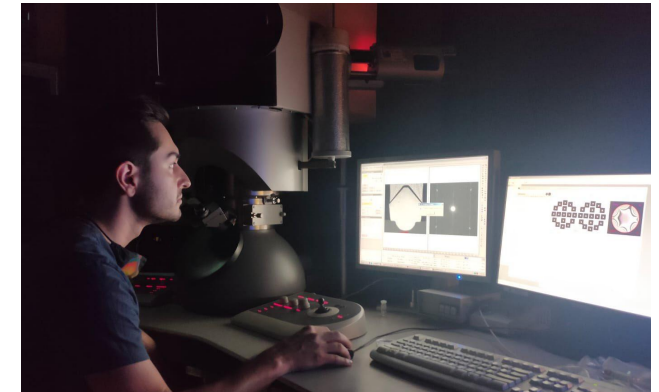
## Masters Thesis & Internships

### Master Thesis:

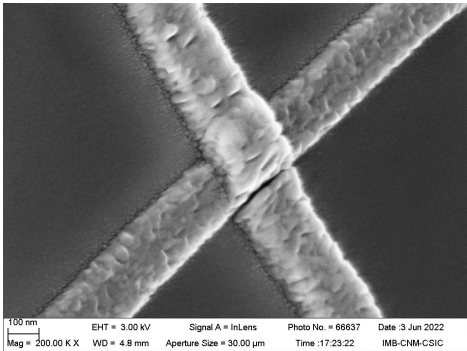
- Mandatory, 24 ECTs, from mid February to July/September

### Internship / Directed research project:

- Elective, 6 ECTs, can be done from Oct to July, flexible.
  - *Students interested in an experimental thesis may wish to take the internship subject in the same group prior to starting the thesis.*
  - **Internships projects** are also available across all **research groups** to broaden your practical experience, with out **international collaborators**, and with our **industry partners** to gain hands-on intersectoral experience



Master student at work during his Master Thesis



Josephson junction developed at IFAE

List of Master Thesis and Internship projects from previous years:

2021-2022 [PDF](#)

2022-2023 [PDF](#)





## Masters Thesis & Internships

Modules: QTheory, QSoftware, QHardware, QOptics  
Partners: UB, UAB, UPC, ICFO, BSC, ICN2, IFAE+ Companies

	Theory path		Experimental path		Engineering path	
<b>Q Communications and Information</b>	UAB, ICFO, ICN2, UPC	QT	ICFO, ICN2, UB	QH, QO	LuxQuanta, Multiverse, Quside, SandboxQuantum, VLC	QH, QO, QT
<b>Q Computation</b>	BSC, UAB	QT, QS	IFAE	QH	Algorithmiq, CryoConcept, DelftCircuits, IQM, IBM, Qilimanjaro, Quantum AI, Pasqal	QH, QS
<b>Q Matter</b>	ICFO, ICN2, UAB, UB, UPC	QH, QS	ICFO, ICN2, UB	QH, QO	ICFO, ICN2	QH
<b>Q Sensing</b>	ICFO, UAB	QT	ICFO	QH, QO	ICFO	QH, QO,
<b>Q Simulation</b>	ICFO, UB, UAB, UPC	QO, QS	ICFO	QH, QO	QUERA, Pasqal	QH, QS, QO

# Connection to Industry





## Funding available

### General Fellowships:

- ICCUB Maria de Maeztu Fellowship covering full registration fees

### Fellowships for Master Thesis at participating institutions:

- ICFO Student Research Fellowships and SPIE@ICFO Maria Yzuel Fellowship Awards
- ICN2 Internships
- Master plus U. Barcelona fellowships
- Grants from *Comunicaciones Cuánticas* project
- DigiQ fellowships

Besides these fellowships, many research groups and companies offer a stipend for students undertaking an Internship or Master Thesis with them.

### Mobility:

- DigiQ fellowships & networks
- Erasmus+



## Eligibility & Admissions

- The Masters program is aimed at graduates in Physics, Physical Engineering or equivalent degrees who want to continue specialization studies in Quantum Science and Technologies.
- Students should have English level B2 or equivalent
- If you are interested in joining the program, [contact us](#) for further details.
- [Registration](#) check: [quantummasterbarcelona.eu](https://quantummasterbarcelona.eu)

**Apply now!** Students will be admitted to the master on a rolling basis, with evaluation of new candidates at the end of each month from March to June.



## Internationalization

We are building links with international partners with quantum masters programs to facilitate cooperation and student exchange through the Erasmus+ program. Current students interested in exploring these opportunities should contact the coordinators at [master.quantum.bcn@ub.edu](mailto:master.quantum.bcn@ub.edu) for more details.

European Quantum Master Program Partners:

- [Master's Program on Quantum Science & Technology](#), Munich Center for Quantum Science and Technology ([TUM](#) and [LMU](#))
- [Master of Science in Quantum, Light, Materials and Nano Sciences](#), Paris-Saclay-University.
- [Quantum Technology Open Master](#), a pilot program of the [QTedu CSA](#) of the European [Quantum Flagship](#).



Our Master is an active participant of DigiQ (Digitally Enhanced Quantum Technology Master), a new European initiative based on a previous project by the [Quantum Flagship](#) and coordinated by the University of Aarhus (DK). DigiQ aims to drive transformation of the education ecosystem by introducing a number of educational innovations and a multinational programme structure to prepare the workforce and talent for future quantum technologies. It is funded by a €17.6 million grant over four years through the European Commission's [Digital Europe Programme](#).



The DigiQ program will offer students the chance to participate in a European ecosystem of more than 30 institutions from XXX countries. Specifically, the DigiQ program will include:

- **Digitally enhanced Modules and Courses** developed by the ecosystem
- **Online courses** that can be accredited through local masters programs
- **DigiQ Networks** with online and presential activities for students, including a Spring School and Quantum Career Symposium organized in Barcelona
- **Mobility:** Industry and research internships and student exchanges supported by extensive travel funding

Students who complete the DigiQ program will be awarded a **DQ-Master certification**.



This project has received funding from the European Union's Digital Europe Programme under grant agreement no. 101084035.



The Master in Quantum  
Science & Technology

# Quantum Careers Symposium

**26 April 2023**

ICFO  
Registration required





## Resources



<https://www.linkedin.com/company/81697059/admin/>

<https://www.linkedin.com/groups/12620016/>



Github repository:

<https://github.com/quantummasterbarcelonacode>



[\(Some\) Master Thesis \(2021-2022\)](#)



2022 edition, <https://quantummasterbarcelona.eu/quantumcareerssymposium/>



# Master in Quantum Science and Technology Barcelona



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