Master in PHOTONICS
”Photonics BCN”
(http://www.photonics.masters.upc.edu)

Master Erasmus Mundus EUROPHOTONICS
(http://www.europhotonics.org/)

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

UAB Universitat Autònoma de Barcelona

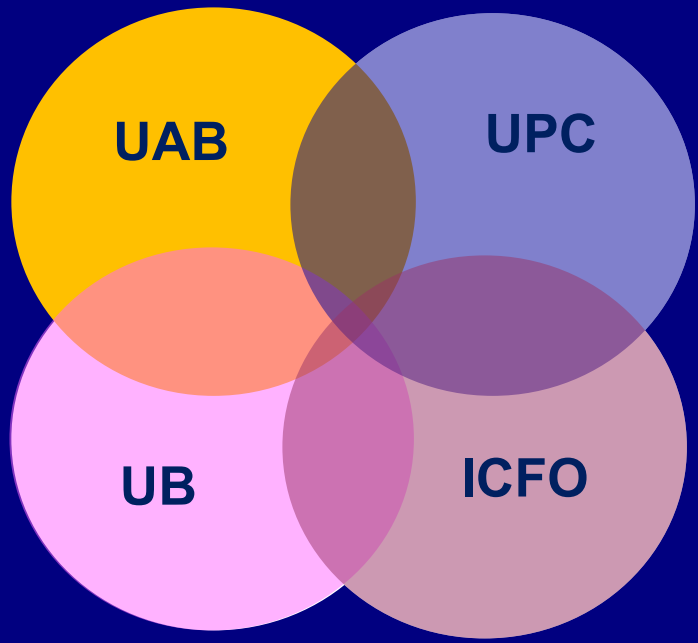
UNIVERSITAT DE BARCELONA

ICFO The Institute of Photonic Sciences

Mario Montes Usategui
(mario_montes@ub.edu)

MSc Photonics – "PHOTONICS BCN"

- **15 years ago, researchers covering different fields of Photonics in Barcelona area (UPC, UAB and UB) and in the Institute of Photonic Science (ICFO), decided to put together their complementary expertise to offer a joint Master in Photonics.**
- **Initiative and close collaboration between the four partner institutions:** a larger number of photonic areas are covered
- **The program started in 2007 – we are running the 16th edition**
- **Official 60 ECTS (1 year) Spanish Degree.**
- **All courses are taught in English.**



UNIVERSITAT POLITÈCNICA DE CATALUNYA
UAB Universitat Autònoma de Barcelona
UNIVERSITAT DE BARCELONA
ICFO Institut de Ciències Fotòniques

Universitat Politècnica de Catalunya (UPC)

Universitat Autonòma de Barcelona (UB)

Universitat de Barcelona (UB)

ICFO – The Institute of Photonic Sciences

Optics & Photonics

- A traditional area of science and technology evolving very fast.

Recent Nobel awards related with Photonics (Physics and Chemistry):

- 2018: Laser Physics: Optical tweezers y ultra-short pulses.
- 2014: Blue LEDs
- 2009: Optical fibers and CCD sensors
- 2005: Quantum theory of optical coherence
- 2001: Bose-Einstein condensates
- 2000: Heterostructures for optoelectronics
- 1997: Atom trapping and cooling
- 2014: Optical Nanoscopy
- 2008: GFP discovery

Expertise spread over the four institutions

UNIVERSITAT POLITÈCNICA DE CATALUNYA

UAB Universitat Autònoma de Barcelona

UNIVERSITAT DE BARCELONA

ICFO Institut de Ciències Fotòniques

- **Optical engineering:** sensors, remote sensing, metrology, optical design, adaptive optics, vision & machine visión, confocal microscopy
- **Image processing**
- **Liquid crystal**
- **Nonlinear optics, nonlinear dynamics**
- **Nanomaterials & metamaterials**
- **Opt. fiber commun.& networks**

- **Quantum information**
- **Optical trapping, optical tweezers**
- **Advanced microscopy**
- **Applied optics: image procesing, diffractive optics**
- **Optoelectronic devices, CMOS**

- **Quantum & Nonlinear Optics, Quantum information.**
- **Image processing, diffractive optics, metrology.**

- **Quantum & Atom optics**
- **Nanophotonics & metamaterials**
- **High resolution microscopy**
- **Nonlinear optics & devices,**
- **Ultrafast light**
- **Biophotonics**

UNIVERSITAT POLITÈCNICA DE CATALUNYA
UAB Universitat Autònoma de Barcelona
UNIVERSITAT DE BARCELONA
ICFO Institut de Ciències Fotòniques

Compulsory courses — 20 ECTS

Fundamentals of Photonics — 10 ECTS

- Introduction to photonics. Optics and Lasers — 5 ECTS
- Beam Propagation and Fourier Optics — 5 ECTS

Applied Photonics & Transversal Skills — 10 ECTS

- Photonics Laboratory — 5 ECTS
- Business and Patents in Photonics — 5 ECTS

Elective Courses — 24 ECTS

- Quantum Optics (QUANTOP) — 18 ECTS
- Biophotonics and Imaging (BIOIMA) — 12 ECTS
- Materials and Nanophotonics (MATNANO) — 12 ECTS
- Telecomm. & Photonics Circuits (TELPHO) — 12 ECTS
- Optical Engineering (OPTENG) — 12 ECTS

Master Thesis — 16 ECTS

Total: 60 ECTS

Quantum Optics and Technology — 18 ECTS

Quantum optics	3
From cooling & trapping of neutral atoms to BE condensates	3
Quantum simulators with ultracold quantum gases	3
Quantum light-matter interfaces	3
Advanced quantum optics with applications	3
Machine learning on classical and quantum data	3

Materials, Nanophotonics & Photonics Circuits — 18 ECTS

Photonic materials and metamaterials	3
Nonlinear optics	3
Nanophotonics	3
Ultrafast and ultraintense laser light	3
Optoelectronics and photovoltaic technology	3
Integrated photonics	3

Optical Engineering — 15 ECTS

Laser systems and applications	3
Optical design	3
Managing light with devices	3
Measuring with light (optical metrology)	3
Fibers and telecommunications	3

UNIVERSITAT POLITÈCNICA DE CATALUNYA · UAB Universitat Autònoma de Barcelona · UNIVERSITAT DE BARCELONA · ICFO Institut de Ciències Fotòniques

Biophotonics and Imaging — 12 ECTS

Experimental optical techniques in biology	3
Active and spectral imaging	3
Visual optics and biophotonics	3
Image processing in biophotonics	3
3D light control for biological applications	3

Additive key competencies — 5 ECTS

Business and Patents in Photonics — 5

- provide fundamental entrepreneurial skills required to successfully start and develop a technology based business,
- learn how to develop a project in a large company environment.
- incite business awareness and to explore the hard and fascinating way leading from cutting-edge research to the marketplace.

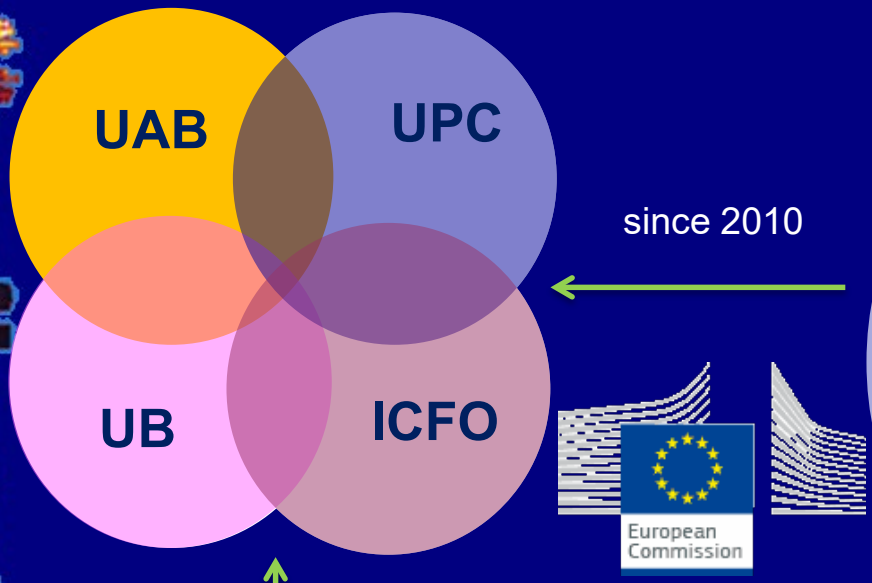
UNIVERSITAT POLITÈCNICA DE CATALUNYA · UAB Universitat Autònoma de Barcelona · UNIVERSITAT DE BARCELONA · ICFO Institut de Ciències Fotòniques

MSc Thesis 16 ECTS

- Many opportunities to start your scientific research (fundamental or applied), in different areas of Photonics in a research lab or in a company.
- **More than 50 project proposals every year** (see list of proposals for 2022_2023 at: https://photonics.masters.upc.edu/en/list-of-proposals-2022-23.
- Possibility to carry out your Master Thesis in an external research center, university or company;
- **Members of SECPhO:** contact with companies (https://www.secpho.org)

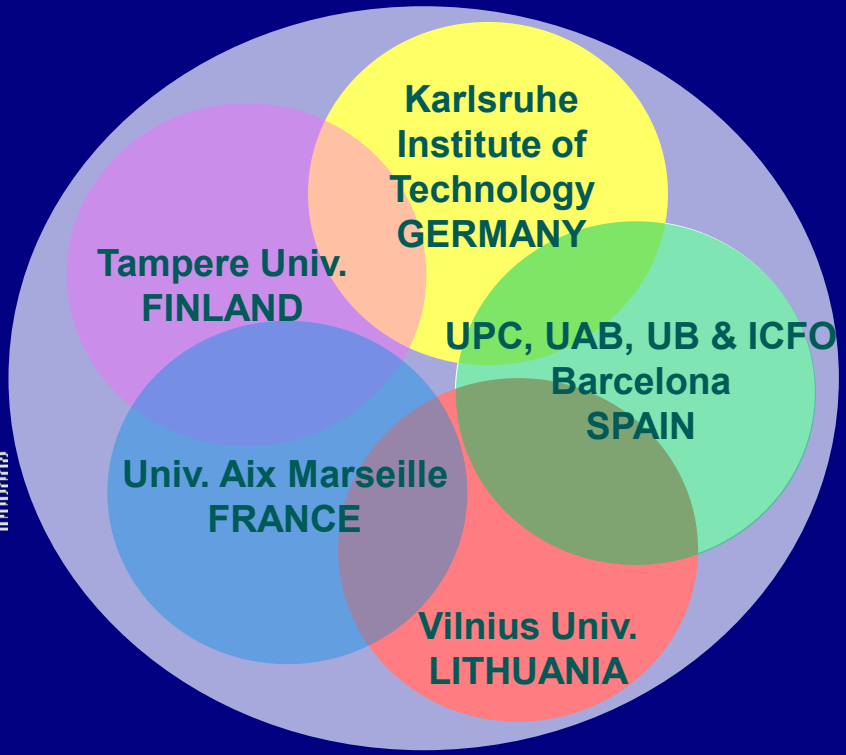
UNIVERSITAT POLITÈCNICA DE CATALUNYA · UAB Universitat Autònoma de Barcelona · UNIVERSITAT DE BARCELONA · ICFO Institut de Ciències Fotòniques

Masters in Photonics "PHOTONICS BCN" & Master Erasmus+ "EUROPHOTONICS"



since 2010

European Commission



Erasmus Mobility Scheme

European Erasmus+ Program

(2 years): multiple degree

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH · UAB Universitat Autònoma de Barcelona · UNIVERSITAT DE BARCELONA · ICFO The Institute of Photonic Sciences