

MSc IN PHOTONICS



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UNIVERSITAT POLITÈCNICA
DE CATALUNYA

UAB

Universitat Autònoma
de Barcelona

U

UNIVERSITAT DE BARCELONA

B

ICFO

Institut
de Ciències
Fotòniques

A master in the area of Barcelona

<http://www.photonicsbcn.eu/>



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CD6 Center

- Optical engineering: sensors, vision, metrology, opt. design, adaptive optics, color science.
- Image processing, liquid crystal, machine vision.
- Nonlinear optics, nonl. dynamics
- Nanomaterials, remote sensing.
- Opt. fiber Commun.& networks



- Applied optics:
Image proc., diffractive optics
- Thin films, Optical tweezers.
- Optoelectr. devices, CMOS
- Quantum information



- Nanophotonics
- Advanced optical imaging
- Quantum & Atom optics
- Nonlinear optics & devices, ultrafast light.
- Biophotonics, opt. tweezers
- Photonic materials



- Quantum & Nonlin. Optics,
Quantum information.
- Image processing, diffractive optics, metrology.
- Synchrotron light, X-ray opt.
- Thin films, multilayers.

We are at the 2nd year. Number of students: 20→26

OBJECTIVES

- (i) Provide knowledge and training in different areas of Photonics, considering both fundamental and applied aspects. With quality.
- (ii) Flexibility: the student can choose from many courses, to get either general (or fundamental or broadband) training, or more specialized training, in different possible areas.
- (iii) Develop competences and skills that will help the student to initiate a research or a professional carrier.

ADDRESSED TO:

- **Physicists, Telecommunication engineers and Electronics engineers.**
- Bachelors in Sciences and Engineers in general (*)
- Bachelors in Optics and Optometry (*)
- Other degrees (*)

() Levelling credits might be required.*

- **Master Council** (Senior members + students)

- **Executive committee:**

Ramon Vilaseca (director) (ramon.vilaseca@upc.edu)

Santi Royo (UPC) (santiago.royo@upc.edu)

Jordi Mompart (UAB) (jordi.mompart@uab.es)

Mario Montes (UB) (mario.montes@ub.edu)

Jordi Martorell (ICFO) (jordi.martorell@icfo.es)

Secretary: **Araceli Ortiz** (araceli.ortiz@upc.edu)

MASTER'S STRUCTURE:

- **Minimum: 60 ECTS itinerary**
- **Maximum: 120 ECTS itinerary**

COURSE PROGRAM

Itinerary
60 ECTS

Itinerary
120 ECTS

(Levelling courses)

≥ 0 ECTS

≤ 15 ECTS

Basics of photonics

10 ECTS

15 ECTS

Complementary skills

5 ECTS

7.5 ECTS

Main branches

≥ 10 ECTS

≥ 20 ECTS

Fundamental aspects

Optical Engineering

Optical Technologies

Electives

≤ 10 ECTS

≤ 27.5 ECTS

MSc Thesis preparation

0 ECTS

10 ECTS

MSc Thesis

25 ECTS

25 ECTS

BLOCK DETAILS (continued)

Itinerary
60 ECTS

Itinerary
120 ECTS

Levelling Courses

≥ 0 ECTS

≤ 15 ECTS

Mathematical Methods

5 ECTS

Electromagnetic Waves

5 ECTS

Quantum Physics

5 ECTS

BLOCK DETAILS

Itinerary
60 ECTS

Itinerary
120 ECTS

Basics of photonics

10 ECTS

10 ECTS

Introduction to photonics

5 ECTS

5 ECTS

Photonics laboratories

5 ECTS

5 ECTS

Photonics Laboratory complements

5 ECTS

Complementary skills

5 ECTS

7.5 ECTS

Photonics and business

2.5 ECTS

Transversal skills

2.5 ECTS

Computing in photonics

2.5 ECTS

BLOCK DETAILS (continued)

Itinerary
60 ECTS

Itinerary
120 ECTS

Main branches

≥ 10 ECTS

≥ 20 ECTS

Fundamental aspects

Quantum Optics	5 ECTS
Nonlinear Optics	5 ECTS
Physics of photonic materials	5 ECTS

Optical Engineering

Optical Metrology	5 ECTS
Optomechanical Systems Design	5 ECTS
Fourier optics	5 ECTS

Optical Technologies

Laser Systems and Technology	5 ECTS
Photonics Technology and Devices	5 ECTS
Optoelectronics	5 ECTS
Fibers&Telecommunications	5 ECTS

Itinerary
60 ECTS

Itinerary
120 ECTS

Electives (2.5 ECTS each)

≤ 10 ECTS

≤ 27.5 ECTS

- Quantum communication
- Quantum computation
- Milestone experiments in QO
- Statistical methods in QO
- Atom optics and BEC
- Nanophotonics
- Integrated photonics
- Optical micromanipulation workshop
- Thin film technologies
- Ultrafast and ultraintense laser light
- Synchrotron light
- Laser spectroscopy
- Applied NL optics and optoelectr.
- Nonlinear dynamics in optical syst.
- Image processing in MatLab
- Adv. Exp. Opt. Techn. in Biology
- Medical imaging
- Digital holography
- Active and adaptive optics
- Advanced optical instrumentation
- Fabrication of optical elements
- Photovoltaic devices
- Color Science
- Visual Optics
- Machine vision applications
- Optical remote sensing
- Optical telecom networks

SPECIAL (PEDAGOGICAL) FEATURES

■ “COMPLEMENTARY SKILLS” Module

Photonics in Business: Entrepreneurial skills [CD6 + ICFO] 

Seminars & Skills: Oral & written communication skills, for research or professional future work.
Scientific data bases manipulation.
Computing in Photonics.

■ “ACTIVITIES” Weeks

One “*activities week*” after 5 regular teaching weeks
Visits to labs. or companies, seminars, special experiences, presentations,...

■ VISITING SPEAKERS

Short Courses (*funded by Spanish government*)
Seminars, conferences

- **FLEXIBILITY:** Photonics Laboratory: possibility of election of experiences. Both general and specialized curricula are possible.
Master Thesis work: many possibilities.

Course on “**Photonics & Business**”

The main purpose of this short course is to provide the students with the fundamental entrepreneurial skills and behaviours required to successfully start and develop a technology based business. These skills are exactly the same as those needed to start and run a major development project in a large company environment.

The second purpose is to incite business awareness and to explore the hard and fascinating way leading from cutting-edge research to the marketplace.

Program will include lectures given by entrepreneurs that have the experience of starting-up a spin-off company. Participants will be also exposed to a highly interactive process of analysis and discussion, including case studies, small-group learning activities and simulations.



NEXT STEPS ...

- **COOPERATION WITH OTHER UNIVERSITIES,**
in particular in EUROPE *(for student's exchange,...)*
- **STRENGTHEN LINKS WITH COMPANIES**

Webpages of several of the related research groups:

- Institute of Photonic Sciences, ICFO
<http://www.icfo.es>
- Centre for Sensors, Instrumentation and Systems Development, CD6 (UPC)
<http://www.cd6.upc.edu>
- Remote sensing research group, RSLAB (UPC):
<http://www.tsc.upc.edu/rs/>
- Free-space optical communications:
<http://www.tsc.upc.edu/fsoc/>.
- Applied Optics and Image Processing research group, GOAPI (UPC)
<http://www.goapi.upc.edu>
- Optical Communications Group, GCO (UPC)
<http://www.tsc.upc.es/gco>
- Group on Nonlinear Dynamics, Nonlinear Optics and Lasers, DONLL
<http://www-fen.upc.es/donll/>
- Micro and nano.technologies research group, MNT
<http://webmnt.upc.es>
- Optics Group (UAB)
<http://optica.uab.es>
- Physical Optics reseach group (UB)
<http://www.ub.edu/optics/>