

**COURSE DATA****DATA SUBJECT**

**Code:** 46799  
**Name:** Optoelectronics and Photonic Devices  
**Cycle:** Doctorate / Master's Degree  
**ECTS Credits:** 3  
**Academic year:** 2025-26

**STUDY (S)**

Degree	Center	Acad. year	Period
2269 - Master's Degree in Electronic Engineering	Escola Tècnica Superior d'Enginyeria	1	First quarter

**SUBJECT-MATTER**

Degree	Subject-matter	Character
2269 - Master's Degree in Electronic Engineering	Diseño Electrónico	COMPULSORY

**COORDINATION**

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PEREZ SOLER JOAQUIN

**SUMMARY**

This course offers a comprehensive introduction to photonics, integrated optical devices, and optoelectronics, highlighting their diverse applications in communications and sensors. It explores the technological aspects that distinguish these devices, enhancing the functionality of electronic elements and systems. The latest technologies, new materials and new optical architectures are included. Examples include: photodetectors, light emitting diodes, lasers, optical fibers, electro-optic modulators, couplers, beam splitters, etc. Finally, real applications are addressed that allow students to acquire professional skills in the field of Photonics and Optoelectronics.

**PREVIOUS KNOWLEDGE****RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE**

There are no specified enrollment restrictions with other subjects of the curriculum.

**OTHER REQUIREMENTS**

The course requires a background in Electronics and Physics, as acquired in the subjects of the Degree in



Industrial Electronics Engineering, Degree in Telecommunications Electronics Engineering and Degree in Physics.

## COMPETENCES / LEARNING OUTCOMES

### 2269 - Master's Degree in Electronic Engineering

Conduct a critical analysis, evaluation and synthesis of new ideas to solve problems in complex or unfamiliar environments within broader contexts in the field of electronic engineering and related multidisciplinary fields.

Create mathematical models and simulations in the field of electronic engineering and related multidisciplinary fields.

Demonstrate a systematic knowledge and a mastery of technical, personal, social and methodological skills in the field of electronic engineering and related multidisciplinary fields.

Design systems and processes that meet electronic, regulatory, economic, social, ethical and environmental specifications.

Gain the professional skills and cooperation abilities that are suitable for practising in the field of electronic engineering and related multidisciplinary fields.

Handle specialised software and hardware, as well as design, simulation and programming environments in the field of electronic engineering and related multidisciplinary fields.

Identify, formulate and solve problems in the field of electronic engineering and related multidisciplinary fields.

Interpret technical documentation and regulatory standards for equipment and systems in the field of electronic engineering and related multidisciplinary fields.

Know advanced techniques of instrumentation and design of electronic, photonic and microelectronic devices.

Project, calculate and design products, processes and installations in the field of electronic engineering and related multidisciplinary fields.

## DESCRIPTION OF CONTENTS

### 1. Introduction.

1.1. Physical fundamentals

1.2. Photonic and optoelectronic materials.



## 2. Detectors.

- 2.1. Types of detectors.
- 2.2. Conditioning circuits.

## 3. Light sources.

- 3.1. LED diodes.
- 3.2. Laser diodes.

## 4. Integrated optics devices.

- 4.1. Introduction to waveguides.
- 4.2. Passive devices.
- 4.3. Active devices.
- 4.4. Integrated optics.

## 5. Optical fibers and applications.

- 5.1. Optical fibers.
- 5.2. Applications.

## 6. Practical.

- Analysis of optical experiments for the characterization of photonic devices.
- Conditioning circuits for photocurrent measurement.
- Characterization of optical fibers.
- Design and analysis of a laser system.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	18,00
Laboratory	12,00
<b>Total hours</b>	<b>30,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	5,00



Individual or group project	10,00
Independent study and work	10,00
Preparation of lessons	10,00
Preparation for assessment activities	5,00
Resolution of case studies	5,00
<b>Total hours</b>	<b>45,00</b>

## TEACHING METHODOLOGY

The teaching methodologies to be used in the development of the course are the following:

(MD1) Theoretical activities.

Expository development of the subject with the participation of the student in the resolution of specific questions. Individual evaluation questionnaires.

(MD2) Practical activities.

Learning by solving problems, exercises and case studies through which competences on the different aspects of the subject are acquired.

These teaching methodologies are developed in the following training activities:

(AF1) Theoretical activities.

In the theoretical classes the topics will be developed providing a global and integrating vision, analyzing in greater detail the key and more complex aspects, encouraging, everytime, the student's participation.

(AF2) Practical activities.

They complement the theoretical activities with the objective of applying the basic concepts and expanding them with the knowledge and experience acquired during the realization of the proposed works. They may include the following types of face-to-face activities:

- Classes of problems and questions in the classroom.
- Sessions of discussion and resolution of problems and exercises previously worked by the students.
- Group projects.
- Laboratory practices.

(AF3) Autonomous work of the student.



Out-of-classroom work on questions and problems, as well as preparation for classes and exams (study). This task will be done individually and tries to promote autonomous work.

The e-learning platforms (Virtual Classroom) will be used as a communication support with the students. Through it, students will have access to the didactic material used in class, as well as the problems and exercises to be solved.

## EVALUATION

The evaluation of the course will be carried out in the following way:

- For students who attend more than 80% of the classes:
  - Continuous evaluation (SE3) that will be graded by means of the delivery and exposition of a work related to the theoretical framework of the subject, which will constitute 50% of the grade.
  - Objective evaluation (SE2) that will consist of the resolution of problems and laboratory practices and will count for 50% of the grade.
- Students who do not attend more than 80% of the classes will take an objective test (SE1) on the official date. This objective test will have contents of the theory and laboratory part and will constitute 50 % of the grade. The other 50 % will be evaluated with the delivery of some practical assumptions (SE2).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA ([ACGUV 123/2020](https://www.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639)).

In any case, the system of evaluation will be ruled by the established in the Regulation of Evaluation and Qualification of the University of Valencia for Degrees and Masters. (<https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639>).

## REFERENCES

- J. Capmany, F. Javier Fraile-Peláez. Dispositivos de Comunicaciones Ópticas, Editorial Síntesis, 1999.



- G. Lifante. Integrated Photonics: Fundamentals, Ed. John Wiley & Sons, 2003.
- J. M. Liu. Photonic Devices, Cambridge University Press, 2005.
- J. Capmany, F. Javier Fraile-Peláez, Fundamentos de Comunicaciones Ópticas, Editorial Síntesis, 1998.
- P.W. Milonni, J.H. Eberly. Laser Physics, Ed. John Wiley & Sons, 2010.
- S.M. Sze, K.K. Ng. Physics of Semiconductor Devices, Ed. John Wiley & Sons, 2007.
- B. E. A. Saleh, M. C. Teich. Fundamentals of Photonics, John Wiley and Sons, 1991.