VNIVERSITAT DE VALÈNCIA

Course Guide
46799 Optoelectrónica y dispositivos fotónicos

COURSE DATA

Data Subject	
Code	46799
Name	Optoelectrónica y dispositivos fotónicos
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
2269 - Master's Degree in Electronic Engineering	School of Engineering	1	Annual

Subject-matter

Degree	Subject-matter	Character
2269 - Master's Degree in Electronic Engineering	3 - Diseño Electrónico	Obligatory

Coordination

Name	Department
PEREZ SOLER, JOAQUIN	242 - Electronic Engineering
SUAREZ ALVAREZ, ISAAC	242 - Electronic Engineering

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 (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

At the end of this course the student will be able to:

- Con2 - To know the advanced techniques of instrumentation and design of electronic, photonic and microelectronic devices.
- Con5 - Interpret the technical documentation and regulatory standards of equipment and systems in the field of Electronic Engineering and related multidisciplinary fields.
- Hab1 - Identify, formulate and solve problems in the field of Electronic Engineering and related multidisciplinary fields.
- Hab2 - Model and simulate mathematically in the field of Electronic Engineering and related multidisciplinary fields.
- Hab3 - Project, calculate and design products, processes and installations in the field of Electronic Engineering and related multidisciplinary fields.
- Hab4 - Handle specialized software and hardware, as well as design, simulation and programming environments in the field of Electronic Engineering and related multidisciplinary fields.
- Hab5 - Design systems and processes that meet specifications from different points of view: electronic, regulatory, economic, social, ethical and environmental.

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

ACTIVITY	Hours	% To be attended
Theory classes	18,00	100
Laboratory practices	12,00	100
Attendance at events and external activities	5,00	0
Development of group work	5,00	0
Development of individual work	5,00	0
Study and independent work	5,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	5,00	0
Preparing lectures	5,00	0

Preparation of practical classes and problem	5,00	0
Resolution of case studies	5,00	0
TOTAL	**75,00**	

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).

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

Basic

- 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.

Additional

- 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.