SUBJECT TEACHING GUIDE

1018 - Light Guide, Amplification and Processing

University Master's Degree in the Science and Engineering of Light

Academic year 2026 - 2027

1. IDENTIFYING DATA					
Degree	University Master's Degree in the Science and Engineering of Light			Type and Year	Compulsory. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline					
Course unit title and code	1018 - Light Guide, Amplification and Processing				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web	https://web.unican.es/estudios/detalle-estudio?p=206&a=2020				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA
Name of lecturer	MARIA ANGELES QUINTELA INCERA
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Other lecturers	LUIS RODRIGUEZ COBO

3.1 LEARNING OUTCOMES

When taking the subject of Guidance, Amplification and Light Processing, the learning results are aimed at the student acquiring a theoretical knowledge training and technologies related to the technique of light guidance and processing. To do this, he is provided with the necessary training in the fundamentals of the propagation of light in waveguides in general, and in optical fiber in particular. Also, the student acquires the necessary knowledge to understand the process of light amplification and know the different technologies of amplifiers. In addition, the learning results are also aimed at the student knowing and mastering the different techniques of light processing.

4. OBJECTIVES

- Become familiar with the reasoning of the guidance of light in different material media and structures. Determine the operating conditions. Know the main devices of integrated optics and optical fibers.
- To base mathematically the existence of the eigen modes in the slab waveguide, rectangular waveguide and cylindrical optical waveguides.
- Understand the physics and technology of the devices in integrated optics and optical fibers.
- Learn skills in the design and simulation of guidance structures in integrated optics.
- Acquire technical skills in the management, measurement and use of integrated optical components and optical fibers.
- Be able to correctly use the light sources (LED diode and laser diode) and photodetectors.
- To theoretically base the process of optical amplification in dielectric and semiconductor media.
- Understand the different technologies used in optical amplification.
- Acquire skills in light processing techniques.

6. COURSE ORGANIZATION

CONTENTS	
1	Introduction to the guidance of light
2	Propagation of light in 1D and 2D waveguides. Slab waveguides, rectangular waveguides, guided modes, cutoff frequency etc.
3	Propagation of light in optical fibers. Guided modes, cutoff frequency, dispersion, etc.
4	Fundamentals of optical amplification.
5	Technologies for optical amplifiers
6	Techniques of light processing.
7	Tutorials
8	Final work

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessment	%
- Activities of continuous evaluation, during the 15 weeks throughout the semester. This activity consists of the collection of deliverables related to problems, exercises, designs, assignments, review tests and other activities, both individually and as	Others	No	Yes	75,00
Evaluation of laboratory practices. They are done at the end of each subject that contains laboratory practice (3 sessions of 1.5 hours and 1 session of 3 hours). Deliverable from memory of laboratory practices.	Laboratory evaluation	No	Yes	25,00
TOTAL				100,00

Observations

- Activities of continuous evaluation, during the 15 weeks throughout the semester. This activity consists of the collection of deliverables related to problems, exercises, designs, assignments, review tests and other activities, both individually and as a group, in the classroom and outside of it. These activities require regular attendance at the lectures and learning activities in the classroom. The minimum grade score is 5.
- Evaluation of laboratory practices. They are done at the end of each subject that contains laboratory practice (3 sessions of 1.5 hours and 1 session of 3 hours). Deliverable from memory of laboratory practices.
- Final work. Cooperative work activity on the design of a light guidance system that contemplates the integration of the knowledge acquired in the subject. It is delivered at the end of the semester. The minimum grade score is 5.

Observations for part-time students

The part-time enrolled student may choose either the evaluation method described above in this teaching guide or solely take the Final Exam in the regular or extraordinary session. In the latter case, the weight of this exam will be 100%.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

1. Chin-Lin Chen, Foundations for guided-wave optics, Wiley 2007.
2. Katsunari Okamoto, Fundamentals of Optical Waveguide, Academic Press, 2° Ed. 2006.
3. E. Rosencher et B. Vinter, Optoelectronics, Cambridge University Press, 2004.
4. Kenji Kawano and T. Kitoh, Introduction to Optical Waveguide Analysis, J. Wiley and Sons, Inc. 2001
5. Robert G. Husperber, Integrated Optics: Theory and Technology, Springer, 6° edition 2009.
6. Allan W. Snyder and J.D. Love, Optical Waveguide Theory, Chapman & Hall, 1983.
7. Takanori Okoshi, Optical Fiber, Academic Press 1982.
8. Emmanuel Desurvire, Erbium-doped-fiber-amplifiers-principles-and-applications, J. Willey & Sons 2002
9. Michel J. F. Digonnet, Rare-Earth-Doped-Fiber-Lasers-and-Amplifiers, Marcel Dekker 2001