SUBJECT TEACHING GUIDE

1083 - Advanced Photonics for Communications

Master's Degree in Telecommunication Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in Telecommunication Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline					
Course unit title and code	1083 - Advanced Photonics for Communications				
Number of ECTS credits allocated	5	Term		Semester based (1)	
Web	https://web.unican.es/estudios/detalle-asignatura?c=M1600&p=164				
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	ADOLFO COBO GARCIA
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Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 3. DESPACHO PROFESORES (S324)
Other lecturers	OLGA MARIA CONDE PORTILLA LUIS RODRIGUEZ COBO

3.1 LEARNING OUTCOMES
- Know the role of photonics as a technology in telemmunication systems
- Name pros and cons of different technologies for the physical layer of telecommunication systems
- Know and model the propagation of ligth in waveguides and non-guided systems
- Know photonic components an sub-systems for communication and sensor networks, knowing its use, parameters and typical values.
- Choose among differnt photonic components and sub-systems for any application related to communications.
- Know and apply models of any photonic and optoelectronic subsystem or component, and is able to integrate them in the design and operation of optical networks at the physical layer.
- understand the impact and neccessities of the physical layer in communication networks, in relationship with the upper layers, specially for an efficient transport, protection, control and operation
- Is able to design and to estimate the performance of photonic and optoelectronic components.
- Design optical communication and sensor networks, in particular, with WDM technology, PON networks for FTTx services, and Ethernet networks.
- Design and select components for networks based on plastic optical fibers, short-distance optical interconnections and optical communications over illumination systems.
- understand the advantages of future transport all-optical networks and is able to compare different architectures, and topologies.
- Use software for the simulation of optical networks at the physical layer level
- Know different types of optical sensors, their technologies, performance and integration in sensor networks
- Anaylse and compare diffferent light sources, detectors, optical amplifiers, passive components and optical fibers, from technical and economical points of view
- Use technical information in English in the photonic and communication networks, and optical sensors field

4. OBJECTIVES
To know the role of photonics as a technology in telemmunication systems
To lay the fundations of light propagation in guided and non-guided mediums
To analyse photonic components an sub-systems for communication and sensor networks, knowing its use, parameters and typical values.
To select among photonic components and systems.
To apply models to calculate the performance of photonic devices and systems, and to use commercial software for the simulation of optical networks at the physical layer level
To study the protection and control of optical networks
To design communication and sensor networks, WDM networks, PON networks for FTTx services, ethernet networks, plastic optical fiber networks, short-distance interconnection optical lijnks, and LiFi networks
To introduce the concept of all-optical networks
To study different optical and fiber optic sensors, their technology, performance and integration into networks
To analyse light sources, detectors, optical amplifiers, passive components, and optical fibers
To use technical information in English related to photonics and networks

6. COURSE ORGANIZATION

CONTENTS	
1	Introduction
2	Concept, techniques and advanced technologies for transmitters, receivers, guided and non-guided channels
3	Advanced photonic components and sub-systems, integrated photonics (for digital and radio over fiber networks)
4	Guided optical channels, microstructured, multicore, Multimode and POF fibers
5	TDM and WDM transport networks, management and control of optical transport networks
6	TDM-PON technology for access networks (FTTH)
7	Non-guided optical systems (LiFi)
8	Tutoring
9	End of semester assignment

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
continous assesment activities	Others	No	Yes	65,00
End of semester assignment	Work	No	Yes	25,00
practice assesment (written report)	Work	No	Yes	10,00
TOTAL				100,00

Observations

Continuous assessment activities are partially based on cooperative classroom activities. In the case of sanitary measures that prevent or discourage this type of activities, it will be substituted by individual activities, or remote cooperative (by videoconference).
The evaluation of the end-of-semeter work is based on the exposition in the classroom of a work carried out autonomously by a group of students, if required, it can be done individually and / or defended remotely by videoconference.
The laboratory practice is based on the use of software that can be done from home, and its evaluation is a report.
In the event of a sanitary alert that prevent us to do face to face evaluation, all evaluation activities will be carried out remotely.

Observations for part-time students

if needed, the in-classroom activities will be allowed to be done individually at home.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Agrawal, Govind P. “Fiber-optic communication systems”, 3rd ed. , John Wiley & Sons, Inc. (2002)
Pastor Abellán, Daniel y otros, “Sistemas de comunicaciones ópticas”, Ed. Univ. Politéc. Valencia, (2007)
Keiser, Gerd E. “Optical fiber communications” , 3rd Ed, McGraw-Hill, Boston (2000)
J. Capmany, "Redes ópticas", 2006
V. Alwayin, "Optical networks design and implementation", Cisco Press, 2004.