SUBJECT TEACHING GUIDE

G852 - Transmission and Optical Commutation

Degree in Telecommunication Technologies Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Transmission and Optical Commutation				
Course unit title and code	G852 - Transmission and Optical Commutation				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web					
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	FELIX FANJUL VELEZ
E-mail	felix.fanjul@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 4. DESPACHO PROFESOR (S4003)
Other lecturers	JOSE LUIS ARCE DIEGO

3.1 LEARNING OUTCOMES
- Knowledge of the fundamentals of optical radiation and its relation to the characteristics of optical transmission systems
- Knowledge of light propagation in optical fibers, particularly in single-mode (telecommunications standard) and modified dispersion optical fibers
- Knowledge of the characteristics of the optical transmitters based on LEDs, SuperLEDs and lasers and ability to choose the most appropriate optical transmitter
- Knowledge of the optical receivers based on PIN and APD photodiodes and ability to choose the most appropriate characteristics of an optical receiver
- Ability to design IM-DD point to point systems, and multilink with regenerative repeaters and optical amplifiers
- Knowledge of the optical multiplexing systems in the time domain and in the wavelength domain and ability to analyze the appropriate multiplexing for an application, and to evaluate the performance of an application with a given multiplexing
- Knowledge of the techniques and the technologies of optical switching and ability to analyze the appropriate switching to an application, and to evaluate the performance of an application with a given switching mechanism
- Knowledge of the future evolution of optical networks, especially packet or burst switching
- Knowledge of typical access networks in optical networks and ability to design and evaluate its performance.
- Knowledge of the usual metropolitan networks in optical networks and ability to design and evaluate its performance
- Knowledge of the usual long-distance networks in optical networks and capacity to design and to evaluate its performance

4. OBJECTIVES
To know the characteristics of the optical radiation and the advantages of optical transmission systems
To know the propagation characteristics of the optical fibers and its different types
To know the basis principles of a LED, a SuperLED and a Laser, and to know the composition of the transmitter block
To know the structure and characteristics of the PIN and APD photodiodes and to characterize the optical receivers
To know the optical devices used in optical fiber communications systems
To design point to point IM-DD systems, multilink with regenerative repeaters and optical amplifiers
To understand the operation of the optical multiplexing in the time domain and in the wavelength domain , and to analyze the characteristics and limitations of WDM and DWDM systems
To understand the benefits of switching in the optical domain and analyze optical switches and several implementation technologies
To study multiplexers and demultiplexers wavelength devices, as well as the insertion and extraction channels
To explain the concepts of optical packet and burst switching networks and its development
To know the architecture, generic topology and design of an optical network
To know the usual types of access networks such as CATV and FTTx
To know the characteristics and types of metropolitan networks
To know the architectures of the usual long distance networks

6. COURSE ORGANIZATION	
CONTENTS	
1	THEMATIC AREA 1: Introduction
2	THEMATIC AREA 2: optical transmission elements 2. Optical transmission media 3. The optical transmitter 4. The optical receiver 5. Basic Optical Devices
3	THEMATIC AREA 3: design of point to point or point to multipoint optical transmission systems 6. Design of optical transmission systems
4	THEMATIC AREA 4: optical networks 7. Optical Multiplexing 8. Optical Switching 9. Optical networks

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Written theoretical and practical final exam	Written exam	Yes	Yes	60,00
Reports and exercises	Work	No	Yes	10,00
Reports of laboratory works	Work	No	Yes	30,00
TOTAL				100,00

Observations
Attendance at lab is mandatory, as well as delivery of reports of laboratory works. You must obtain a grade of at least 4 out of 10 in the final written test to pass the course. Remote evaluation is considered, including reports, exercises, laboratory work and written tests, in case a new COVID-19 emergency alert makes it impossible to be implemented in person.
Observations for part-time students
Part-time students who are not eligible to get their continuous assessment will conform their final mark by the lab reports, with a weight of 30% and the same conditions as full-time students, with compulsory attendance, and the final written exam, with a weight of 70%.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
J. Capmany, F. Fraile, J. Marti, Fundamentos de Comunicaciones Opticas, Ed. Sintesis, 1998.
J. Capmany, B. Ortega, Redes Ópticas, Editorial UPV , 2006.
Gerd Keiser, Optical Fiber Communications, McGrawn-Hill Internacional, 3ª Edición, 2000.
John M. Senior, Optical Fiber Communitacions. Principles and Practice, Prentice Hall Intern. Series in Optoelectronics, 2ª Edición, 1992.
John Gowar, Optical Fiber Communications Systems, Prentice Hall Intern. Series in Optoelectronics, 1996.
G. Agrawal, Fiber-Optic Communications Systems, Edit. Wiley-Interscience, 2002.
Hecht-Zajac, Óptica, Addison Wesley Edit., Madrid, 1988.
B.E.A. Saleh, y M.C. Teich, Fundamentals of Photonics, Edit. Wiley-Interscience, 2007.