Last update: 06-05-2019

230697 - OFLAB - Optical Fiber Telecommunications Lab

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 739 - TSC - Department of Signal Theory and Communications

Academic year: 2019

Degree: MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional)
MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: Gabriel Junyent Giralt

Others: José A. Lázaro, Jaume Comellas, Salvatore Spadaro and Joan M. Gené

Opening hours

Timetable: Any time is possible by appointment email

Degree competences to which the subject contributes

Specific:

CE1. Ability to apply information theory methods, adaptive modulation and channel coding, as well as advanced techniques of digital signal processing to communication and audiovisual systems.
CE13. Ability to apply advanced knowledge in photonics, optoelectronics and high-frequency electronic

CE3. Ability to implement wired/wireless systems, in both fix and mobile communication environments.

Transversal:

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Teaching methodology

Lectures
Laboratory classes
Laboratory practical works

Learning objectives of the subject

Learning objectives and results:
Learning objectives: The aim of this course is to train the students in using advanced equipment to measure, characterize and/or evaluate sophisticated fiber-optic devices and systems.

Learning results:
1.-Ability to operate, characterize and design optical transmitters, optical receivers, optical amplifiers, optical filters and multiplexers/demultiplexers.

Last update: 06-05-2019

230697 - OFLAB - Optical Fiber Telecommunications Lab

2.-Ability to evaluate the quality of a fiber-optic digital transmission.
3.- Ability to carry out measurements of optical fiber characterization.
4.- Ability to use fiber-optic-specific software to simulate and/or design both devices and systems.

Study load

Total learning time: 125h	Hours small group:	39h	31.20%
	Self study:	86h	68.80%

Last update: 06-05-2019

230697 - OFLAB - Optical Fiber Telecommunications Lab

Content

1. Introduction to Fiber-optics Laboratory

Learning time: 5h
Laboratory classes: 3h
Self study : 2h

Description:
Introduction to Fiber-optics Lab.
Description:
1.-Description of the practices to be performed
2.-Explanation of the equipment to be used
3.-Introduction to the simulation software to be used

Practice 1: Optical Amplifiers

Learning time: 20h
Laboratory classes: 6h
Self study : 14h

Description:
Description: Operation of optical amplifiers
Characterization of:
1.-A semiconductor optical amplifier (SOA)
2.-An erbium-doped fiber amplifier (EDFA)
Design of:
1.-An EDFA (hardware)
2.-Raman optical amplifier (software)

Practice 2: Optical Modulators

Learning time: 20h
Laboratory classes: 6h
Self study : 14h

Description:
Description: Operation of optical modulators
Characterization of: A Mach-Zehnder optical modulator
Design of:
1.-An optical intensity modulator (hardware)
2.-An optical IQ modulator (software)

Last update: 06-05-2019

230697 - OFLAB - Optical Fiber Telecommunications Lab

Practice 3: Optical Filters, Multiplexers-Demultiplexers and Switches

Learning time: 20h

Laboratory classes: 6h
Self study : 14h

Description:
Description: Operation of optical filters, multiplexers-demultiplexers and switches
Characterization of.
1.-An optical filter
2.-An optical multiplexer-demultiplexer
3.-A wavelength-selective switch (WSS)
Design of:
1.-An optical cross-connect (software)

Practice 4: Digital Transmission System

Learning time: 20h

Laboratory classes: 6h
Self study : 14h

Description:
Description:
Operation of:
1.-bit error testers
2.-optical oscilloscopes
Characterization of:
1.-An optical transmitter
2.-An optical receiver
Evaluation of: An intensity-modulation with direct detection system (hardware)
Design of: An advanced optical modulation system (software)

Practice 5: Wavelength Division Multiplexing (WDM)

Learning time: 20h

Laboratory classes: 6h
Self study : 14h

Description:
Description:
Operation of: Ethernet-SDH data generators
Evaluation of:
1.- A DWDM System (hardware)
2.- A coarse WDM system (hardware)
Design of: A flex-grid optical network (software)

Last update: 06-05-2019

230697 - OFLAB - Optical Fiber Telecommunications Lab

Practice 6: Control Plane-driven connectivity provisioning	Learning time: 20h Laboratory classes: 6h Self study : 14h

Description:
Description:
Operation of: Control plane-based approach of connectivity provisioning.
Evaluation of: Connectivity provisioning according to different requirements (latency, QoS, etc).

Qualification system

Individual assessments: 20%
Laboratory assessments: 80%

Bibliography

Basic:

Agrawal, G.P. Fiber-optic communication systems [on line]. 4th ed. Hoboken: Wiley, 2010 [Consultation: 17/10/2016]. Available on: <http://onlinelibrary.wiley.com/book/10.1002/9780470918524>. ISBN 9780470505113.

Hui, R.; O'Sullivan, M. Fiber optic measurement techniques. 1 edition. Academic Press, 2009. ISBN 9780123738653.

Complementary:

Agrawal, G.P. Lightwave Technology: Components and Devices. Hoboken, New Jersey: Wiley-Interscience, 2004. ISBN 0471215732.

Desurvire, E. Erbium-doped fiber amplifiers: principles and applications. Willey & Soncs, 1994. ISBN 0471589772.

Ramaswami, R.; Sivarajan, K.N. Optical networks: a practical perspective. 3rd edition. San Francisco [etc.]: Morgan Kaufmann, 2010. ISBN 9780123740922.

Chan, C.K. Optical performance monitoring : advanced techniques for next-generation photonic networks. 1ª edición. Amsterdam ; Boston: Academic Press, 2010. ISBN 9780123749505.

Le Nguyen, B. Optical fiber communication systems with MATLAB and Simulink models [on line]. 2nd ed. Boca Raton: CRC Press, 2015 [Consultation: 14/02/2017]. Available on: <http://site.ebrary.com.recursos.biblioteca.upc.edu/lib/upcatalunya/detail.action?docID=11167597>. ISBN 9781482217513.

Alwayn, V. Optical Network Desing and Implementation. Cisco, 2004. ISBN 1587051052.