Course guide
230697 - OFLAB - Optical Fiber Telecommunications Lab

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.
Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: English

LECTURER

Coordinating lecturer: Consultar aquí / See here:
https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura

Others: Consultar aquí / See here:
https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

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.
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**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>86,0</td>
<td>68.80</td>
</tr>
<tr>
<td>Hours small group</td>
<td>39,0</td>
<td>31.20</td>
</tr>
</tbody>
</table>

**Total learning time:** 125 h

**CONTENTS**

1. **Introduction to Fiber-optics Laboratory**

**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

**Full-or-part-time:** 5h
- Laboratory classes: 3h
- Self study: 2h

**Practice 1: Optical Amplifiers**

**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)

**Full-or-part-time:** 20h
- Laboratory classes: 6h
- Self study: 14h

**Practice 2: Optical Modulators**

**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)

**Full-or-part-time:** 20h
- Laboratory classes: 6h
- Self study: 14h
Practice 3: Optical Filters, Multiplexers-Demultiplexers and Switches

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)

Full-or-part-time: 20h
Laboratory classes: 6h
Self study: 14h

Practice 4: Digital Transmission System

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)
An advanced optical modulation system (software)

Full-or-part-time: 20h
Laboratory classes: 6h
Self study: 14h

Practice 5: Wavelength Division Multiplexing (WDM)

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)

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

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

Full-or-part-time: 20h
Laboratory classes: 6h
Self study : 14h

GRADING SYSTEM

Individual assessments: 20%
Laboratory assessments: 80%

BIBLIOGRAPHY

Basic:

Complementary: