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

<table>
<thead>
<tr>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes</td>
</tr>
<tr>
<td>Laboratory practical works</td>
</tr>
</tbody>
</table>

Learning objectives of the subject

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></th>
<th>Total learning time: 125h</th>
<th>Hours small group:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>39h</td>
<td>86h</td>
</tr>
<tr>
<td>Study load</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total learning time: 125h

Hours small group: 39h
Self study: 86h
# 1. Introduction to Fiber-optics Laboratory

**Description:**
Introduction to Fiber-optics Lab.

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

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes:</td>
<td>3h</td>
</tr>
<tr>
<td>Self study:</td>
<td>2h</td>
</tr>
</tbody>
</table>

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## Practice 1: Optical Amplifiers

**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)

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>20h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes:</td>
<td>6h</td>
</tr>
<tr>
<td>Self study:</td>
<td>14h</td>
</tr>
</tbody>
</table>

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## Practice 2: Optical Modulators

**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)

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>20h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes:</td>
<td>6h</td>
</tr>
<tr>
<td>Self study:</td>
<td>14h</td>
</tr>
<tr>
<td>Practice</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Practice 3: Optical Filters, Multiplexers-Demultiplexers and Switches</td>
<td><strong>Description:</strong> 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), <strong>Design of:</strong> 1.-An optical cross-connect (software)</td>
</tr>
<tr>
<td>Practice 4: Digital Transmission System</td>
<td><strong>Description:</strong> Operation of: 1.-bit error testers, 2.-optical oscilloscopes, Characterization of: 1.-An optical transmitter, 2.-An optical receiver, <strong>Evaluation of:</strong> An intensity-modulation with direct detection system (hardware), <strong>Design of:</strong> An advanced optical modulation system (software)</td>
</tr>
<tr>
<td>Practice 5: Wavelength Division Multiplexing (WDM)</td>
<td><strong>Description:</strong> Operation of: Ethernet-SDH data generators, <strong>Evaluation of:</strong> 1.- A DWDM System (hardware), 2.- A coarse WDM system (hardware), <strong>Design of:</strong> A flex-grid optical network (software)</td>
</tr>
</tbody>
</table>
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).

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

Qualification system
Individual assessments: 20%
Laboratory assessments: 80%

Bibliography

Basic:

Complementary: