230351 - TRACOM - Transoceanic Communications

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications
Academic year: 2015
Degree: MASTER’S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)
ERASMUS MUNDUS MASTER’S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Teaching unit Optional)
DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 1992). (Teaching unit Optional)
ECTS credits: 2,5
Teaching languages: English

Teaching staff
Coordinator: Joan M. Gené
Others: José A. Lázaro, Jaume Comellas, Gabriel Junyent

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.
CE3. Ability to implement wired/wireless systems, in both fix and mobile communication environments.
CE4. Ability to design and dimension transport, broadcast and distribution networks for multimedia signals
CE13. Ability to apply advanced knowledge in photonics, optoelectronics and high-frequency electronic

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.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

Teaching methodology
- Laboratory practical work
- Group work
- Other activities
  o Technical Report

Laboratory:
- Description: Implementation of a transoceanic fiber-optic link using the simulation tool Transmission Maker by Virtual Photonics Inc.
- Description: Intermediate check points to supervise the progress.
- Description: Final technical report describing the designed link and its evaluation.

Learning objectives of the subject

Learning objectives of the subject:
The aim of this seminar is to train students in designing, dimensioning and evaluating transoceanic fiber-optic links. The challenge is to design a 10,000 Km link with maximum capacity using commercially available devices and fibers.

Learning results of the subject:

- Ability to design, dimension and evaluate ultra long-haul fiber-optic links.
- Ability to implement advanced modulation and detection schemes.
- Ability to deal with propagation impairments like chromatic dispersion, polarization-mode dispersion (PMD), and nonlinear effects.
- Ability to deal with optical amplifier noise.
- Ability to analyse the signal-to-noise (SNR) and bit error ratio (BER) in realistic scenarios.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 62h 30m</th>
<th>Hours small group: 20h</th>
<th>32.00%</th>
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<tbody>
<tr>
<td></td>
<td>Self study: 42h 30m</td>
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<td>68.00%</td>
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Universitat Politècnica de Catalunya
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## Content

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<tr>
<th>1. Introduction</th>
<th>Learning time: 4h 30m</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>- Transoceanic Link Specifications</td>
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<td>- Recommended Lectures</td>
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<tr>
<td>- Introduction to the Simulation Tool</td>
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<tr>
<td>Guided activities: 2h 30m</td>
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<tr>
<th>2. Design of a Transoceanic Fiber-optic Link</th>
<th>Learning time: 58h</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Laboratory classes: 18h</td>
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<tr>
<td>- Advanced Transmitter/Receiver Designs</td>
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<td>- Loss Management</td>
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<td>- Chromatic Dispersion Management</td>
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<td>- Polarization-Mode Dispersion (PMD) Management</td>
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<tr>
<td>- Amplified Spontaneous Emission (ASE) Noise Management</td>
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<td>- Fiber Nonlinearities Management</td>
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<td>- Extended WDM Bands</td>
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<td>Self study: 40h</td>
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## Qualification system

Partial examinations and controls: from 50% (Continuous Evaluation)
Laboratory assessments: from 50% (Final Report)
Bibliography

Basic:


Complementary:


