Transoceanic Communications:

Name of the subject (English): Transoceanic Communications (TRACOM)
Name of the subject (Català): Comunicacions Transoceàniques
Name of the subject (Español): Comunicaciones Transoceánicas

Coordinating unit: ETSETB - Escola Tècnica Superior d'Enginyeria de Telecomunicació de Barcelona
Teaching unit: Signal Theory and Communications Department
Study programme:
- Master in Telecommunications Engineering
- Telecommunications Engineering (Pla92)
ECTS credits: 2,5

Type of subject (compulsory, elective, seminar): Seminar
Type of learning (face-to-face, semi-distance learning, distance learning): Face-to-face

Weekly hours of theory and laboratory (3T+0L, 2T+1L, 1T+2L, 0T+3L): 0T+3L
Pre-requisites: Basics on Fiber-Optic Communications
Co-requisites: -

Coordinator: Joan M. Gené
Other teaching staff (minimum 2): José A. Lázaro, Jaume Comellas, Gabriel Junyent.
Capacity of the course: 12
Classroom: D5-002
Laboratory: D5-001
Capacity of the laboratory: 12

Master competences to which the subject contributes:

Specific competences:
- CE1: Ability to apply information theory methods, adaptive modulation and channel coding, as well as advanced techniques of digital signal processing to communication
- CE3: Ability to implement wired and 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 competences:
- CT3: Teamwork. To be able to work as a member of an interdisciplinary team either as a member, or performing management tasks in order to help develop projects with pragmatism and sense of responsibility, assuming commitments given available resources.
- CT4: Solvent use of information resources. Managing the acquisition, structure, analysis and visualization of data and information in the field of the speciality and critically evaluate the results of this effort.

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

Learning objectives and results 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 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.

Study load:
Total learning time: 62,5h
- Small group/Laboratory classes: 20h
- Guided study: 2,5h
- Self study: 40h
Content:

1. Introduction
   Description:
   - Transoceanic Link Specifications
   - Recommended Lectures
   - Introduction to the Simulation Tool
   Dedication: 4,5h
   - Small group/Laboratory classes: 2h
   - Guided study: 2,5h

2. Design of a Transoceanic Fiber-optic Link
   Description:
   - Advanced Transmitter/Receiver Designs
   - Loss Management
   - Chromatic Dispersion Management
   - Polarization-Mode Dispersion (PMD) Management
   - Amplified Spontaneous Emission (ASE) Noise Management
   - Fiber Nonlinearities Management
   - Extended WDM Bands
   Dedication: 58h
   - Small group/Laboratory classes: 18h
   - Self study: 40h

Planning of activities:
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.

Qualification system:

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

Basic:


Complementary: