Last update: 28-05-2015

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)
DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 1992). (Teaching unit Optional)
MASTER'S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Teaching unit Optional)
ERASMUS MUNDUS MASTER'S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (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

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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: 62h 30m	Hours small group:	20h	32.00%
	Self study:	42h 30m	68.00%

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Content

1. Introduction	Learning time: 4h 30m Theory classes: 2h Guided activities: 2h 30m

Description:
- Transoceanic Link Specifications
- Recommended Lectures
- Introduction to the Simulation Tool

2. Design of a Transoceanic Fiber-optic Link	Learning time: 58h Laboratory classes: 18h Self study : 40h

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

Qualification system

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

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Bibliography

Basic:

Agrawal, G. P. Fiber-optic communication systems [on line]. 4th ed. Hoboken, New Jersey: Wiley, 2010 [Consultation: 13/07/2015]. Available on: <http://onlinelibrary.wiley.com/book/10.1002/9780470918524>. ISBN 9780470505113.

Agrawal, G. P. Lightwave technology : telecommunication systems. Hoboken, New Jersey: Wiley-Interscience, 2005. ISBN 9780471215721.

Agrawal, G. P. Lightwave technology : components and devices. Hoboken, New Jersey: Wiley-Interscience, 2004. ISBN 9780471215738.

Chesnoy, J. [et al.]. Undersea fiber communication systems [on line]. Amsterdam, Boston: Academic Press, 2002 [Consultation: 12/01/2016]. Available on: <http://lib.myilibrary.com/Open.aspx?id=100514>. ISBN 9780080492377.

Complementary:

Kaminow, I. P.; Li, T. Optical fiber telecommunications IV. San Diego [etc.]: Academic Press, 2002. ISBN 0123951720.

Kaminow, I.P.; Koch, T.L. Optical Fiber Telecommunications IIIA [on line]. 1997. San Diego: Academic Press, 1997 [Consultation: 18/01/2016]. Available on: <http://site.ebrary.com/lib/upcatalunya/detail.action?docID=10597054>. ISBN 9780080513164.

Kaminow, I. P.; Li, T.; Willner, A. E. Optical Fiber Telecommunications, V. 2008. Academic Press, 2008. ISBN 9780123741714.

Kaminow, I. P.; Li, T.; Willner, A. E. Optical Fiber Telecommunications Volume VI-B [on line]. 2013. San Diego [etc.]: Academic Press, 2013 [Consultation: 18/09/2015]. Available on: <http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10713017>. ISBN 9780123972378.

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