Course guide
230351 - TRACOM - Transoceanic Communications

Last modified: 28/05/2015

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).

Academic year: 2015 **ECTS Credits:** 2.5 **Languages:** English

LECTURER

Coordinating lecturer: 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 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

Type	Hours	Percentage
Self study	42,5	68.00
Hours small group	20,0	32.00

Total learning time: 62.5 h

CONTENTS

1. Introduction

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

Full-or-part-time: 4h 30m
Theory classes: 2h
Guided activities: 2h 30m

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

Full-or-part-time: 58h
Laboratory classes: 18h
Self study : 40h

GRADING SYSTEM

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

BIBLIOGRAPHY

Basic:
- 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.
- 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.
- 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.; Willner, A. E. Optical Fiber Telecommunications VI-A [on line]. 2013. San Diego [etc.]: Academic Press, 2013 [Consultation: 18/09/2015]. Available on: http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10698605. ISBN 9780123972354.
- Kaminow, I. P.; Li, T. Optical fiber telecommunications IV. San Diego [etc.]: Academic Press, 2002. ISBN 0123951720.
- 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.
- 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; Koch, T.L. Optical fiber telecommunications IIIB [on line]. 3rd. ed. San Diego [etc.]: Academic Press, cop. 1997 [Consultation: 21/01/2016]. Available on: http://site.ebrary.com/lib/upcatalunya/detail.action?docID=10606186. ISBN 0123951712.