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230354 - MICPHOT - Microwave Photonics

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 739 - TSC - Department of Signal Theory and Communications

Academic year: 2015

Degree: DEGREE IN ELECTRONIC ENGINEERING (Syllabus 1992). (Teaching unit Optional)
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2009). (Teaching unit Optional)
DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 1992). (Teaching unit Optional)
MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 2,5 Teaching languages: English

Teaching staff

Coordinator: María SANTOS

Others: María SANTOS

Degree competences to which the subject contributes

Specific:

CE2. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
CE3. Ability to implement wired/wireless systems, in both fix and mobile communication environments.

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

- Lectures
- Application classes
- Laboratory classes
- Group work (distance)
- Individual work (distance)
- Exercises
- Oral presentations
- Other activities
- Short answer test (Control)
-Short answer test (Test)

Learning objectives of the subject

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The aim of this course is to train students in the methods for the analysis of photonic systems for applications in the microwave and millimeter wave frequencies such as wireless and satellite communications, remote sensing and Earth Observation, etc.

Learning results of the subject:

- Knowledge of the basic concepts and techniques related to applications of electromagnetic wave propagation at microwave frequencies in the fields of communications, satellite and remote sensing.
- Knowledge of the fundamental photonic components, materials and manufacturing processes for these applications.
- Understanding of the basic phenomena involved in the generation, detection, and frequency conversion of electromagnetic waves in both microwave and photonic frequency bands.

Study load

Total learning time: 62h 30m	Hours large group:	20h	32.00%
	Self study:	42h 30m	68.00%

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Content

1. Introduction

Learning time: 12h 30m

Theory classes: 6h
Self study : 6h 30m

Description:
Review of electronic and photonic components for Microwave applications of Photonics. Transmission and distribution of microwave signals through optical fiber.

2. Performance metrics for Microwave Photonic Sytems

Learning time: 30h

Theory classes: 12h
Self study : 18h

Description:
- Figures of Merit for assessing the performance of microwave photonic systems. Directly modulated laser (DML) and Externally modulated Laser systems (EML).
- Gain
- Noise Figure
- Intermodulation Distortion
- Optimization techniques

3. Case studies of Microwave Photonic (MWP) Sytems

Learning time: 30h

Theory classes: 12h
Self study : 18h

Description:
- Microwave signal distribution Networks
- MWP mixers
- Filters
- Beam steering Networks
- Other MWP systems: ADC, Oscillators, ...

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Qualification system

Exercises:	from 20% to 30%
Individual assessments:	from 40% to 60%
Group assessments:	from 20% to 30%

Exercises:
- Description: Exercises to strengthen the theoretical knowledge.

Oral presentation:
- Description: Presentation of a work group.

Short answer test (Test):
- Description: Partial evaluation test with theoretical questions and short exercises.

Bibliography

Basic:

Rumelhard, C. Microwave photonic links: components and circuits [on line]. Wiley, 2013 [Consultation: 12/01/2016]. Available on: <http://onlinelibrary.wiley.com/book/10.1002/9781118586372>. ISBN 9781118586372.

Cox, Charles Howard. Analog optical links: theory and practice. New York: Cambridge University, cop. 2004. ISBN 0521621631.

Iezekiel, S. Microwave photonics : devices and applications [on line]. Chichester: Wiley & Sons, 2009 [Consultation: 12/05/2015]. Available on: <http://onlinelibrary.wiley.com/book/10.1002/9780470744857>. ISBN 9780470744857.