Course guide
230703 - AMPLAB - Laboratory of Antennas, Microwaves and Photonics for Communications Systems

Last modified: 26/05/2023

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).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura

Others: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS

Previous knowledge of Antennas, Microwaves and Optics.

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.
CE11. Knowledge of hardware description languages for high-complex circuits.
CE13. Ability to apply advanced knowledge in photonics, optoelectronics and high-frequency electronic
CE15. Ability to integrate Telecommunication Engineering technologies and systems, as a generalist, and in broader and multidisciplinary contexts, such as bioengineering, photovoltaic conversion, nanotechnology and telemedicine.
CE5. Ability to design radio-navigation and location systems, as well as radar systems.

Transversal:
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

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.

TEACHING METHODOLOGY

Being a laboratory course there are not formal lectures and learning is acquired through practice. Initially the assignments are guided and at the end more freedom of action are allowed to the students.

LEARNING OBJECTIVES OF THE SUBJECT

The student will learn how to design, characterize and measure the different devices that constitute a system that uses antennae, microwave circuits and optical devices. From these knowledge, the student would face the integration of the different elements conforming the system as well as its characterization, validation and practical application.

STUDY LOAD

Type	Hours	Percentage
Self study	86,0	68.80
Hours small group	39,0	31.20

Total learning time: 125 h

CONTENTS

Microwave Circuitry Dessing and Simulation (I)

Description:
Design and simulation of passive circuits (mixers and filters) with ADS and Momentum linked with the systems to implement at the end of the course.

Full-or-part-time: 3h
Guided activities: 3h

Microwave Circuitry Desing and Simulation (II)

Description:
Design and simulation of passive circuits (mixers and filters) with ADS and Momentum linked with the systems to implement at the end of the course.

Full-or-part-time: 3h
Guided activities: 3h

Antenna Design and Simulation

Description:
Design and simulation of antennas linked with the systems to implement at the end of the course.

Full-or-part-time: 3h
Guided activities: 3h

Antenna Measurement

Description:
Measurement antenna techniques. First the students will use the anechoic chamber located at building D3 to charcaterize and antenna. The data will be later processed using the transformation near to far-field in order to determine its radiation pattern and gain.

Full-or-part-time: 3h
Guided activities: 3h

Advanced use of Vector Network Analyzers (VNA)

Description:
Advanced measurement techniques with VNA.

Full-or-part-time: 3h
Guided activities: 3h

Advanced use of Spectrum Analyzers (SA)

Description:
Advanced measurement techniques with Spectrum Analyzers (SA).

Full-or-part-time: 3h
Guided activities: 3h

Advanced use of Optical Spectrum Analyzers (OSA)

Description:
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Full-or-part-time: 3h
Theory classes: 3h

Systems implementation

Description:
Building, assembling, testing and validation of systems.
The different groups would select one system among this list: radar systems and processing, radio over fiber, phase arrays with optical shifters, optical telemeter and distributed antenna systems.
Due to the obvious time constrains most of the devices will be comercial or already mounted. Only few of them will be mounted by the students. Most of the work will concéntrate on the modules integration and system testing and performance evaluation.

Full-or-part-time: 12h
Theory classes: 12h

Final report presentations

Description:
Presentation of the final report with the system implementes by each group of students.

Full-or-part-time: 3h
Laboratory classes: 3h

Photonics Systems Design

Description:
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Full-or-part-time: 3h
Guided activities: 3h

GRADING SYSTEM

The course has no final exam.
The final mark is the average of:
- 8 in-lab sessions (80%)
- Group System desing assignement (20%)