Last update: 06-05-2019

230635 - MRS - Microwave Imaging for Remote Sensing

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

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

Academic year: 2019

Degree: MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional)
MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: Camps, Adriano Jose; Broquetas, Antoni

Others: Camps Carmona, Adriano Jose; Broquetas Ibars, Antoni; Mallorqui Franquet, Jordi J., Carlos López Martínez

Prior skills

Camps electromagnètics, Radiació i Ones Electromagnètiques

Degree competences to which the subject contributes

Specific:

1. Ability to apply advanced knowledge in photonics, optoelectronics and high-frequency electronic

2. Ability to design radio-navigation and location systems, as well as radar systems.

3. Ability to develop, direct, coordinate, and technical and financial management of projects in the field of: telecommunication systems, networks, infrastructures and services, including the supervision and coordination of other's subprojects; common telecommunications infrastructures in buildings or residential areas, including digital home projects; telecommunication infrastructures in transport and environment; with corresponding energy supply facilities and assessment of electromagnetic emissions and electromagnetic compatibility.
4. Ability to develop electronic instrumentation, as well as transducers, actuators and sensors.

5. 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.

Transversal:

6. 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.
7. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.
8. 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.
9. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
10. 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.

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Teaching methodology

The students must attend the course lectures imparted mostly using power point presentations. A copy of the slides can be downloaded from the Atenea course web page. Several imaging exercises are proposed during the course to allow the students to write their own imaging algorithms. Some of the lectures will be given in the laboratory to allow the students to acquire a hands-on imaging and processing experience using experimental data. The exercises difficulties and results are commented by the students themselves in the lecture room with the assistance of the course professors.

Learning objectives of the subject

The main objective of this course are the physical and engineering principles to obtain images and additional information of distant objects, including penetrable ones, at microwaves frequencies. The course is specially convenient in Remote Sensing research. The theoretical basis and presented techniques of the course are common to most imaging systems using the Electromagnetic Spectrum, including optical frequencies and X Rays with important applications in the industry and biomedicine.

Study load

Total learning time: 125h	Hours large group:	39h	31.20%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	86h	68.80%

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Content

(ENG) 1 Introduction. 1.1 Interaction of EM waves with matter

Degree competences to which the content contributes:

(ENG) 2 Direct and inverse problems in electromagnetics

Degree competences to which the content contributes:

(ENG) 3 Imaging radars

Degree competences to which the content contributes:

(ENG) 4 Imaging radiometers and applications

Degree competences to which the content contributes:

(ENG) 5 Other imaging sensors and applications: GNSS Reflectometers

Degree competences to which the content contributes:

(ENG) -

Degree competences to which the content contributes:

Qualification system

The course evaluation is based on the solution of excercises proposed and works addressing the image reconstruction from existing measured or simulated data.

Regulations for carrying out activities

At home, in the classroom durign regular lecture hours, or during the scheduled exam.

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Bibliography

Basic:

Blackledge, J.M. Quantitative coherent imaging: theory, methods and some applications. London [etc.]: Academic Press, 1989. ISBN 0121033007.

Wehner, D.R. High-resolution radar. 2nd ed. Boston [etc.]: Artech House, 1995. ISBN 0890067279.

Soumekh, M. Fourier array imaging. New Jersey: Prentice Hall, 1994. ISBN 01306376966.

Goodman, J.W. Introduction to Fourier optics. 3rd ed. Englewood, Colo.: Roberts & Co., 2005. ISBN 0974707724.