



## Course guide

# 230602 - AAM - Antennas and Microwaves

**Last modified:** 25/05/2023

**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

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**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

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background in engineering, math or physics

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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#### Specific:

1. Ability to apply advanced knowledge in photonics, optoelectronics and high-frequency electronic
2. 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.
3. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
4. Ability to implement wired/wireless systems, in both fix and mobile communication environments.
5. Ability to design radio-navigation and location systems, as well as radar systems.

#### Transversal:

6. **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.
7. **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.
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.



## TEACHING METHODOLOGY

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- Lectures
- Study of technical documents and multimedia material
- Laboratory classes
- Homework (problems and exercises)
- Oral presentations
- Short answer test (Control)
- Extended answer test (Final Exam)

## LEARNING OBJECTIVES OF THE SUBJECT

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Learning objectives of the subject:

To understand the different concepts of radiation, propagation and interaction with matter, and reception of electromagnetic waves from microwave up to optical frequencies. Its application to different communication and sensing systems will be studied, giving a special attention to the physical mechanisms and to the whole system vision.

Learning results of the subject:

- Ability to analyze communication systems operating from microwave up to optical frequencies.

## STUDY LOAD

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Type	Hours	Percentage
Self study	86,0	68.80
Hours large group	26,0	20.80
Hours small group	13,0	10.40

**Total learning time:** 125 h

## CONTENTS

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### Introduction

**Description:**

introduction

**Full-or-part-time:** 0h 30m

Theory classes: 0h 30m

### Electromagnetic Spectrum - Radiation of electromagnetic waves

**Description:**

Description of the electromagnetic spectrum - Fundamentals of radiation of electromagnetic waves

**Full-or-part-time:** 15h 30m

Theory classes: 1h 30m

Laboratory classes: 4h

Self study : 10h



### Electromagnetic waves

**Description:**

Electromagnetic waves

**Full-or-part-time:** 9h

Theory classes: 2h

Laboratory classes: 2h

Self study : 5h

### Fundamentals of noise

**Description:**

Fundamentals of noise

**Full-or-part-time:** 9h

Theory classes: 2h

Laboratory classes: 2h

Self study : 5h

### Transmission lines

**Description:**

Transmission lines

**Full-or-part-time:** 9h

Theory classes: 2h

Laboratory classes: 2h

Self study : 5h

### Wireless communications

**Description:**

Wireless communications

**Full-or-part-time:** 9h

Theory classes: 2h

Laboratory classes: 2h

Self study : 5h

### Fundamentals of transmitters and receivers

**Description:**

Fundamentals of transmitters and receivers

**Full-or-part-time:** 9h

Theory classes: 2h

Laboratory classes: 2h

Self study : 5h



### Lab practises

**Description:**

Lab practises

**Full-or-part-time:** 16h

Theory classes: 2h

Laboratory classes: 4h

Self study : 10h

### Case study

**Description:**

Case study

**Full-or-part-time:** 19h

Theory classes: 4h

Self study : 15h

### Midterm exam

**Description:**

Midterm exam

**Full-or-part-time:** 13h

Theory classes: 2h

Self study : 11h

### Final Exam

**Description:**

Final exam

**Full-or-part-time:** 18h

Theory classes: 3h

Self study : 15h

## GRADING SYSTEM

Final exam : 20%

Homework, case studies and lab work: 80%

## BIBLIOGRAPHY

**Basic:**

- Olver, A.D. Microwave and optical transmission. Chichester: John Wiley, 1992. ISBN 047193416X.
- Saunders, S.R.; Aragón-Zavala, A. Antennas and propagation for wireless communication systems. 2nd ed. Chichester (UK): John Wiley & Sons, 2007. ISBN 9780470848791.
- Cardama, Á. [et al.]. Antenas [on line]. 2a ed. Barcelona: Edicions UPC, 2002 [Consultation: 09/02/2015]. Available on: <http://hdl.handle.net/2099.3/36797>. ISBN 8483016257.