Course guide

230648 - WLA - Wireless Communication Links and Antennas

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

Academic year: 2022  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

Tools and concepts used in radiofrequency such as impedance matching, antenna parameters, transmission equation. Use of dB, and power units such as dB. Knowledge of electromagnetic field theory.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
2. Ability to implement wired/wireless systems, in both fix and mobile communication environments.
3. Ability to design radio-navigation and location systems, as well as radar systems.

Transversal:
4. 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.

5. 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.

6. 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

- Lectures
- Application classes
- Laboratory classes
- Exercises
- Short answer test (Control)
- Short answer test (Test)
- Extended answer test (Final Exam)

LEARNING OBJECTIVES OF THE SUBJECT

Learning objectives of the subject:

To present advanced antenna concepts based on a modern time-space formulation, system oriented CAD design techniques and wireless antenna optimization and measurements. In addition, the course develops appreciation for research issues of antennas for mobile wireless and advanced communications systems.

Learning results of the subject:

- Ability to specify, design antennas of telecommunications in both a fixed, mobile, personal, local or long distance, with different bandwidths.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>13,0</td>
<td>10.40</td>
</tr>
<tr>
<td>Self study</td>
<td>86,0</td>
<td>68.80</td>
</tr>
<tr>
<td>Hours large group</td>
<td>26,0</td>
<td>20.80</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

**Antennas in a System**

Description:
About antennas in a system

Full-or-part-time: 16h
Theory classes: 3h
Laboratory classes: 1h
Self study : 12h

**Radiation**

Description:
Radiation

Full-or-part-time: 17h
Theory classes: 3h
Laboratory classes: 2h
Self study : 12h
<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Full-or-part-time</th>
<th>Theory classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical techniques. MoM</td>
<td>About numerical methods.</td>
<td>18h</td>
<td>4h</td>
<td>2h</td>
<td>12h</td>
</tr>
<tr>
<td>Input Parameters. Fundamental Limits.</td>
<td>Fundamental limits.</td>
<td>18h</td>
<td>4h</td>
<td>2h</td>
<td>12h</td>
</tr>
<tr>
<td>Miniaturization techniques.</td>
<td>Antenna miniaturization.</td>
<td>18h</td>
<td>4h</td>
<td>2h</td>
<td>12h</td>
</tr>
<tr>
<td>Printed antennas.</td>
<td>Printed antennas.</td>
<td>10h</td>
<td>2h</td>
<td>1h</td>
<td>7h</td>
</tr>
<tr>
<td>Antennas in dielectric media.</td>
<td>Antennas in media.</td>
<td>10h</td>
<td>2h</td>
<td>1h</td>
<td>7h</td>
</tr>
</tbody>
</table>
### Broadband and UWB antennas

**Description:**
Broadband antennas.

**Full-or-part-time:** 18h  
Theory classes: 4h  
Laboratory classes: 2h  
Self study : 12h

### Multielement (Array and MIMO)

**Description:**
content english

**Full-or-part-time:** 1h  
Theory classes: 1h

### Smart and reconfigurable antennas.

**Description:**
content english

**Full-or-part-time:** 1h  
Theory classes: 1h

### Integrated and plasmonic antennas

**Description:**
content english

**Full-or-part-time:** 1h  
Theory classes: 1h

### ACTIVITIES

#### LABORATORY

**Description:**
Antenna design

**Full-or-part-time:** 12h  
Laboratory classes: 12h

#### EXERCISES

**Description:**
Exercises to strengthen the theoretical knowledge.
ORAL PRESENTATION

Description:
Presentation of a work group.

SHORT ANSWER TEST (CONTROL):

Description:
Mid term control.

EXTENDED ANSWER TEST (FINAL EXAMINATION):

Description:
Final examination.

GRADING SYSTEM

Final examination: from 20% to 70%
Partial examinations and controls: from 0% to 50%
Individual assessments: from 0% to 40%
Laboratory assessments: from 0% to 70%

BIBLIOGRAPHY

Basic: