Course guides
230912 - EAFO - Applied Electromagnetism and Photonics

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.

Degree: BACHELOR’S DEGREE IN ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018).

Academic year: 2020  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: María Concepción Santos Blanco

Others: Dios Otin, Victor Federico

PRIOR SKILLS


DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE3. (ENG) GREELC: Comprensió i domini dels conceptes bàsics sobre les lleis generals de la macànica, termodinàmica, camps i ones i electromagnetisme i la seva aplicació per a la resolució de probemes propis de l'enginyeria. (Mòdul de formació bàsica).

General:
CG5. (ENG) GREELEC: Coneixements per a la realització de medicions, càlculs, taxacions, peritacions, estudis, informes, planificació de tasques i treballs anàlegs en l'ambit específic de la telecomunicació.

Basic:
CB2. (ENG) GREELEC: Que els estudiants sapin aplicar els coneixements adquirits al seu treball o vocació d'una forma professional i tinguin les competències que solen desmostrar-se per mitjà de l'elaboració i defensa d'arguments i la resolució de problemes dins de la seva àrea d'estudi.

TEACHING METHODOLOGY

The course provides a general view of the nature of electromagnetic waves, the characteristics of their propagation, both in free space as in guides and fibers, and their interaction with material media, dielectrics and conductors. There is a rich range of phenomena that are at the base of current technologies related to the transmission of information and of sensors and user interfaces. It is intended to give a fundamentally practical vision, but without neglecting a sufficiently general mathematical description, as to allow the student to understand the operating principles of other emerging technologies. The course is complemented by an introductory explanation to laser emitters and photodetection. Explanations are combined in the classic exhibition format, classes with transparencies, proposed exercises and laboratory work in which students have to obtain or confirm results by combining the experimental measures with the theory learned.

LEARNING OBJECTIVES OF THE SUBJECT

The basic objective is for students to be able to express, in an appropriate physical-mathematical language, situations that may be related to the propagation, reflection, transmission, diffraction or guidance of electromagnetic waves, as well as the various wave interference problems that may be encountered.
**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>8.67</td>
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<tr>
<td>Hours large group</td>
<td>52,0</td>
<td>34.67</td>
</tr>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>56.67</td>
</tr>
</tbody>
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**Total learning time:** 150 h

**CONTENTS**

### Wave equation. Plane waves

**Description:**

**Full-or-part-time:** 12h  
Theory classes: 9h  
Laboratory classes: 3h

### Plane wave polarization

**Description:**
Polarization types and mathematical description. Orthogonal polarizations. Devices for polarization control.

**Full-or-part-time:** 9h  
Theory classes: 6h  
Laboratory classes: 3h

### Plane waves in lossy media

**Description:**

**Full-or-part-time:** 4h  
Theory classes: 4h

### Incidence of plane waves on the separation surface of two media

**Description:**

**Full-or-part-time:** 12h  
Theory classes: 7h  
Laboratory classes: 5h
Waveguides

Description:

Full-or-part-time: 8h
Theory classes: 7h
Laboratory classes: 1h

Radiation fundamentals

Description:

Full-or-part-time: 7h
Theory classes: 7h

Optical detection

Description:

Full-or-part-time: 7h
Theory classes: 6h
Laboratory classes: 1h

Laser fundamentals

Description:

Full-or-part-time: 6h
Theory classes: 6h

GRADING SYSTEM

Continuous evaluation: 30%
Laboratory practices (compulsory): 10%
Final exam: 60%

EXAMINATION RULES.

Resolution of problems related to the topics studied. The standards are the general ones at the UPC.
BIBLIOGRAPHY

Basic: