Course guide
230090 - ONELE - Electromagnetics Waves

Last modified: 24/05/2024

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

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: VICTOR FEDERICO DIOS OTIN

Others:

Primer quadrimestre:
DAVID ARTIGAS GARCIA - 13
VICTOR FEDERICO DIOS OTIN - 11, 12, 13
CRISTINA GIL DÍAZ - 11, 12

Segon quadrimestre:
DAVID ARTIGAS GARCIA - 41, 42, 43
VICTOR FEDERICO DIOS OTIN - 11, 12, 13

PRIOR SKILLS

Ability to manipulate high-level mathematical equations.
Geometric visualization capacity.
Ability to understand abstract concepts.

Familiarity in the following topics: Vector Fields, Vector Analysis, Surface and Volume Integrals, Trigonometry, Complex Numbers.

REQUIREMENTS

ELECTROMAGNETISM - Precorequisite

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:
12 CPE N2. They will be able to identify, formulate and solve engineering problems in the ICC field and will know how to develop a method for analysing and solving problems that is systematic, critical and creative.

TEACHING METHODOLOGY

Most of lessons will be given on the blackboard, and others with multimedia material.

LEARNING OBJECTIVES OF THE SUBJECT

It is intended that students acquire a solid basis, both visual and mathematical, of the phenomena associated with the propagation of electromagnetic waves in free space, of reflection and transmission on separating surfaces of different media, and of their propagation through waveguides, optical fibers and transmission lines.

STUDY LOAD

Type	Hours	Percentage
Hours small group	13,0	8.67
Self study	85,0	56.67
Hours large group	52,0	34.67

Total learning time: 150 h

CONTENTS

1. Electromagnetics waves in free space

Description:
Wave equation. Plane and spherical waves. Waves in sinusoidal steady state. Wavefronts, transported power. Group and phase velocity. Plane waves in lossy materials.

Related activities:
Laboratory, P1

Full-or-part-time: 8h
Theory classes: 8h

2. Wave polarization

Description:
Polarization types. Devices used to control and measure polarization.

Related activities:
Laboratory, P2

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

3. Incidence of plane waves

Description:
Incidence of plane waves on a separation surfaces between media. Parallel and perpendicular polarization. Brewster angle. Internal total reflection. Incidence on a perfect conductor.
Stationary waves. Multilayers.

Related activities:
Laboratory, P3 and P4

Full-or-part-time: 11h
Theory classes: 11h

4. Waveguides. Types and characteristics. Transmission lines

Description:
Waves in a coaxial line. Planar waveguide with conductor walls. Transverse electric and transverse magnetic waves. Propagation modes. Cutt-off frequencies. Dispersion curves. Dielectric planar waveguides.

Related activities:
Laboratory, P5

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

5. Foundations of radiation

Description:
Wave equation with charge and current densities. Electric potencial and magnetic vector A. Radiating dipoles. Characteristic parameters. Arrays of dipoles

Full-or-part-time: 10h
Theory classes: 10h

GRADING SYSTEM

Partial exam: 30% (cannot be retaken)
Laboratory and work summaries: 10% (cannot be retaken)
Final exam: 60%

BIBLIOGRAPHY

Basic:
- Dios, F. [et. al]. Campos electromagnéticos [on line]. Barcelona: Edicions UPC, 1998 [Consultation: 09/07/2015]. Available on: http://hdl.handle.net/2099.3/36160. ISBN 8483012499.
- Cheng, D.K. Fundamentos de electromagnetismo para ingenieria. Wilmington: Addisson-Wesley iberoamericana, 1997. ISBN 9684443277.
- Reitz, J.R.; Milford, F.J.; Christy, R.W. Fundamentos de la teoría electromagnética. 4a ed. Wilmington: Addisson-Wesley iberoamericana, 1996. ISBN 020162592X.