Electromagnetic fields and waves

Academic Year: (2023 / 2024) **Review date: 20-06-2022**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: RAJO IGLESIAS, EVA

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Physics I and Physics II, 1st year
Differential Equations, 2nd year
Complex variable and transforms, 2nd year
Electromagnetism and Optics, 2nd year
Signals, systems and circuits, 2nd year

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction: review of the Maxwell Model. Harmonic time variation. Phasors. Pointyng's theorem.
2- Fundamentals and characteristics of waves. Wave equation. Plane waves and cylindrical waves. Transmission and reflection in different scenarios: standing waves.
3- Guided waves: - waveguides, transmission lines and Smith chart.
4- Radiated waves: - radiation integral, antenna parameters, link budget.

LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES. Knowledge and concepts students mustacquire. Receive course notes and will have basic reference texts.Students partake in exercises to resolve practical problems
AF2. TUTORING SESSIONS. Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher.Subjects with 6 credits have 4 hours of tutoring/ 100% on- site attendance.
AF3. STUDENT INDIVIDUAL WORK OR GROUP WORK.Subjects with 6 credits have 98 hours/0% on-site.
AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.
AF9. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course. It entails 4 hours/100% on-site
AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.
MD1. THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject`s main concepts are developed, while providing material and bibliography to complement student learning
MD2. PRACTICAL CLASS. Resolution of practical cases and problem, posed by the teacher, and carried out individually or in a group
MD3. TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with teacher as tutor. Subjects with 6 credits have 4 hours of tutoring/100% on-site.
MD6. LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

LABS (1 ECTS)
There will be four labs:
LAB 1:
Introduction to CST simulation software and visualization of phenomena related to plane wave
LAB 2:
Waveguide simulation and study of guided wave characteristics
LAB 3:
Transmission lines. Design of a component with the CST software.
LAB 4:
Design and simulation of an antenna (dipole or patch).

ASSESSMENT SYSTEM

SE1. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course.60% of the final grade.
SE2. CONTINUOUS EVALUATION. Result of labs and midterm exams. 40%.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- C.A. Balanis Advanced engineering electromagnetics, John Wiley and Sons, second edition, 2012

- D. K. Cheng Fundamentals of Engineering Electromagnetics, Prentice Hall, Second Edition , 1989

- Ramo, S., J. R. Whinnery and T. Van Duzer Fields and Waves in Communication Electronics, John Wyley and Sons, Third Edition, 1994

ADDITIONAL BIBLIOGRAPHY

- C.T.A. Johnk Engineering Electromagnetic Fields and Waves, Wiley, Second Edition, 1988

- R.F. Harrinton Time.Harmonic Electromagnetic Fields, MacGraw-Hill Book Company, 2001

- V.V. Nikolski Electrodinámica y propagación de ondas de radio, Editoria MIR, 1973