30006 - Physics II

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	436 - Bachelor's Degree in Industrial Engineering Technology
ECTS	6.0
Year	1
Semester	Half-yearly
Subject Type	Basic Education
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

5.2.Learning tasks

5.3.Syllabus

Physics II course provides in a first part the basic concepts and laws related to electromagnetic fields and ends with Maxwell's equations in integral form. The wave concepts are also shown from a general point of view, while it is performed a more detailed analysis of the peculiarities of wave phenomena of interest in engineering: waves in solids and fluids (acoustics), electromagnetic waves and optics.

1. Wave motion: Mathematical description. Transverse waves in a stretched string. Mechanical energy of a harmonic wave. Waves in two and three dimensions.

2. Acoustics: Longitudinal waves in a solid. Longitudinal waves in a gas. Doppler effect.

3. Superposition of waves: Standing waves. Interference and diffraction

4. Electrostatic field and potential: Coulomb's Law: field and potential. Charge distributions. Energy stored in a charge distribution.

5. Gauss' law: Flux of the electrostatic field: Gauss' law. Applications: planar, cylindrical and spherical symmetries.

6. Electrostatic fields in the presence of conductors: electrostatic equilibrium conditions. Potential and capacity coefficients. Capacitor.

7. Electrostatic field in the presence of dielectrics: Electric dipole. Polarization vector. Gauss' law. Displacement vector. Dielectric properties of matter.

8. Electric current: Current density. Continuity equation. Microscopic Ohm's law. Resistance.

9. Magnetic induction field, B: Lorentz force. Hall effect. Biot-Savart's law. Current distributions.

10. Ampère's law in vacuum: Circulation of the magnetic field, B. Ampère's law. Applications: calculation of B in highly symmetric situations.

11. Magnetostatic field in the presence of matter: Magnetic dipole. Magnetization. Ampère's law. H field. Magnetic properties of matter.

12. Electromagnetic induction: Faraday's law. Self-inductance and mutual inductance coefficients.

13. Maxwell's equations: Ampère-Maxwell's law. Displacement current. Maxwell's equations in integral form. Electromagnetic waves.

5.4.Course planning and calendar

5.5.Bibliography and recommended resources