

Academic Year: (2019 / 2020)

Review date: 16-05-2019

Department assigned to the subject: Physics Department

Coordinating teacher: SANCHEZ FERNANDEZ, LUIS RAUL

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

OBJECTIVES

- CB1. Students have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study
- CB2. Students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study
- CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues
- CB4. Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
- CB5. Students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy
- CG1. Analyze and synthesize basic problems related to physics and engineering, solve them and communicate them efficiently.
- CG2. Learn new methods and technologies from basic scientific and technical knowledge, and being able to adapt to new situations.
- CG3. Solve problems with initiative, decision making, creativity, and communicate and transmit knowledge, skills and abilities, understanding the ethical, social and professional responsibility of the engineering activity. Capacity for leadership, innovation and entrepreneurial spirit.
- CG5. Use the theoretical and practical knowledge acquired in the definition, approach and resolution of problems in the framework of the exercise of their profession.
- CE13. Understand and handle solid state physical principles relevant to engineering and, in particular, semiconductors for application in electronic and photonic components, as well as the fundamentals and applications of analog and digital electronics and microprocessors.
- CE17. Understand and handle the fundamental concepts of Quantum Physics, its relationship with Classical Physics, and its application to the understanding of the physics of atoms and molecules, as well as solving simple one- and three-dimensional quantum problems and applying approximate resolution methods.
- CT1. Work in multidisciplinary and international teams as well as organize and plan work making the right decisions based on available information, gathering and interpreting relevant data to make judgments and critical thinking within the area of study.
- RA1. To have acquired sufficient knowledge and proved a sufficiently deep comprehension of the basic principles, both theoretical and practical, and methodology of the more important fields in science and technology as to be able to work successfully in them;
- RA2. To be able, using arguments, strategies and procedures developed by themselves, to apply their knowledge and abilities to the successful solution of complex technological problems that require creating and innovative thinking;
- RA3. To be able to search for, collect and interpret relevant information and data to back up their conclusions including, whenever needed, the consideration of any social, scientific and ethical aspects relevant in their field of study;
- RA6. To be aware of their own shortcomings and formative needs in their field of specialty, and to be able to plan and organize their own training with a high degree of independence.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Foundation of Quantum Mechanics. Black body spectrum and Planck's postulate. Einstein's theory of the photoelectric effect. The Compton effect. De Broglie principle and the wave-particle duality. Rutherford and Bohr atomic models.
2. Schrödinger's equation. Wave functions. Born interpretation: probability density. Expected values

and measurement. Energy, position and momentum. Uncertainty principle.

3. Time-independent Schrödinger equation. Energy quantization. Bounded and unbounded states.

4. Unidimensional problems. Free particle solution. Potential steps, wells and barriers. The harmonic oscillator. Quantum tunneling.

5. Three-dimensional problems. Central potentials. The Schrödinger equation in spherical coordinates. Three-dimensional harmonic oscillator.

6. Solution of the Hydrogen atom.

LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES. Knowledge and concepts students must acquire. 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.

ASSESSMENT SYSTEM

SE1. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course. The percentage of the evaluation varies for each subject between 60% and 0%.

SE2. CONTINUOUS EVALUATION. Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course. The percentage of the evaluation varies for each subject between 40% and 100% of the final grade.

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