Universidad Zaragoza

Year : 2019/20

26921 - Quantum Physics I

Syllabus Information

Academic Year: 2019/20
Subject: 26921 - Quantum Physics I
Faculty / School: 100 -

Degree: 447 - Degree in Physics

ECTS: 7.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, laboratory sessions and a final exam.

4.2.Learning tasks

The course includes the following learning tasks:

- **Lectures** (45 hours). They provide students with the basic theoretical knowledge to acquire the associated technical competences* (CE1, CE2, CE3, CE4, CE5, CE6, CE10).
- **Practice sessions** (15 hours). They consist of solving problems, which allow the acquisition of the technical competences from a practical point of view (CE1, CE2, CE3, CE5, CE6, CE10).
- **Laboratory sessions**. They allows/facilitate the acquisition of the technical competences from a practical point of view (CE7, CE8, CE9). Four practice tasks in 2 laboratory sessions will be held, corresponding to the formative activity "Observation, analysis and experimental measurement of quantum phenomena", including 10 hours of autonomous work. The elaboration of a report about the experiments in the laboratory will take 14 hours approximately.

- **Exam** covering all the contents of the course, in order to evaluate the degree of acquisition of all competences and objectives.
- **Autonomous work and study** (87 hours).

The competences CE are defined in the Degree in Physics verification report that can be accessed at http://ciencias.unizar.es/aux/generalDcha/EEES/MEmVeriFisicaANECA.pdf

4.3.Syllabus

The course will address the following topics:

- 0. Introduction. ¿What is, and why to study Quantum Physics?
- 1. Origin of the Quantum Theory. Corpuscular properties of waves.
- 2. Wave properties of free particles. Atomic models and the de Broglie hypothesis.
- 3. Particles under external conservative forces. The Srödinger equation.. Some simple examples in 1D.
- 4. The quantum harmonic oscillator.
- 5. The Dirac formalism. Space of states. Kets and bras. The postulates of Quantum mechanics.
- 6. Physical contents of the formalism.
- 7. Angular moment. Central potentials. Hydrogen atom.
- 8. Addition of angular momenta. Clebsch-Gordan coefficients.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Sciences website.

4.5.Bibliography and recommended resources