GENERAL CONSIDERATIONS

Quantum Physics is a basic cornerstone of Modern Physics as it constitutes a basic ingredient of topics
such as Atomic Physics, Nuclear Physics or Solid State Physics.
The main aim of Quantum Physics is to provide the conceptual tools needed for the analysis and solution of a wide range physical problems at the microscopic level.

PREREQUISITES

A good command of algebra and vector analysis

Knowledge of the theory of complex variables

Some elementary knowledge of functional analysis and differential equations

Some elementary knowledge of probability and random variables.

OBJECTIVES

Understand the experimental basis of Quantum Physics

Familiarize with the particle-wave aspect of the microscopic phenomena

Understand the concept of wave-function and its use in the interpretation of the quantum phenomena

Solve Schroedinger's equation for the specific case of some simple one-dimensional potentials.

Understand and learn how to apply the postulates of Quantum Mechanics.

Analyze the experiments leading to the introduction of the spin.

Familiarize with the formalism of the kinetic moments.

Understand the behavior of identical particles. Application of Pauli's principle to explain the Periodic Table.

PROGRAM

Schroedinger's Theory of Quantum Mechanics

Solutions of Time-Independent Schroedinger Equations

One electron Atoms

The Mathematical Tools of Quantum Mechanics

The Postulates of Quantum Mechanics

General Properties of Angular Momentum in Quantum Mechanics

Addition of Angular Momenta

Systems of Identical Particles

Multielectron Atoms: Ground States and Optical Excitations

Molecules

Solids: Conductors and Semiconductors

BIBLIOGRAPHY

Quantum Physics. R Eisberg and R Resnick, 2nd Ed. John Wiley and Sons

Quantum Mechanics. **Vol I and II**. C Cohen-Tannoudji, B Diu and F Laloe, John Wiley and Sons

An introduction to Quantum Physics, A.P. French and E F Taylor, Ed. Reverte

ACTIVITIES

The teaching process will include several academic activities such as: lectures, problem solving, seminars and exams.

The lectures will consist on the exposition and explanation of the topics listed in the program.

The problem solving part will focus on the application of the theoretical concepts introduced in the lectures.

Seminars. The research work performed by most members of our Department deals with topics closely connected with Quantum Physics. Therefore, some of the seminars organized by our Department can be of interest to the students and we will encourage them to attend those seminars

Exams. There will be several controls in order to check the student's academic achievements. In fact,
there will be three controls per semester.

The measures that the academic authorities establish based on the health situation during the academic year will be scrupulously followed.

If, during part of the academic year, is necessary to teach online due to the closure of the centers, the following changes will be made with respect to the aforementioned:

The methodology will be adapted to the circumstances that we find ourselves based on the evolution of the state of emergency, and according to the guidelines received from academic and government authorities.

Given the impossibility of face-to-face teaching, this would be carried out through the virtual course of the official subject on the Moodle platform supported on our own server: http://metodos.fam.cie.uva.es/moodle/. This server is managed by staff from our teaching unit (Atomic Physics), and there is no problem of storage capacity. Through the virtual course the student will have access to all the material and relevant links. Students will receive weekly homework. Explanatory videos of those parts that require it will also be provided.

The tutorials will be carried out through two forums, one for news and the other for questions and discussion, with the teachers being available throughout the period including weekends and holidays. The forums will be open to all students, so that everyone benefits from the discussion, although only teachers will be authorized to answer questions in the forums.