Structure of Matter

Academic Year: (2023 / 2024) **Review date: 23-05-2023**

Department assigned to the subject: Physics Department

Coordinating teacher:

Type: Electives ECTS Credits : 6.0

Year : Semester :

SKILLS AND LEARNING OUTCOMES

The student at the end of this subject should be able to:

¿ Analyze and describe problems in the field of science and technology, modeling complex systems and solving them in an approximate way .

¿ Apply the methods of numerical computation to solve problems in the field of science and technology.

¿ Know the principles of quantum mechanics, its application to simple systems and its most important technological applications.

¿ Know the main methods to describe the electronic structure of atomic and molecular systems.

¿ Distinguish the different models of chemical bonding and relate them to the physicochemical properties of solids.

¿ Understand the characteristics of the solid phase and how the properties of solids (mechanical, thermal, optical, magnetic, etc.) depend on it.

¿ Understand the characteristics of the solid phase and how the properties of solids depend on it (mechanical, thermal, optical, magnetic, etc.)

¿ Know and apply the fundamentals of thermodynamics, phase equilibrium and chemical equilibrium to energy transfer processes.

¿ Understand the different thermodynamic cycles and the basic processes of heat transfer (conduction, convection and radiation)

¿ Understand and apply the basic concepts of circuit theory, both in direct and alternating current.

¿ Understand and apply the basic concepts of circuit theory, both in direct and alternating current.

¿ Know, understand and use the main electronic components

¿ Know and use electronic instrumentation, measurement systems and instruments and data acquisition systems.

¿ Understand the concept of environmental pollution and its impact on the environment, especially in the field of engineering.

¿ Know how to apply environmental prevention methodologies

¿ Recognize and describe the main pollutants and the analytical parameters necessary to measure them, as well as to know their effects on the environment.

¿ Critically evaluate, from parameters of equity and sustainability, the applications of the acquired knowledge.

¿ Identify the social, economic and environmental implications of the academic-professional activities of the own field of knowledge.

¿ Develop models that exemplify social, economic and environmental impacts - Show sensitivity towards environmental issues.

¿ Demonstrate ethical awareness and empathy with the environment - Critically and constructively analyze environmental education programs and activities.

DESCRIPTION OF CONTENTS: PROGRAMME

Types of bonds.
Crystalline lattice.
Metals.
Band theory.
Semiconductors.
Dielectrics.
Magnetic materials.
Optical properties

LEARNING ACTIVITIES AND METHODOLOGY

TRAINING ACTIVITIES

Lectures: these are systematic and orderly expository sessions of the subject's syllabus and selected problems are solved in detail to exemplify the implementation of the theoretical contents. The objective is for students to acquire the specific competences of each subject. 210 hours, 100% attendance.

Practical classes in the classroom: in these sessions, students work on the applications of the contents of the subjects, including numerical examples, case analysis, data search, directed work, gamification sessions, etc. The objective is to show students how to act. 50 hours, 100% attendance.

Practical laboratory classes and practices with computer media: students will carry out supervised experimental or computational work in specialized laboratories in which they will put into practice the theoretical knowledge acquired in the different subjects and learn to work safely in the laboratory. 150 hours, 100% attendance.

Individual and/or small group tutorials: this is a personalized attention to students, in person and where a professor attends, facilitates and guides one or more students in the training process. They allow the teacher a more individualized follow-up of each student's learning. 20 hours, 100% face-to-face. Evaluation tests. 20 hours, 100% attendance.

Group study and work: consists of the preparation of seminars, problems, exercises, readings, data collection and analysis, etc. to be presented or delivered in class by students working in groups, so that they acquire the ability to work as a team and learn through interaction with their peers. 190 hours.

Study and individual autonomous work to develop self-learning skills. Includes the same activities of the group work, but carried out individually. It also includes personal study (preparing exams, complementary readings, doing problems and exercises), which is fundamental for autonomous learning. 240 hours.

Completion of online tasks using information and communication technologies, in order for students to acquire skills in these technologies, in addition to those of the subject. 50 hours.

Preparation of reports, writing of practical reports (laboratory, field, computer), writing of papers on current issues related to the development and applications of science and technology, etc. 120 hours.

ASSESSMENT SYSTEM

EVALUATION SYSTEM

Continuous evaluation by means of different types of controls, individual or in group, carried out at different stages of the course. Maximum weighting 50%.

Final written exam. Maximum weighting 80%.

Resolution of problems and practical cases. Maximum weighting 50%.

Completion of written work and reports, delivery of practice reports, delivery of complementary work, exercises, cases, readings. Maximum weighting 50%.

Oral presentation of work done individually or in groups, as well as its debate and discussion. Maximum weighting 50%.

Attendance and/or participation in theoretical classes, classroom practices and individual and group face-to-face activities. Maximum weighting 50%.

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