

26920 - Physical Techniques II

Syllabus Information

Academic year: 2023/24

Subject: 26920 - Physical Techniques II

Faculty / School: 100 - Facultad de Ciencias

Degree: 447 - Degree in Physics

ECTS: 10.0

Year: 3

Semester: Annual

Subject type: Compulsory

Module:

1. General information

The general objective of this subject is to deepen in the measurement systems, establishing the characteristics of a system that aims to measure in an automated way one or more physical quantities and the analysis methods necessary to achieve the result from the measurements, as a basis for its application specifically in the various areas of Physics: Acoustics, Fluids, Radiation-matter interaction and Properties of matter.

These approaches and objectives are aligned with the following Sustainable Development Goals: Goal 4: Education of quality; Goal 8: Decent work and economic growth.

2. Learning results

- Acquire knowledge of the physical fundamentals and criteria for the selection of physical magnitude sensors.
- Analyse and design the signal conditioning of a measurement system.
- Understand the fundamentals of signal sampling and quantification.
- Know and know how to choose between the different measurement automation systems.
- Handle specific measurement and control instrumentation in different experimental areas of Physics: Acoustics, Fluids, Radiation-matter interaction and Properties of matter.
- Use computer tools for the acquisition, automation and processing of measurements.

3. Syllabus

First semester:

Block I. Fundamentals of DAQs.

Block II. Sensors. Physical principles Characterization and applications. Selection criteria.

Block III. Conditioners. Operational amplifiers. Instrumentation amplifiers. Filtering.

Block IV. Signal Converters. Sampling and quantification. A/D and D/A converters.

Block V. Acquisition, Control and Processing. Basic instrumentation. Computer interface systems: DAQ cards, instrumentation buses. Control and processing software tools.

Laboratory Practices.

Session 1: Conditioning systems.

Session 2: Signal conversion.

Session 3: Acquisition of physical quantities by means of DAQ.

Session 4: Acquisition of physical quantities by means of computer-controlled instrumentation.

Session 5: Automated electronic measurement, control and processing system.

Second semester:

Session 6: Simulation of physical systems.

Session 7: Measurement of thermal and optical properties of matter.

Session 8: Interaction of ionizing radiation with matter.

Session 9: Acoustics.

4. Academic activities

The subject consists of 10 ECTS distributed as follows:

S1: 4 ECTS

Master classes: 2.5 ECTS

Problems: 0.5 ECTS

Laboratory: 0.5 ECTS

S2: 6 ECTS

Laboratory: 4 experiences of 1.5 ECTS each

5. Assessment system

- Activity 1 (25%): Completion of a theoretical-practical test on a date pre-established by the teacher. With this part students can achieve up to 2.5 points, but it is necessary to obtain a minimum of 1.
- Activity 2 (5%): Resolution of exercises derived from the theoretical classes, their delivery on the established dates and the possible presentation in class. Exercises not submitted on time will be graded with 0 points. With this part students can achieve up to 0.5 points.
- Activity 3 (10%): Resolution of a questionnaire for sessions 1 to 5 of the laboratory practices and its delivery on the established dates. Questionnaires not submitted on time will be graded with 0 points. With this part students can achieve up to 1.0 points, but it is necessary to obtain a minimum of 0.5.
- Activity 4 (60%): Writing of the reports of sessions 6 to 9 of the laboratory practices and their delivery in the established dates. Reports not submitted on time will be graded with 0 points. With this part students can achieve up to 6 points, but it is necessary to obtain a minimum of 0.6 in each of the sessions from 6 to 9 and a minimum of 3 points in total.

Passing the subject by means of a single global test. Students who have not passed the subject with the four previous activities, or who wish to improve their grade may take a theoretical test (40%) and another practical test (60%), on the dates established by the official exam calendar. Up to 4 points may be obtained in the theoretical test and up to 6 points in the practical but it is necessary to obtain a minimum of 3 points in the latter.