

## 26927 - Physical Techniques III

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 26927 - Physical Techniques III

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 447 - Degree in Physics

**ECTS:** 6.0

**Year:** 4

**Semester:** First semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The objective of this subject is the acquisition of skills for the development of practical work in different areas of Physics, with an increasing level of autonomy. Specifically, skills will be developed related to the design of experimental setups, their set-up, the application to a specific problem and the evaluation of their performance, as well as simulation and statistical techniques for the understanding of physical models.

In the subjects of Physical Techniques I and II the students have handled basic laboratory instruments and used computers to control instruments, acquire data and process them. By taking this subject, they will advance in their practical learning, including the achievement of previously defined objectives according to a schedule; this will enhance their initiative and autonomy when making decisions during the development of the designed experiments and propose possible modifications based on the results obtained.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>); specifically, the planned learning activities will contribute to the achievement of Objectives 4.3 and 4.4 of SDG 4.

It is recommended to have taken the subjects Computer Science, Physics Laboratory, Physical Techniques I and Physical Techniques II.

### 2. Learning results

The stated learning results should demonstrate that the student is able to cope with the different stages of the activities carried out:

- Correct adaptation of the experimental design to achieve the proposed objectives, always in accordance with the conditions established by the available instrumentation and the established schedule.
- Operation and development of the necessary computer tools to model, simulate, control instruments and/or acquire data
- Preparation of a report on the work carried out and the results obtained.

### 3. Syllabus

In this subject, each student must complete 4 of the 11 activities indicated below ( in parentheses is the area of knowledge responsible). The dedication to each of them corresponds to 1.5 ECTS. The assignment will be made trying to respect as much as possible the preferences of each student.

Activity 1: Experimental characterization of unstable, oscillating and chaotic electronic systems (Electronics).

Activity 2: Design, assembly, characterization and application of a radiation and particle detector ( Atomic, Molecular and Nuclear Physics).

Activity 3: Application of optical and spectroscopic techniques to the study of materials (Physics of Condensed Matter).

Activity 4: Characterization of an optical device (Optics).

Activity 5: Introduction to Molecular Simulation (Condensed Matter Physics).

Activity 6: Magnetic materials, semiconductors and superconductors (Condensed Matter Physics) Activity 7: Introduction to Monte Carlo Simulations in Field Theories and Complex Systems (Theoretical Physics)

Activity 8: Photonics (Optics)

Activity 9: Study of cosmic radiation with a muon telescope (Atomic, Molecular and Nuclear Physics) Activity 10: Gravitational Waves (Theoretical Physics)

Activity 11: Laser-based Optical Measurement Techniques (Applied Physics)

## 4. Academic activities

**Informative meeting at the beginning of the term. The objectives of this meeting are:**

- 1) To inform the students about the organization, calendar and development of the subject.
- 2) To set a deadline for choosing and assigning the 4 activities to be performed by each student. Once the assignment is made, each student must:
  - Carry out the four activities during the first four-month period. The student will receive from the faculty responsible for each activity the bibliography and documentation necessary for its realization.
  - Prepare the reports of the activities carried out, which must be submitted no later than the day before the beginning of the exam period of the first call of the corresponding academic year.

## 5. Assessment system

**A) The evaluation in this subject is based on two aspects:**

A.1. Work developed in the practical sessions. As an aid to evaluation, the teacher may conduct an objective test or other equivalent method (in this subject, an objective test will be conducted, at least, in activities 2, 7, 8, 9 and 10).

The grade for this section will be the average of the grades obtained in the 4 activities and will have a weight of 30% in the final grade of the subject.

Attendance to all sessions scheduled in each activity is a prerequisite to be evaluated. Any unexcused absence will prevent the person from being evaluated.

A.2. Individual report for each of the 4 activities. In the case of team work, the report may be done in a group, if deemed appropriate by the teacher responsible for the activity.

The grade for this section will be the average of the grades obtained in each of the 4 activities and will have a weight of 70% in the final grade of the subject.

B) In the event that the subject has not been passed as indicated in A), a single global test may be taken on the dates set forth in the official calendar. This test will be of a practical nature and will require to demonstrate sufficient competence in different areas of knowledge in the field of Physics, so it will include evaluation activities in four of these areas. The final grade will be the average of the grades obtained in each activity.

In any case, in order to pass the subject, the final grade must be equal or higher than 5.0 (out of 10)