# 26920 - Physical Techniques II

**Información del Plan Docente**

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| **Academic Year** | 2018/19 |
| **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

## 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. This is an introductory course on acquisition, control, instrumentation and data processing as well as the application of specific instrumentation and tools in different fields of physics. a wide range of teaching and learning tasks are implemented such as lectures, practice sessions and laboratory sessions.

## 4.2.Learning tasks

The course includes the following learning tasks:

- Lectures (2.5 ECTS)
- Practice sessions (0.5 ECTS)
- Laboratory sessions (7 ECTS)

## 4.3.Syllabus

The course will address the following topics:

Topic 1: Measurement and Instrumentation Principles

- Introduction
- Basic blocks of a measurement system
- Static and dynamic performance characteristics

Topic 2: Sensors

- Physical principles
- Technology and applications
- Selection criteria

Topic 3: Signal Conditioners

- Operational amplifiers
- Instrumentation amplifiers
- Analog signal filtering

Topic 4: Signal Converters

- Sampling and quantification
- A/D and D/A converters

Topic 5: Acquisition, Control and Processing

- Basic instrumentation
- Computer interfacing: DAQ cards
- Computer interfacing: instrumentation buses
- Control and processing software tools

**Practice sessions**

ELECTRONICS:

1. Signal conditioning
2. Signal Conversion
3. Physical data acquisition by DAQ
4. Physical data acquisition by computer controlled instrumentation
5. Intelligent sensor systems

SIMULATION OF PHYSICAL SYSTEMS

CONDENSED MATTER PHYSICS

1. Phase diagram gas- liquid.
    - Objectives: Studying the hexafluoride sulphur gases (SF6) and ethane (C2H6), and their gas - liquid phase diagram.
2. Thermal and electrical conductivity of metals.

- Objectives: Determining the thermal and electrical conductivity of various metals. Experimental verification of the Wiedemann - Franz law

FARADAY EFFECT

- Objectives: Measuring the magnetic field in the air gap of a magnetic circuit. Observation of Faraday effect in a glass

ULTRASONIC TESTING

- Objectives: Determining the speed of propagation of elastic waves in solids. Determination of thickness of pieces accessible on one side only. Detection of internal cracks

RADIATION PHYSICS.

1. Study of the natural radiation with a NaI (Tl) detector
2. Detector commissioning and calibration
3. Data taking
4. Data analysis and conclusions

ACOUSTICS:

1. Estimation of effective A-weighted sound pressure levels when hearing protectors are worn. (ISO/DIS 4869-2).
2. Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane. (ISO 3744).
3. Determination of sound absorption coefficient and impedance in impedance tubes -- Part 1: Method using standing wave ratio. (ISO 10534-1).

## 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