

Academic Year/course: 2022/23

## 26911 - Physical Techniques I

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 26911 - Physical Techniques I

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

**Degree:** 447 - Degree in Physics

**ECTS:** 8.0

**Year:** 2

**Semester:** Annual

**Subject Type:** Compulsory

**Module:**

## 1. General information

### 1.1. Aims of the course

The aims of the course are aligned with the following Sustainable Development Goals (SDGs):

- Goal 4: Quality Education

## 2. Learning goals

## 3. Assessment (1st and 2nd call)

## 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 and acquire the specific skills. A wide range of teaching and learning tasks are implemented, such as:

- Lecture classes
- Problems sessions
- Laboratory sessions
- Assignment proposal
- Seminars and projects
- Electronic laboratory sessions
- Laplace transform
- Frequency spectrum project
- Measurement planning
- Specific instrumentation in physics
- EDA tools
- Assessment and self-assessment test

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other learning resources such as self-assessment tests, laboratory material (data sheet, manuals, etc).

Further information regarding the course will be provided on the first day of class.

## 4.2. Learning tasks

The 8 ECTS course includes the following learning tasks:

- Lectures, practice sessions and assessment tests: (5 ECTS): Lecture notes problems sets will be available for the students. At the end of each topic, some of the problems will be solved in class by the teacher and the rest will be done individually or in a group.
- Laboratory sessions: 3 ECTS: 4-hour sessions where students are provided with the practical exercises' instructions to be done as well as a theoretical introduction to the session's contents. The students must do a previous test on line.

## 4.3. Syllabus

The course will address the following topics

### Lectures

#### Section I Basics

1. Types of signals
2. Physical and electrical variables
3. Foundations and modeling of physical sensors. Applications.
4. Fundamental laws and equivalences

#### Section II Transformed Field

1. Circuits in the transformed field
2. Network Function
3. Permanent sinusoidal regime

#### Section III Systematic methods of analysis

1. Circuit analysis

#### Section IV Equivalent circuits and systems

1. Thévenin and Norton
2. Quadropole

#### Section V Metrology

1. Basics of metrology
2. Quality in metrology
3. Introduction to units and patterns

#### Section VI Basic Instrumentation

1. Basic instrumentation
2. Features of an electronic system

#### Section VII Basic measurement characteristics

1. Characteristics related to design
2. Characteristics related to behavior
3. Characteristics related to reliability
4. Selection criteria

### Laboratory sessions:

- Session 1: Measurement of physical and electrical variables
- Session 2: Types of signal processing
- Session 3: Filtering and signal conditioning
- Session 4: Radiation metrology with a Geiger counter
- Session 5: Application of statistical tools to measure physical quantities
- Session 6: Electronic measurement and actuation system for physical magnitudes

#### **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**

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=26911>