# 26911 - Physical Techniques I

**Información del Plan Docente**

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| **Academic Year** | 2017/18 |
| **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.Introduction

## 1.2.Recommendations to take this course

## 1.3.Context and importance of this course in the degree

## 1.4.Activities and key dates

## 2.Learning goals

## 2.1.Learning goals

## 2.2.Importance of learning goals

## 3.Aims of the course and competences

## 3.1.Aims of the course

## 3.2.Competences

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

## 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

## 5.Methodology, learning tasks, syllabus and resources

## 5.1.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

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- Thematic work proposal
- Seminars and projects.

Electronic laboratory
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.

## 5.2.Learning tasks

The course includes 8 ECTS organized according to:

Lectures, problems and evaluation tests: 5 ECTS
Laboratory sessions: 3 ECTS

Theory sessions: lecture notes and a series of problems 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: in these 4-hour sessions 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.

## 5.3.Syllabus

The course will address the following topics:

Theory sessions

Block I Basics

- Types of signals
- Physical and electrical variables
- Foundations and modeling of physical sensors. Applications.
- Fundamental laws and equivalences

Block II Transformed Field

- Circuits in the transformed field
- Network Function
- Permanent sinusoidal regime

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Block III Systematic methods of analysis

- Circuit analysis

Block IV Equivalent circuits and systems

- Thévenin and Norton
- Quadrupole

Block V Metrology

- Basics of metrology
- Quality in metrology
- Introduction to units and patterns

Block VI Basic Instrumentation

- Basic instrumentation
- Features of an electronic system

Block VII Basic measurement characteristics

- Characteristics related to design
- Characteristics related to behavior
- Characteristics related to reliability
- Selection criteria

Laboratory experiences:

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

## 5.4.Course planning and calendar

The distribution of the different activities will be given according to the academic calendar of the corresponding course. Regarding the different assessment tests, they will be performed according the schedule set in advance by the faculty and the official exam period set by the center. It will be announced well in advance.

## 5.5.Bibliography and recommended resources

- BB Barlow, Roger. Statistics : a guide to the use of statistical methods in the physical sciences / Roger Barlow . - 1st ed. repr. Chichester [etc.] : John Wiley, 1999
- BB Davis, Artice M.. Linear circuit analysis / Artice M. Davis Boston [etc.] : PWS, 1998

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- BB Decarlo, Raymond A.. Linear circuit analysis : Time Domain, Phasor, and laplace transform approaches / Raymond A. Decarlo, Pen- Min Lin Englewood Clifs (New Jersey) : Prentice Hall, cop. 1995
- BB Hebra, Alex. The Physics of Metrology: All about Instruments: From Trundle Wheels to Atomic Clocks. Springer (2010)
- BB Huelsman, Lawrence P.. Basic circuit theory / Lawrence P. Huelsman . - 3rd ed. Englewood Cliffs, N.J. : Prentice Hall, 1991
- BB Nilsson, James W.. Circuitos eléctricos / James W. Nilsson, Susan A. Riedel . - 7ª ed. Madrid : Pearson Educación, 2005
- BB Thomas, Roland E.. The analysis and design of linear circuits / Roland E. Thomas, Albert J. Rosa . - 3rd ed. New York [etc.] : John Wiley & Sons, cop. 2001
- BB Witte, R.A.. Electronic Test Instruments: Analog and Digital Measurements Prentice Hall (2002)
- BB Wolf, Stanley. Student reference manual for electronic instrumentation laboratories / Stanley Wolf, Richard F.M. Smith . - 2nd ed. Upper Saddle River, N.J. : Prentice Hall , cop. 2004