26920 - Physical Techniques II

Información del Plan Docente

Academic Year	2017/18
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.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

Introductory course on acquisition, control, instrumentation and data processing. Application of specific instrumentation and tools in different fields of physics.

5.2.Learning tasks

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The ECTS assigned to the planned activities is as following:

Lectures: 2.5 ECTS

Problems: 0.5 ECTS

Laboratory: 7 ECTS

5.3.Syllabus

1:Measurement and Instrumentation Principles

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

2: Sensors

- Physical principles
- Technology and applications
- Selection criteria

3: Signal Conditioners

- Operational amplifiers
- Instrumentation amplifiers
- Analog signal filtering

4: Signal Converters

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

5: Acquisition, Control and Processing

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

Practical 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

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SIMULATION OF PHYSICAL SYSTEMS

CONDENSED MATTER PHYSICS

1. Phase diagram gas- liquid

Objectives: To study the hexafluoride sulfur gases (SF 6) and ethane (C 2 H 6) , and their gas - liquid phase diagram.

1. Thermal and electrical conductivity of metals

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

1. FARADAY EFFECT

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

1. 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.

Study of the natural radiation with a NaI(Tl) detector

1. Detector commissioning and calibration
2. Data taking
3. 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).

5.4.Course planning and calendar

The distribution of the planned activities depends on the general schedule of the scholastic year. The dates of the exams will be published by the professors according to the calendar approved by the Faculty.

5.5.Bibliography and recommended resources

- BB Agilent 2000-X Series Programmer's Guide. 2011 Agilent [DESCARGA PDF en "Listado de URLs"]
- BB Agilent 2000-X Series User's Guide. 2011 Agilent [DESCARGA PDF en "Listado de URLs"]
- BB Callen, Herbert B.. Thermodynamics and an introduction to thermostatistics / Herbert B. Callen . - 2nd ed. New York : John Wiley and Sons, cop. 1985
- BB Casas Peláez, Justiniano. Optica / Justiniano Casas . - 7ª ed. Zaragoza : [El Autor], 1994

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- BB Klaassen, Klaas B.. Electronic measurement and instrumentation / K.B. Klaassen ; translation from Dutch, S.M. Gee . - 1st ed. repr. Cambridge : Cambridge University Press, 2000
- BB Knoll, Glenn F.. Radiation detection and measurement / Glenn F. Knoll . - 4th. ed. New York [etc.] : John Wiley & Sons, cop. 2010
- BB Low level measurements : precision DC current, voltage, and resistance measurements / [J. F. Keithley, J. R. Yeager, R. J. Erdman] . - 5th ed. Cleveland, Ohio : Keithley Instruments, cop. 1998
- BB Matlab Data Acquisition Toolbox Documentation. 2011 The Mathworks [Información disponible en Mathworks.es, en "Listado de URLs"]
- BB Matlab Getting Started Documentation. The Mathworks [Información disponible en Mathworks.es, en "Listado de URLs"]
- BB Matlab Instrument Control Toolbox Documentation. 2011 The Mathworks [Información disponible en Mathworks.es, en "Listado de URLs"]
- BB Nanoscience and the environment / edited by Jamie R. Lead, Eugenia Valsami-Jones . Amsterdam [etc] : Elsevier, cop.2014
- BB Sedra, Adel S.. Microelectronic circuits / Adel S. Sedra, Kenneth C. Smith . 5th ed. New York [etc.] : Oxford University Press, 2004
- BB Standard Commands for Programmable Instruments (SCPI), Vol. 1: Syntax and Style. mayo 1999 SCPI Consortium [DESCARGA PDF en "Listado de URLs"]

LISTADO DE URLs:

- Agilent 2000-X Series : User's Guide and Programmer's Guide [http://www.home.agilent.com/agilent/facet.jspx?c=189413.i.2&to=79841.g.1&cc=ES&lc=eng]
- Documentación sobre MatLab y sus Toolbox [http://www.mathworks.es/help/]
- Standard Commands for Programmable Instruments (SCPI), Vol. 1: Syntax and Style. SCPI Consortium, mayo 1999. [http://www.ivifoundation.org/docs/scpi-99.pdf]