60036 - Intelligent Instrumentation

Información del Plan Docente

Academic Year	2018/19
Subject	60036 - Intelligent Instrumentation
Faculty / School	100 - Facultad de Ciencias
Degree	538 - Master's in Physics and Physical Technologies
ECTS	5.0
Year	1
Semester	First semester
Subject Type	Optional
Module	---

1.General information

1.1.Aims of the course

Last decades advances in Physics have resulted in numerous widespread technological applications. Thus, solid-state hard drives, broadband mobile communication systems, GPS systems or very high resolution flat screens are, among others, technological products directly derived from the experimental results obtained in research laboratories. In this context, it is essential to have high performance measurement systems, which allow scientists get closer to the physical limit, being able to determine changes in the behavior of matter at increasingly lower scales. This requires the employment of sensors with high sensitivity and resolution, as well as disposing of the appropriate electronic systems for a suitable signal processing: low noise amplifiers, configurable filters, high resolution analog-digital conversion systems or instrumentation capable of measuring in the physical limit. Besides, their operation should be temporarily synchronized to get the correct interpretation of the phenomena under study.

This course will provide students with the basic fundaments for high precision measurement of electrical magnitudes (low-level voltage and current systems, measurements over high output impedance systems, high noise level systems, etc...), the principles of analog and digital signal processing (filters, equalizers, low noise amplifiers), as well as the design techniques for computer controlled acquisition systems with a multi-parameter synchronized acquisition.

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)

60036 - Intelligent Instrumentation

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

A continued evaluation will take into account the personal work of the students by solving questions, problems and proposed assignments, their delivery in scheduled deadlines and a possible oral presentation in class. This will constitute 50 % of the final mark.

The course will also comprise several practical sessions. 50 % of the final mark will correspond to this laboratory work, which will involve the continuous assessment of the attitude and skills that the student demonstrates in developing the practical sessions, and the grade obtained in the final report of each of the proposed experiences. The report should accurately describe the objectives, methodology and results, as well as the answers to the questions raised.

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. A wide range of teaching and learning tasks are implemented, such as:

- Lectures and case-based learning comprising the core contents of the course (3 ECTS).
- Individual and/or small group solving of questions, problems and proposed assignments, and their presentation and defense (1 ECTS).
- Laboratory sessions and demos. Preparation of reports (1 ECTS).

4.2.Learning tasks

The course includes the following learning tasks:

- Lectures on the main topics (3 ECTS).
- Individual and/or small group solving of questions, problems and proposed assignments (0.5 ECTS).
- Defense of problems and assignments (0.5 ECTS).
- Laboratory work, leading to the design and characterization of a complete acquisition measurement system with control instrumentation (1 ECTS).

4.3.Syllabus

The course will address the following topics:

1. Electrical Modeling of physical sensors.
2. Specific electronic Interfaces: low current, high strength, low noise, etc.
3. Analog Signal Processing: linear and nonlinear.
4. Digital and quasi-digital conversion techniques.
5. Digital Signal Processing.
6. High performance electronic instrumentation: SMUs, nanovoltmeters, picoammeters, etc.
7. Standard instrumentation buses.
8. Automatic control of processes and remote labs.

4.4.Course planning and calendar

The distribution of the different activities will be decided according to the academic calendar of this course.

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 Science http://ciencias.unizar.es/

60036 - Intelligent Instrumentation

4.5.Bibliography and recommended resources