Universidad Zaragoza

Academic Year/course: 2021/22

29642 - Electrical Measurements

Syllabus Information

Academic Year: 2021/22
Subject: 29642 - Electrical Measurements
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 430 - Bachelor's Degree in Electrical Engineering
ECTS: 6.0
Year: 4
Semester: Second semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

The course aims to instruct the students on basics concepts related to electrical measurements, including the working principle of some sensors and their computational simulation. Besides, the course includes fundamental knowledge about sensor networks.

The course objectives are aligned with some of the Sustainable Development Goals (SDG) by 2030 (https://www.un.org/sustainabledevelopment/) so that the knowledge provided to the students makes them capable of accomplishing them partially or totally.

- SDG 7: Affordable and Clean Energy
  - 7.3 By 2030, double the global rate of improvement in energy efficiency
- SDG 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation
  - 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

1.2. Context and importance of this course in the degree

The course is taught during the second semester of the fourth year of Electrical Engineering Degree. In order to have a good performance, it is recommended to have previous knowledge of electricity and magnetism, circuits theory, and programming.

1.3. Recommendations to take this course

It is recommended to have previous knowledge of electricity and magnetism, circuits theory, and programming. Besides, rudiments of instrumentation for electrical engineering are desirable.

2. Learning goals

2.2. Learning goals

- Understand the working principle of several sensors and their signal conditioning.
- Comprehend the interactions between the sensors and microcontrollers and their programming.
- Understand the working principle of small communication networks and the Internet of Things.
- The students will work with multidisciplinary teams due to the various topics and fields involved in this course.
- The students will understand the implications of adopting electrical measurements from societal, environmental, economic, and industrial perspectives.

2.3. Importance of learning goals

The students are going to acquire essential knowledge to complement their technical and scientific background with topics related to electrical measurements. Such issues are important to increase their skill in Electrical Engineering.

3. Assessment (1st and 2nd call)

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

- Experiments and practical work in the laboratory (80%). The experiments are directly related to the topics discussed in the classroom.
- Other activities (20%). It could be a report or other activity about a topic of interest in the field of sensors and communications.

The students that do not fulfill this evaluation methodology will have the alternative of a global exam. The global exam considers all of the topics taught during the course. A score of 5 out of 10 is required to pass the exam and the course under this evaluation mode.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning methodology applied in this course is carried out using the techniques presented as follows:

- Activities in the classroom
- Activities in the laboratory
- Evaluation through a Report
- Evaluation through assignments

4.2. Learning tasks

The activities in the classroom include detailed explanation about fundamental concepts related to the working principles of some sensors and communication technology required to connect them with a data-processing computer. Then, those concepts are discussed from a practical perspective in the laboratory. In general, the course has 12 theoretical classes with 12 sessions in the laboratory.

4.3. Syllabus

1. Introduction to the simulation of electronic circuits and sensors.
2. Resistive sensors and their signal conditioning.
3. Variable reactance sensor
4. Anti-aliasing filter
5. Sample and hold, and analog-to-digital conversion
6. Introduction to communication networks
7. Introduction to communication networks, including IP addressing and subnetting
8. Introduction to sensor networks and the internet of things
9. Introduction to MQTT protocol.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates, other details and further information regarding this course will be provided on the first day of class or please refer to the EINA (Escuela de Ingeniería y Arquitectura de la Universidad de Zaragoza), website (http://eina.unizar.es). In general, classes are held once a week for two hours and experimental sessions are held once a week for three hours.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29642&Identificador=15368