Electronic Instrumentation Systems

Academic Year: (2022 / 2023) **Review date: 20/05/2022 17:48:55**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: GARCIA SOUTO, JOSE ANTONIO

Type: Compulsory ECTS Credits : 3.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electronic Instrumentation

OBJECTIVES

1. A systematic understanding of the key aspects and concepts of their branch of engineering in electronic instrumentation.
2. A coherent knowledge of their branch of engineering including some at the forefront of the branch in electronic instrumentation.
3. The ability to apply their knowledge and understanding of electronic instrumentation to identify, formulate and solve engineering problems using established methods.
4. The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements.
5. An understanding of design methodologies, and an ability to use them in the design of electronics instrumentation systems.
6. Workshop and laboratory skills.
7. The ability to select and use appropriate equipment, tools and methods.
8. The ability to combine theory and practice to solve problems of electronic instrumentation.
9. An understanding of applicable techniques and methods in electronic instrumentation, and of their limitations.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Noise and interference in electronic instrumentation systems.
   1.1. Instrumentation errors and their treatment.
   1.2. Types of noise sources, properties and characterization of noise in instrumentation.
   1.3. Evaluation of the resolution of a measurement system.
   1.4. Interferences and EMC: shielding and grounding.
2. Specific signal conditioning and modulation techniques for different transducers.
   2.1. VCO, FM, PDM, etc.
   2.2. Synchronous demodulator.
   2.3. Lock-in amplifier.
3. Data acquisition systems, architectures and standards, communication interfaces and industrial buses.
   3.1. Integration of analog and digital signals in instrumentation systems: architectures, standards.
   3.2. Description of the most used systems and buses (IEEE, VXI, PXI, etc.).
   3.3. Sampling and basic digital signal processing techniques.
4. Introduction to virtual instrumentation and its software tools.
   4.1. LabVIEW as an example of Instrumentation Software.

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will include:

Lectures, where students will be introduced to the basic knowledge to be acquired. Students will be provided with lecture notes and will have basic reference texts that will allow them to complete and

deepen their knowledge of the subject.

Practical classes oriented to the resolution of exercises and examples in the context of a real practical case. These classes will be complemented with the resolution of practical exercises by the student.

Laboratory practical sessions.

Group tutorials

ASSESSMENT SYSTEM

% end-of-term-examination/test:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

1. Test-type questionnaires or reasoned questionnaires as part of the continuous evaluation and in the final exam.
2. Questions associated with the instrumentation system developed in the laboratory.
3. Laboratory project with previous questions, set up of a system, measurements in the laboratory and documentation with results and conclusions.
4. Analysis and design of electronic instrumentation systems though exercises in the final exam.

Ordinary call:
Continuous evaluation based on two individual assignments of theoretical-practical content (40%) and a project done in group that includes practical laboratory sessions (20%).
Final exam (40%).

Extraordinary Call:
Based on continuous evaluation and final exam with the same weightings of the ordinary call. Optionally, it can be based on a single final exam (100%).

BASIC BIBLIOGRAPHY

- LabVIEW Core 1 Course Manual, National Instruments Corporation, 2012

- Clyde F.Coombs Jr Electronic Instrument Handbook, McGraw-Hill Professional, 2000

- M.A. Perez Garcia Instrumentacion Electronica, Paraninfo, 2014