Electronic and industrial instrumentation systems

Academic Year: (2019 / 2020) **Review date: 10/02/2020 11:09:41**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: SAN MILLAN HEREDIA, ENRIQUE

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- Fundamentals of electronics
- Fundamentals of control engineering

OBJECTIVES

Ability to design electronic and industrial instrumentation systems. The key objectives of the course are:
- Provide principles and practices in the management of measuring instruments.
- Learn the basics of analog and digital signals processing.
- Know the components of data acquisition systems: signal conditioning, A / D converters and D / A, memory and digital processors.
- Know the means and systems for data communication in industrial instrumentation environments.

DESCRIPTION OF CONTENTS: PROGRAMME

1. INTRODUCTION
1.1 Architecture of an industrial instrumentation system
1.2 Review of signals and systems
1.3 Frequency response RLC circuit

2 Analog Electronic Systems
2.2 Amplification and characteristics of amplifiers: circuits with operational amplifiers. Differential amplifiers. Applications
2.4 Filtering and filter types. Transfer function of first and second order filters.
Filter circuits
2.4 Examples and practical documentation of sensors and amplifiers for instrumentation.
2.5 Instruments for measuring analog signals
2.6 Static and dynamic characteristics of sensors

3. Digital Electronic Systems
3.1 Description of discrete signals and systems.
3.2 Sampling of signals
3.3 Signals quantification and coding
3.4 Data Representation
3.5 Sample and hold circuits, AD converters and DA: Features
3.6 Digital filters
3.7 Discrete Regulators
3.8 Data acquisition cards and instrumentation SW (LabVIEW)

4. Instrumentation systems with microcontrollers
4.1 Introduction to instrumentation with microcontroller
4.2 Architecture of the reference microcontroller: CPU + peripherals
4.3 Configuring inputs and outputs (analog and digital)
4.4 Timers. Time capture and signal generation
4.5 Description of programs using flowcharts

LEARNING ACTIVITIES AND METHODOLOGY

Six theory/practice problems sessions plus a lab session per thematic block.
Lab project (four lab sessions).

ASSESSMENT SYSTEM

% end-of-term-examination/test:	75
% of continuous assessment (assigments, laboratory, practicals…):	25

The weight of each evaluation activity is:
Practices: 10%
Project: 15%
Ordinary exam: 75% (minimum mark 4 points)

In extraordinary examination it is necessary to pass the exam (minimum mark 5 points) and the final mark will be the mark of the exam or, if this is greater, the result of weighting the exam with practices and laboratory as in the ordinary examination.

BASIC BIBLIOGRAPHY

- Miguel A. Pérez García Instrumentación electrónica , Paraninfo, 2014

- Richard S. Figliola Theory and design for mechanical measurements , John Wiley & Sons, 1995

- Tattamangam R. Padmanabham Industrial instrumentation: Principles and Design , Springer, 2000

- Thomas E. Kissell Industrial electronics , Prentice Hall, 2000