

Course guide

220203 - 220203 - Basic Instrumentation

Last modified: 19/04/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 2.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: RAUL FERNANDEZ GARCIA

Others: RAUL FERNANDEZ GARCIA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Ability to design electronic systems and industrial instrumentation.

TEACHING METHODOLOGY

The course is divided into three parts:

- Exposure sessions.
- Laboratory sessions.
- Self study.

In the exposure sessions, teachers will introduce the theoretical foundations of the subject , concepts , methods and illustrate them with examples and exercises to facilitate their understanding .

In laboratory sessions , teachers will guide students in applying theoretical concepts to solve experimental set-ups , based on critical thinking at all times . We propose activities that students solve in the classroom and outside the classroom , to promote contact and use the basic tools necessary to perform an instrumentation system .

Students, independently, is working on material provided by the. The teachers provide a curriculum and monitoring activities (ATENEA) .

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student should:

- Understand and select the main types sensor
- Be able to perform signal conditioning system of sensors.
- Understand the operation and select Analog Interfaces

STUDY LOAD

Type	Hours	Percentage
Hours large group	15,0	24.00
Self study	40,0	64.00
Hours small group	7,5	12.00

Total learning time: 62.5 h

CONTENTS

Module1: Introduction to Electronic Instrumentation

Description:

- 1.1 Introduction
- 1.2 Measuring Systems
- 1.3 Static characteristics
- 1.4 Dynamic characteristics

Related activities:

- Activity 1: Exercises
- Activity 2: Pre-Laboratory task
- Activity 3: Laboratory Exam
- Activity 4: Final Exam

Full-or-part-time: 7h 30m

Theory classes: 2h

Laboratory classes: 1h 30m

Self study : 4h

Module 2: Sensors

Description:

- 2.1. Resistive sensors
- 2.2. Reactive sensors
- 2.3. Generator sensors

Related activities:

- Activity 1: Exercises
- Activity 2: Pre-Laboratory task
- Activity 3: Laboratory Exam
- Activity 4: Final Exam

Full-or-part-time: 16h

Theory classes: 4h

Laboratory classes: 2h

Self study : 10h

Module 3: Signal conditioning

Description:

- 3.1. Operational amplifier
- 3.2. Instrumentation amplifiers
- 3.3. Analog filters

Related activities:

- Activity 1: Exercises
- Activity 2: Pre-Laboratory task
- Activity 3: Laboratory Exam
- Activity 4: Final Exam

Full-or-part-time: 24h

Theory classes: 6h

Laboratory classes: 2h

Self study : 16h

Module 4: Acquisitions and signal distribution

Description:

- 4.1. Sample and hold
- 4.2. Analogue to digital conversion
- 4.3. Transmission

Related activities:

- Activity 1: Exercises
- Activity 2: Pre-Laboratory task
- Activity 3: Laboratory Exam
- Activity 4: Final Exam

Full-or-part-time: 15h

Theory classes: 3h

Laboratory classes: 2h

Self study : 10h

GRADING SYSTEM

The final grade depends on the following activities:

- Activity 1: Exercises, weight: 20%
- Activity 2: Pre-Laboratory exercises, weight: 10%
- Activity 3: Laboratory Exam, weight: 20%
- Activity 4: Final Exam, weight: 50%

The results with average grade of less than 5 can be recovered by special recovery exam. The maximum grade you can get in this extraordinary examination of recovery 5.

BIBLIOGRAPHY

Basic:

- Pérez García, M.A. [et al.]. Instrumentación electrónica. 2ª ed. Madrid: Thomson, 2004. ISBN 8497321669.

Complementary:

- Pallás Areny, Ramón. Sensores y acondicionadores de señal. 2ª ed. Barcelona: Marcombo Boixareu, 1994. ISBN 8426709893.



- Morris, Alan S.; Langari, Reza. Measurement and instrumentation: theory and application [on line]. Waltham, MA: Academic Press, 2012 [Consultation: 20/09/2022]. Available on : <https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780123819604/measurement-and-instrumentation>. ISBN 9786613612038.

RESOURCES

Hyperlink:

- <http://www.ni.com/labview/esa/> />