

## 220203 - Basic Instrumentation

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
Teaching unit: 710 - EEL - Department of Electronic Engineering  
Academic year: 2019  
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)  
ECTS credits: 2,5 Teaching languages: Catalan

### Teaching staff

Coordinator: 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

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### Study load

Total learning time: 62h 30m	Hours large group:	15h	24.00%
	Hours medium group:	0h	0.00%
	Hours small group:	7h 30m	12.00%
	Guided activities:	0h	0.00%
	Self study:	40h	64.00%

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### Content

<p>Module1: Introduction to Electronic Instrumentation</p>	<p>Learning time: 7h 30m Theory classes: 2h Laboratory classes: 1h 30m Self study : 4h</p>
<p>Description: 1.1 Introduction 1.2 Measuring Systems 1.3 Static characteristics 1.4 Dynamic characteristics</p> <p>Related activities: -Activity 1: Exercises -Activity 2: Pre-Laboratory task -Activity 3: Laboratory Exam -Activity 4: Final Exam</p>	
<p>Module 2: Sensors</p>	<p>Learning time: 16h Theory classes: 4h Laboratory classes: 2h Self study : 10h</p>
<p>Description: 2.1. Resistive sensors 2.2. Reactive sensors 2.3. Generator sensors</p> <p>Related activities: -Activity 1: Exercises -Activity 2: Pre-Laboratory task -Activity 3: Laboratory Exam -Activity 4: Final Exam</p>	

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<p>Module 3: Signal conditioning</p>	<p>Learning time: 24h Theory classes: 6h Laboratory classes: 2h Self study : 16h</p>
<p>Description: 3.1. Operational amplifier 3.2. Instrumentation amplifiers 3.3. Analog filters</p> <p>Related activities: -Activity 1: Exercises -Activity 2: Pre-Laboratory task -Activity 3: Laboratory Exam -Activity 4: Final Exam</p>	
<p>Module 4: Acquisitions and signal distribution</p>	<p>Learning time: 15h Theory classes: 3h Laboratory classes: 2h Self study : 10h</p>
<p>Description: 4.1. Sample and hold 4.2. Analogue to digital conversion 4.3. Transmission</p> <p>Related activities: -Activity 1: Exercises -Activity 2: Pre-Laboratory task -Activity 3: Laboratory Exam -Activity 4: Final Exam</p>	

### Qualification 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.

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### 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]. 2nd ed. Amsterdam: Academic Press, 2015 [Consultation: 24/07/2017]. Available on:  
<<http://www.sciencedirect.com/science/book/9780128008843>>. ISBN 9780128011324.

#### Others resources:

##### Hyperlink

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