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

<table>
<thead>
<tr>
<th></th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>15h</td>
<td>0h</td>
<td>7h 30m</td>
<td>0h</td>
<td>40h</td>
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## Content

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

**Learning time:**
- 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

**Learning time:**
- Theory classes: 3h
- Laboratory classes: 2h
- Self study: 10h

## 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.
Bibliography

Basic:


Complementary:


Others resources:

Hyperlink

http://www.ni.com/labview/es/