340606 - SENS-R2O10 - Sensors and Mems

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2018
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Teaching unit Compulsory)
ECTS credits: 5  Teaching languages: Spanish, English

Teaching staff
Coordinator: Jordi Prat Tasias

Prior skills
Basic knowledge of circuit theory, basic electronics, basics of programming and digital electronics.

Degree competences to which the subject contributes

Specific:
1. CEV08 - Ability to select sensors and preparation for the design of measurement systems.
2. CEV09 - Ability to design and test instrumentation systems, and make their integration and programming using devices of measurement and data acquisition.
3. CG03 - Ability to combine various electronic functional blocks for a complex system.

Teaching methodology
This subject uses a teaching methodology based on lectures, individual assignments, exercises and laboratory experimentation.

Learning objectives of the subject
Know and use different types of sensors used in industrial and research applications.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 22h 30m</th>
<th>18.00%</th>
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<tr>
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<td>Hours medium group: 0h</td>
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<tr>
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<td>Hours small group: 22h 30m</td>
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<td>Guided activities: 0h</td>
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<td>Self study: 80h</td>
<td>64.00%</td>
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# Content

## Introduction

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<tr>
<th>Description:</th>
<th>Learning time: 6h</th>
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| Brief description of the historical evolution of the devices used to perform measurements of different types, and how electronics and microelectronics revolutionizes the ability to perform measurements. Introduction to the industry 4.0 | Theory classes: 2h  
Self study : 4h |

## Sensors and measuring converters

<table>
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<tr>
<th>Description:</th>
<th>Learning time: 66h</th>
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| Description of several sensors for measuring deformation, temperature and displacement | Theory classes: 14h 30m  
Laboratory classes: 22h 30m  
Self study : 29h |

## Introduction to MEMS

<table>
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<tr>
<th>Description:</th>
<th>Learning time: 18h</th>
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| 3. Introducción a MEMS  
3.1 Introducción y concepto  
3.2 Descripción y evolución  
3.3 Tecnologías de fabricación  
3.4 Ejemplos de aplicación: DMD y acelerómetros  
3.5 MEMS en IoT y en IIoT. Ejemplo de aplicación: IoT in Smart Cities. | Theory classes: 6h  
Self study : 12h |
### Planning of activities

| Projects about sensor integration in data acquisition systems | Hours: 14h 30m  
| Laboratory classes: 4h 30m  
| Self study: 10h |

**Description:**
During the course students will build different measurement and calibration projects with commercial sensors and acquisition systems to implement real measurement systems.

| Laboratory experimentation. Study of an LVDT sensor. Implementation the conditioning circuit of the sensor. | Hours: 43h  
| Laboratory classes: 18h  
| Self study: 25h |

### Qualification system

The student will be evaluated independently on the theoretical part (55%), with two written tests and a theoretical work. The practical part (45%) is evaluated including labs and a mini-project. The two written tests will have the option to be re-evaluated according to current regulations.

### Regulations for carrying out activities

The student has to attend all theoretical and practical lectures and delivering all the exercises.

### Bibliography

**Basic:**