Course guide
340606 - SENS-R2010 - Sensors and Mems

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Optional subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: Spanish

LECTURER
Coordinating lecturer: Rafael Ramón Ramos Lara
Others: Rafael Ramón Ramos Lara
José Pascual Chico Villegas

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>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours small group</td>
<td>22,5</td>
<td>18.00</td>
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<tr>
<td>Hours large group</td>
<td>22,5</td>
<td>18.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
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</tbody>
</table>

Total learning time: 125 h
CONTENTS

TEMA 1.- Introducción a los sistemas electrónicos de medida

Description:
1.1. Conceptos básicos de instrumentación y cadena de medida.
1.2. Introducción a la cadena de medida analógica.
1.3. Introducción a la cadena de medida digital.
1.4 Introducción a los sensores y convertidores de medida.
1.5 Características estáticas y dinámicas de los sensores.

Full-or-part-time: 8h
Theory classes: 5h
Self study: 3h

TEMA 2.- Sensores para la medida de deformación, fuerza y presión

Description:
2.1 Galgas extensiométricas
2.2 Sensores piezoelectricos
2.3 Sensores de presión

Full-or-part-time: 18h
Theory classes: 10h
Guided activities: 3h
Self study: 5h

TEMA 3.- Sensores de medida de temperatura

Description:
3.1 RTD
3.2 Termistores
3.3 Sensores de unión semiconductor
3.4 Termopares

Full-or-part-time: 9h
Theory classes: 6h
Self study: 3h

TEMA 4.- Sensores para la medida de desplazamiento

Description:
4.1 Sensores potenciométricos
4.2 Sensores capacitivos
4.3 Sensores inductivos
4.4 Encoders ópticos
4.5 Sensores de proximidad

Full-or-part-time: 10h
Theory classes: 4h
Guided activities: 3h
Self study: 3h
TEMA 5.- MEMS

Description:
5.1 Introducción a los MEMS (Micro Electro Mechanical Systems)
5.2 Descripción y evolución
5.3 Tecnologías de construcción
5.4 Ejemplos de aplicación.

Full-or-part-time: 10h
Theory classes: 5h
Guided activities: 2h
Self study: 3h

ACTIVITIES

Projects about sensor integration in data acquisition systems

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

Full-or-part-time: 14h 30m
Laboratory classes: 4h 30m
Self study: 10h

Laboratory experimentation. Study of an LVDT sensor. Implementation the conditioning circuit of the sensor.

Full-or-part-time: 43h
Laboratory classes: 18h
Self study: 25h

GRADING SYSTEM

The student will be evaluated independently on the theoretical part (60%), with two written tests and a theoretical work. The practical part (40%) is evaluated including labs and a mini-project. The two written tests will have the option to be re evaluated according to current regulations.

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic: