Course guides
230122 - ISDM - Instrumentation and Measurement Systems

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2020 ECTS Credits: 6.0 Languages: Spanish

LECTURER

Coordinating lecturer: JUAN JOSE RAMOS CASTRO, MIGUEL J. GARCIA HERNANDEZ
Others: JUAN JOSE RAMOS CASTRO MIGUEL J. GARCIA HERNANDEZ Vargas Drechsler, Manuel Agustin

REQUIREMENTS

To have passed
Functions and Electronic Systems (2A)
Signals and Systems (2A)

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:
10 ECI N3. They will have acquired knowledge related to experiments and laboratory instruments and will be competent in a laboratory environment in the ICC field. They will know how to use the instruments and tools of telecommunications and electronic engineering and how to interpret manuals and specifications. They will be able to evaluate the errors and limitations associated with simulation measures and results.

TEACHING METHODOLOGY

Lectures
Laboratory classes
Problem classes
Group work (Home)
Individual work (Home)
Long answer tests (Control)
Long answer tests (Final Exam)
Lab

LEARNING OBJECTIVES OF THE SUBJECT

- Ability to perform the specification, implementation, documentation and development of equipment and instrumentation electronics and considering both the technical and related regulatory compliance.
- Ability to apply electronic and assistive technology in other fields and activities, not only in the field of Information Technologies and Communications.
- Ability to design analog electronic circuits and data capture. - Ability to specify and use electronic instrumentation and measurement systems.
- Ability to analyze and solve problems of interference and electromagnetic compatibility in measurement systems.
### STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>39.0</td>
<td>26.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>26.0</td>
<td>17.33</td>
</tr>
<tr>
<td>Self study</td>
<td>85.0</td>
<td>56.67</td>
</tr>
</tbody>
</table>

**Total learning time:** 150 h

### CONTENTS

**Unit 1. Measuring system characteristics**

**Description:**
Definition of basic terminology, types of measures. Methods of evaluation of uncertainty in the measurement. Magnitude estimation in time and frequency domains

**Full-or-part-time:** 24h
Theory classes: 12h
Self study: 12h

**Unit 2. Sensors and signal conditioning**

**Description:**
Types of signals. Classification of sensors and analysis of its characteristics. Analysis and circuit design of signal conditioning for sensors.

**Full-or-part-time:** 22h
Theory classes: 10h
Guided activities: 2h
Self study: 10h

**Unit 3. Signal Acquisition**

**Description:**
Structures and circuits for analog signals multiplexing. Sample and hold circuits. Analog to digital and D/A, conversion architectures.

**Full-or-part-time:** 20h
Theory classes: 10h
Self study: 10h

**Unit 4. The measuring system in its environment**

**Description:**

**Full-or-part-time:** 14h
Theory classes: 7h
Self study: 7h
## Laboratory 1: Introduction to the lab and measurement theory.

**Description:**
Introduction to Lab View and measurement automation. Measurements with basic tools, Uncertainty assessment.

**Full-or-part-time:** 20h  
Laboratory classes: 8h  
Self study: 12h

## Laboratory 2: Basic sensors applications.

**Description:**

**Full-or-part-time:** 24h  
Laboratory classes: 9h  
Self study: 15h

## Laboratory 3: Design and implementation of a measurement system.

**Description:**
Project design of a complete system of measurement: Choice of suitable sensors for measuring, design and installation of signal conditioning circuits, the choice of the structure of multiplexing and signal acquisition. Acquisition and processing software design.

**Full-or-part-time:** 24h  
Laboratory classes: 9h  
Self study: 15h

### ACTIVITIES

<table>
<thead>
<tr>
<th>Activity</th>
<th>Full-or-part-time</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory practices</td>
<td>9h</td>
<td>9h</td>
</tr>
<tr>
<td>Long anwser tests (Control)</td>
<td>1h</td>
<td></td>
</tr>
<tr>
<td>Theory classes</td>
<td>1h</td>
<td></td>
</tr>
<tr>
<td>Long anwser tests (Final Exam)</td>
<td>3h</td>
<td></td>
</tr>
<tr>
<td>Theory classes</td>
<td>3h</td>
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GRADING SYSTEM

50% Final Exam
30% lab work
20% Exercises and controls

BIBLIOGRAPHY

Basic:

Complementary: