Last update: 06-05-2019

230122 - ISDM - Instrumentation and Measurement Systems

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 710 - EEL - Department of Electronic Engineering

Academic year: 2019

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

ECTS credits: 6 Teaching languages: Spanish

Teaching staff

Coordinator: JUAN JOSE RAMOS CASTRO, MIGUEL J. GARCIA HERNADEZ

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

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Study load

Total learning time: 150h	Hours large group:	39h	26.00%
	Hours small group:	26h	17.33%
	Self study:	85h	56.67%

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Content

Unit 1. Measuring system characteristics

Learning time: 24h

Theory classes: 12h
Self study : 12h

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

Unit 2.- Sensors and signal conditioning

Learning time: 22h

Theory classes: 10h
Guided activities: 2h
Self study : 10h

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

Unit 3.- Signal Acquisition

Learning time: 20h

Theory classes: 10h
Self study : 10h

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

Unit 4.- The measuring system in its environment

Learning time: 14h

Theory classes: 7h
Self study : 7h

Description:
Regulations and standards for the electronic measurement equipment: electrical safety and electromagnetic compatibility. Interference analysis and methods for reduction of interferencies in measurement systems. Measurement systems reliability. Systematization of design for the reduction of uncertainty.

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Laboratory 1: Introduction to the lab and measurement theory.	Learning time: 20h Laboratory classes: 8h Self study : 12h

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

Laboratory 2: Basic sensors applications.	Learning time: 24h Laboratory classes: 9h Self study : 15h

Description:
Design and assembly of signal conditioning circuits for resistive sensors. Sensor linearization, temperature measurements. Variable reactance sensors, and its signal conditioning circuits. The Wheatstone bridge for modulators sensors.

Laboratory 3: Design and implementation of a measurement system.	Learning time: 24h Laboratory classes: 9h Self study : 15h

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.

Planning of activities

Laboratory practices	Hours: 9h Self study: 9h

Long anwser tests (Control)	Hours: 1h Theory classes: 1h

Long anwser tests (Final Exam)	Hours: 3h Theory classes: 3h

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Qualification system

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

Bibliography

Basic:

Kularatna, N. Digital and analogue instrumentation: testing and measurement. Stevenage, UK: The Institution of Electrical Engineers, 2003. ISBN 0852969996.

Pallás Areny, R. Sensores y acondicionadores de señal. 4a ed. Barcelona: Marcombo Boixareu, 2003. ISBN 8426713440.

Complementary:

Pallás Areny, R; Webster, J.G. Analog signal processing. New York [etc.]: John Wiley & Sons, 1999. ISBN 0471125288.

Pérez García, M.A [et al.]. Instrumentación electrónica. 2a ed. Madrid: Thomson, 2004. ISBN 8497321669.

Pallás Areny, R; Webster, J.G. Sensors and signal conditioning. 2nd ed. New York [etc.]: John Wiley & Sons, 2001. ISBN 0471332321.