

Course guide

230122 - ISDM - Instrumentation and Measurement Systems

Last modified: 11/05/2022

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

Degree: **Academic year:** 2022 **ECTS Credits:** 6.0
Languages: Spanish

LECTURER

Coordinating lecturer:

Others:

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

Type	Hours	Percentage
Self study	85,0	56.67
Hours small group	26,0	17.33
Hours large group	39,0	26.00

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:

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

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:

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.

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

Laboratory practices

Full-or-part-time: 9h

Self study: 9h

Long answer tests (Control)

Full-or-part-time: 1h

Theory classes: 1h

Long answer tests (Final Exam)

Full-or-part-time: 3h

Theory classes: 3h

GRADING 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. Instrumentación electrónica. Madrid: Thomson, 2014. ISBN 9788428337021.
- Pallás-Areny, R; Webster, J.G. Sensors and signal conditioning [on line]. 2nd ed. New York: John Wiley & Sons, 2001 [Consultation: 03 / 02 / 2021] . Available on : <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=4747125>. ISBN 0471332321.