



Course guides

19602 - TISAA - Test and Instrumentation Systems in Aerospace Applications

Last modified: 04/12/2020

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

Degree: MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2015). (Optional subject).

Academic year: 2019 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: Defined at the infoweb

Others: Defined at the infoweb

PRIOR SKILLS

1. Basic Circuit Analysis
2. Laplace transform, circuits in Laplace space, zeros, poles analysis.
3. Fourier Transform, frequency analysis.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

- CE2 MAST. (ENG) CE2: Utilizar las herramientas, dispositivos, y sistemas que permiten realizar el acondicionamiento tanto analógico como digital de señal.
- CE4 MAST. (ENG) CE4: Aplicar el método científico para el estudio de la fenomenología particular del ambiente aeroespacial.

Generical:

- CG2 MAST. (ENG) CG2: Identificar y aplicar los análisis teóricos, experimentales y numéricos fundamentales de uso actual en ingeniería aeroespacial.

Transversal:

- CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

- CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

- CT1b. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.

- CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

Basic:

CB6. (ENG) CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.

CB7. (ENG) CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.

CB8. (ENG) CB8 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios.

CB9. (ENG) CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.

CB10. (ENG) CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

TEACHING METHODOLOGY

The theoretical knowledge is presented in expository class sessions that are complemented with problem-solving class sessions. Practical knowledge is acquired through the development of a team project at the lab.

LEARNING OBJECTIVES OF THE SUBJECT

When finishing this matter, students should be able to:

1. Design, implement and verify data acquisition systems
2. Specify, select, and test circuits, subsystems and instruments to measure physical quantities.
3. Design and perform experiments on circuits, electronic measurement systems and instruments, and assess the results.
4. Implement automatic test and virtual instrumentation systems.
5. Process data of acquisition or sensors systems.

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	64.00
Hours large group	45,0	36.00

Total learning time: 125 h

CONTENTS

Advanced Measurement

Description:

Understanding advanced instrumentation systems specifications and performance
(Instruments seen as a black box)

Specific objectives:

- Measurement Basics
- Errors & Uncertainty
- Accuracy & Calibration
- Interfacing instrumentation systems
- Data Acquisition Rate

Full-or-part-time: 32h

- Theory classes: 16h
- Self study : 16h



Automatic Test Equipment

Description:

Understanding how to combine several (many) instrumentation systems to build a test system for an aerospace application, being able to choose among the several options existing currently in the market.

Specific objectives:

I/O Devices
Instrumentation Buses
Test Software

Full-or-part-time: 16h

Theory classes: 8h
Self study : 8h

Instrumentation Systems Design

Description:

Understanding what is inside instrumentation systems black box

Specific objectives:

Instrumentation systems building blocks
Noise
Interference

Full-or-part-time: 16h

Theory classes: 8h
Self study : 8h

Project-Laboratory

Description:

Design and implementation of a test system controlling several instrumentation systems to measure physical quantities

Specific objectives:

Building and automated test environment (Labview), automated control of instruments (using GPIB) and data-acquisition systems, measurements and uncertainties analysis.

Full-or-part-time: 61h

Theory classes: 13h
Self study : 48h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

- Merhav, Shmuel. Aerospace sensor systems and applications. Berlin: Springer-Verlag, cop. 1996. ISBN 0387946055.
- Pallás Areny, Ramón; Webster, John G. Sensors and signal conditioning. 2nd ed. New York [etc.]: John Wiley & Sons, cop. 2001. ISBN 9780471332329.