# Course guide
# 19602 - TISAA - Test and Instrumentation Systems in Aerospace Applications

**Last modified:** 09/06/2023

**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).
MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2021). (Optional subject).

**Academic year:** 2023 **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 MAST21. Apply systems engineering in the aerospace environment for the design and management of the different technological aspects associated with a mission.

**Transversal:**
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.

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.

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.

## 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.