

SUBJECT TEACHING GUIDE

1085 - Electronic Instrumentation

Master's Degree in Telecommunication Engineering

Academic year 2023-2024

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|---|------------------|--------------------|------------------|--------------------|
| Degree | Master's Degree in Telecommunication Engineering | | | Type and Year | Compulsory. Year 1 |
| Faculty | School of Industrial Engineering and Telecommunications | | | | |
| Discipline | | | | | |
| Course unit title and code | 1085 - Electronic Instrumentation | | | | |
| Number of ECTS credits allocated | 5 | Term | Semester based (1) | | |
| Web | https://moodle.unican.es/ | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

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|------------------|--|--|--|--|--|
| Department | DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA | | | | |
| Name of lecturer | M. MERCEDES GRANDA MIGUEL | | | | |
| E-mail | mercedes.granda@unican.es | | | | |
| Office | Facultad de Ciencias. Planta: + 3. DESPACHO DE PROFESORES (3060) | | | | |
| Other lecturers | MARIA ELENA MEDIAVILLA BOLADO | | | | |

| 3.1 LEARNING OUTCOMES | |
|--|--|
| - Know how to design, build and validate an instrumentation system for measuring physical magnitudes based on a computerized environment. | |
| - Know how to generate and interpret the qualification documentation of an instrumentation system in order to make measurements with it and define its validity range. | |

4. OBJECTIVES

- The student will know the procedures for specifying, designing, characterizing and using instrumentation systems with transducers, actuators and sensors to perform measurements of physical magnitudes.
- The student will know and be able to use the techniques for signal acquisition and processing and for presentation of results.
- The student will know how to use the computer as a central element of the measurement system and build with it automated environments.
- The student will know to assess the influences of the real measurement environment to consider the limitations of the components and the interference issues.
- Students will learn the process of calibration and validation of instruments and know how to interpret the information provided.

6. COURSE ORGANIZATION

CONTENTS

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|---|---|
| 1 | Introduction to instrumentation systems and measurement processes: Instrumentation systems. Computerized instrumentation. Characteristics of an instrument. Statistical analysis of experimental data. Uncertainty calculation. |
| 2 | Electronic instrumentation systems with transducers, actuators and sensors and signal conditioning circuits. Real model of the operational amplifier. Instrumentation amplifiers. Integrated instrumentation amplifiers. |
| 3 | Programmable electronic instrumentation. Data acquisition systems. Instrumentation buses. High-level software for electronic instrumentation. Development of virtual instrumentation. |
| 4 | Noise and interferences: Noise concept. Characterization of noise levels. Noise sources. Noise in operational amplifiers. Nature and cause of the interferences. Grounding and shielding techniques. Isolation amplifiers. |
| 5 | Individual project to design and characterize an instrumentation environment. |

7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|---|-----------------------|-------------|-----------|---------------|
| Description THEORY EXAM | Written exam | Yes | Yes | 50,00 |
| Description LABORATORY PRACTICES EVALUATION | Laboratory evaluation | No | No | 50,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| The student must have a grade equal to or greater than 4.0 in the theory exam and, if this condition is verified, the final grade will be the average of the marks from the theory exam and the practical evaluation. The final grade must be greater than or equal to 5.0 to pass the subject. Laboratory practices must be carried out face to face and are not reassessed because, due to their nature, it is not possible to reassess an activity carried out throughout all the course, with delivery of reports within established deadlines, in the short time available in the Ordinary and Extraordinary Exams. | | | | |
| Observations for part-time students | | | | |
| Part-time students will be governed by the same rules as full-time students. | | | | |

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

GRANDA M. y MEDIAVILLA E., Instrumentación Electrónica: Transductores y Acondicionadores de señal. PubliCan, Ediciones de la Universidad de Cantabria, Santander, 2010.

FRANCO S., Design with Operational Amplifier and Analog Integrated Circuits. Mc Graw Hill, 1988.

PEREZ M.A., ALVAREZ J.C. y otros, Instrumentación Electrónica. Thomson-Paraninfo, 2004.