COURSE DATA

DATA SUBJECT

Code: 34810
Name: Instrumentation and electronic equipment
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	Escola Tècnica Superior d'Enginyeria	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	Electronic instrumentation, equipment and products	COMPULSORY

COORDINATION

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SUMMARY

The subject Instrumentation and Electronic Equipment is intended for students interested to know the real possibilities of basic electronic equipment that can be found in a lab and to learn to make correct measurements of variables of electrical and nonelectrical nature. Special emphasis is placed on the limitations of electronic equipment and its influence on the accuracy of the measurements made with them.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

It is recommended to have competences in calculus and mathematical analysis, circuit and linear systems analysis, especially: Kirchhoff current law, superposition and Thévenin theorems, input impedances calculus, development of periodic functions in Fourier series and fundamental concepts of network functions.

COMPETENCES / LEARNING OUTCOMES

1402 - Degree in Telecommunications Electronic Engineering

G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.

G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.

G5 - Knowledge to carry out measurements, calculations, assessments, evaluations, loss adjustments, studies, reports, task planning, and other analogous work in the specific field of telecommunications.

G6 - Ability in the handling of specifications, regulations and norms of compulsory compliance.

G9 - Ability to work in a multidisciplinary environment and in a multilingual group and to communicate, in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.

TE3 - Ability to specify, implement, document and set-up electronics, instrumentation and control equipment and systems, considering both technical aspects and the relevant regulatory requirements.

TE8 - Ability to specify and use electronic instrumentation and measurement systems.

TE9 - Ability to analyze and solve the problems of interference and electromagnetic compatibility.

DESCRIPTION OF CONTENTS

1. General principles of measurement systems.

General concepts and terminology. Characteristics of the measurement systems. Measurement errors. Types of errors: random and systematic. Uncertainty and laws of propagation. Least-squares fit.Deshacer cambios

2. The digital multimeter.

Overview of a digital multimeter. Main stages. Interpretation of specifications: accuracy.

3. Signal sources.

Introduction. Interpretation of the manufacturer's specifications. Basic signal generation. Arbitrary signal generation. Generation of arbitrary waveforms.

4. The oscilloscope.

Introduction. The vertical system. The horizontal system. The trigger system. Sampling modes of digital oscilloscopes. Oscilloscope probes.

5. RLC impedances meaurements circuits.

Introduction. Resistance measurements: DC bridges (Wheatstone and Kelvin). Capacitance and inductance measurements.

6. Sensors.

Classification of sensors. Resistive sensors: RTD, thermistors and strain gauges. Capacitive sensors. Photodiodes.

7. Conditioning circuits.

Conditioning circuits for resistive sensors: Wheatstone bridge, difference amplifier and instrumentation amplifier. Pseudobridges. Current-to-voltage converters. Influence of the imbalances of the operational

amplifiers in measurements.

8. Laboratory.

1 Measurements using the digital multimeter.
2 Design and experimental verification of signal generating circuits.
3 Measurements using the oscilloscope and the arbitrary functions generator.
4 Inductance measurement based on the series resonance method.
5 Temperature measurement and conditioning using platinum resistance sensor.
6 Design of an actuator based on linearized thermistor and integrated voltage comparator.
7 Pressure measurement using piezoresistive sensor and instrumentation amplifier.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	20,00
Laboratory	20,00
Classroom practices	20,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	24,00
Independent study and work	30,00
Preparation of lessons	25,00
Preparation for assessment activities	11,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the course is structured around four themes: the theory sessions, problems, tutorials, continuous evaluation tests, and presentation of technical documentation practices. Group learning with the teacher

Group learning with the teacher (G3, G4, G5, G6, G9, TE3, TE8)

In that case (sessions of theory and problems), the lecture model will be used. At the excercise class, the teacher will explain a number of problems by which the student will learn to identify the essential elements to solve them. These sessions will also use the participatory approach in order to facilitate communication between students and student / teacher.

Tutorial time (G3, G4, G5)

The students have a schedule of tutorial time aimed to solving the problems, doubts, work orientation, etc.. The schedule of these tutorials will be indicated at the beginning of the academic year.

Individual Study

The student may submit the resolution of a series of proposed tests. These must be resolved exclusively by the students without any help from the teacher.

Laboratory sessions (G5, G6, G9)

They will be organized around groups preferably formed by two people who should be planned for the design, assembly and different experimental works. At any time, if the teacher sees fit, the working group may be separated so that each member worked individually. Each practice combines experimental and theoretical activities, the estimated time for resolution is 3 hours.

Teaching materials

The student will have in the virtual classroom over the academic year, the following documents:

Teaching Guide: provides sufficient data elements to determine what it is intended that the student learns, how it will do, under what conditions and how it will be evaluated.

Presentations from each of the course topics.

Practical exercices of each lesson.

Continuous Tests (PECs) of each of the lessons.

The script of laboratory practices.

EVALUATION

In the first and second evaluation calls the theory and laboratory work will be examined with a weight on the final grade of 60% and 40% respectively. For averaging the ratings of theory and laboratory the students

must obtain marks equal or greater than 4 on each one.

Getting the theory marks (G3, G4, G5, G6, G9, TE3, TE8)

At the **first evaluation call**, the theory marks will be calculated as a result of:

1. A written exam consisting of practical issues related to the course contents. This part will score 70% of the theory grade.

2. As a formative assessment, the student will deliver on the date specified by the professors continuous tests (CT), reports on activities and others. Whatever CT not delivered will be computed as zero at the time to compute the average marks of this item. This part will score 30% of the theory grade.

In that way, the theory marks will be obtained according to the following expression:

MarkTheory=0,7 x MarkWritten exam + 0,3 x CTsAverage

At the **second evaluation call**, the theory marks will emerge as a result of:

1. A written exam consisting of practical issues related to the course contents. This part will score 100% of the theory grade.

Getting the laboratory marks (G3, G4, G5, G6, G9, TE3, TE8)

Note: Attendance to laboratory classes is compulsory and in any case it must be satisfied that explained in the point 9, art. 6 of the Reglament d'avaluació i qualificació de la Universitat de València per a títols de Grau i Màster.

Depending on the characteristics of the practice it will be shown, prior to entry in the laboratory certain calculations and designs necessary for the realization of the experience. The lab session will not be countable if they have not been made previously the proposed activities.

At the **first evaluation call** the laboratory marks will be the result of the three following assessments:

1. Laboratory Session (SL). It will assess the skill demonstrated, the interest in the assembly, the mastery in the use of laboratory equipment and the execution of the practice throughout the session. All this will score 40% of the laboratory marks.

2. Delivery of activities, questions and laboratory manuals verification (CU). The professors will inform about the specific experimental activities the laboratory group must deliver within the specified period of

time. Concerning to the laboratory manual, this can be requested at any time throughout the academic course since students must deliver it in the same session as the teacher requires it. The organization and capacity of the laboratory group and the clarity in the presentation and the designs will be valued. This part will score 40% of the lab marks.

3. Implementation of a practical assembly (MP). It will be carried out by the group at the last lab session. It must be analyzed and previously designed before the laboratory session as individual work. This part will score 20% of the lab marks.

In the **second evaluation call** the students must:

1. Delivery of completed non-presential practice scripts (GP). These will score 40% of the laboratory mark.

2. On the official date of the exam, students will have 3 hours to take a theoretical/practical exam that will include laboratory questions and/or the experimental set-up and adjustment of a proposed circuit (ME). This part will account for 60% of the laboratory mark.

If the students would not appear for the written exam in any evaluation call, in this case it would appear as "Not Presented" in the final grade mark for the course.

If any of the parts (Written Exam test or Laboratory) has a grade mark lower than 4 it will not give rise to averaging and it will have to be recovered in a later evaluation call. In this case, the grade for the subject will correspond to the lowest of the theory and laboratory grades. The final mark of the subject, provided the theory and lab marks are equal or greater than 4, will be obtained according to the following expression:

MarkSubject=0,6 x MarkTheory+ 0,4 x MarkLab

	Theory marks (60%)	Laboratory marks (40%)
First evaluation call		SL (40%) + CU (40%)

	Examination (70%) + CT (30%) Minimum score of 4 out of 10 on the test for averaging	+ Practical final assembly (20%) Minimum score of 4 out of 10 for averaging.
Second evaluation call	Examination (100%) Minimum score of 4 out of 10 on the test for averaging	Lab scripts MP (40%) + Practical Exam (60%) Minimum score of 4 out of 10 for averaging

According to the Universitat de València¿s regulation, copying or performing any fraudulent action during the exams will turn out in a zero qualification and the beginning of the process according to the University regulation.

The copying or plagiarism of any activity that is part of the evaluation will mean the impossibility of passing the subject, subsequently subjecting yourself to the appropriate disciplinary procedures indicated in the PROTOCOL FOR ACTION AGAINST FRAUDULENT PRACTICES AT THE UNIVERSITAT DE VALÈNCIA (ACGUV 123/2020).

123/2020).

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