



GENERAL INFORMATION

Data of the subject	
Subject name	Electronic Instrumentation
Subject code	DEAC-MIT-524
Main program	Máster Universitario en Ingeniería de Telecomunicación por la Universidad Pontificia Comillas
Involved programs	Grado en Administración y Dirección de Empresas y Máster Univ. en Ingeniería de Telecomunicación [Fifth year] Máster Universitario en Ingeniería de Telecomunicación y Mást. Univ. en Administración de Empresas [First year] Máster Universitario en Ingeniería de Telecomunicación [First year] Máster Universitario en Ingeniería de Telecomunicación y Máster en Ciberseguridad [First year] Máster Universitario en Ingeniería de Telecomunicación y Mást. Univ. en Administración de Empresas [First year] Máster Universitario en Ingeniería de Telecomunicación + Máster Big Data.Tecnología y Anal. Avanzada [First year] Máster Universitario en Ingeniería de Telecomunicación + Máster in Smart Grids [First year]
Level	Postgrado Oficial Master
Quarter	Semestral
Credits	3,0 ECTS
Type	Obligatoria
Department	Department of Electronics, Control and Communications
Coordinator	Romano Giannetti
Schedule	Mornings
Office hours	Send e-mail to get an appointment
Course overview	DEA-TEL-524

Teacher Information	
Teacher	
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DESCRIPTION OF THE SUBJECT



Contextualization of the subject

Prerequisites

A solid basic knowledge of analog electronics circuits and devices is needed for this course, as well as signal theory and circuit analysis. In details, the student should be confident with:

- Concept of amplification, amplifier, input and output impedance;
- Frequency response, Bode plots, time-frequency relationship;
- Operational amplifier model and operation

Course contents

Contents

Sensor classification and matching conditioning systems.

1. Classification of analog and digital sensors.
2. Actuators classification.
3. Typical components for sensor conditioning: op amps,
4. instrumentation and special components.
5. Components for conditioning actuators. Power transistors and boosters
6. Digital audio and video sensors, principles and main applications.

DC conditioning

1. DC conditioning fundamentals: range, sensitivity, linearity.
2. Direct conditioning and measurement bridges.
3. Design of a complete conditioning system (laboratory)

AC conditioning and precision converters.

1. Reactive and AC sensors.
2. Amplitude, frequency and phase detection system.
3. Lock-in and chopping.
4. Interferences, noise and filtering.
5. Design of a complete circuit (laboratory)

Definition of accuracy, errors, linearity.

1. Errors and accuracy in instruments
2. Linearity error

Advanced conditioning systems

Study of advanced conditioning systems (depending on the year, available time, students' interests).



Laboratory projects

After each theoretical block the student will design, build and analyze a simple system based on the principles recently seen.

The students are supposed to do personal research to delve into the subject, to choose a sensor, and to present a complete application.

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Individual exams and tests.	Correctness of the solutions found, approach to the problem, understanding of the theoretical basis.	70
Group (via reports) and individual (via tests) evaluation of the laboratory work.	Correctness of the methods, analysis and results of the projects.	30

Grading

Ordinary (normal) period

The normal period evaluation/grading is composed by:

- A midterm exam, group reports on the laboratory work, and individual tests on theory and laboratory will be combined with 50%, 30%, and 20% weights to give the continuous evaluation grade. This grade will account for 60% of the final grade. The laboratory is passed if the average mark on the reports is better than 5/10; the course is failed if the laboratory is less than 5/10.
- A final written exam (problems about measurement system design and theoretical tests) with a 40% weight (provided that a minimum mark of 4/10 is obtained; otherwise the course is failed)

Extraordinary (re-sit) exam

In the case the laboratory part has not been passed in the normal period, a practical (laboratory) exam will be required. The grade obtained will replace the laboratory part in the continuous evaluation grade.

The final grade will be composed by:

- The continuous evaluation (50% weight)
- There will be a re-sit written exam (problems about measurement system design and theoretical tests) with a 50% weight (provided that a minimum mark of 4/10 is obtained; otherwise the course is failed)

Attendance rules.

Class attendance is mandatory, according to the Academic Regulations of the Higher Technical School of Engineering (ICAI). the requirements of

attendance will be applied independently for theory and laboratory sessions:

- In the case of theory sessions, failure to comply with this rule may prevent them from taking the exam in the ordinary period.
- In the case of laboratory sessions, failure to comply with this rule may prevent you from taking the exam both in the normal and

re-sit period.

- In any case, unjustified absences from laboratory sessions will be penalized in the evaluation.

BIBLIOGRAPHY AND RESOURCES

Basic References

Textbook R.F.Coughlin, F.F.Driscoll, Operational amplifiers & Linear integrated circuits. 6ª Edición, Prentice Hall

M.A. Pérez García et al, "Instrumentación Electrónica", Thomson-Paraninfo, 2005, 2a Ed

Notes and links provided by the instructor in the course web page

In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data [that you have accepted on your registration form](#) by entering this website and clicking on "download"

<https://servicios.upcomillas.es/sedelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792>