

Academic Year/course: 2022/23

29721 - Fundamentals of electronics

Syllabus Information

Academic Year: 2022/23

Subject: 29721 - Fundamentals of electronics

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 330 - Complementos de formación Máster/Doctorado
434 - Bachelor's Degree in Mechanical Engineering

ECTS: 6.0

Year: 434 - Bachelor's Degree in Mechanical Engineering: 3
330 - Complementos de formación Máster/Doctorado:

Semester: Second semester

Subject Type: Compulsory

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The teaching process will be developed in three main levels: theory and problem classes, simulation as the main basis for understanding the subject, and laboratory. The student's level of participation will grow as he or she assumes the basics of the subject.

- In the theory and problems classes, the theoretical bases of electronics will be exposed, focusing the student on practical cases related to their specialty.
- The simulation works have a double purpose: to settle down in an optimal way the theoretical concepts and to prepare the laboratory sessions.
- Laboratory practices will be developed in small groups, where the student will assemble and check the operation of electronic circuits previously studied in class. The practical sessions will be oriented to make a project, that is to say, the student will have a complete electronic system in the last session.

The material for the development of the subject will be available in the ADD platform of the subject, from where the student will be able to download the following documents:

- Presentation of the subject including: contact details of the teachers, tutoring schedules, teaching, practices and evaluation dates; evaluation criteria; description of the objectives and subject program, as well as the most relevant bibliographical references.
- Transparency of the master classes.
- Guides of the practical laboratory sessions.
- Presentation of tasks and completion of theoretical and practical questionnaires corresponding to the evaluable activities.

- Compilation of problems to support the evaluation activity.
- Compilation of exams from previous courses.

4.2. Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.8 ECTS): 30 hours.
- Laboratory sessions (0.6 ECTS): 15 hours.
- Guided assignments (1.2 ECTS): 45 hours.
- Autonomous work (2.2 ECTS): 55 hours.
- Evaluation (0.2 ECTS): 5 hours.
- Tutorials

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

Laboratory sessions: sessions will take place every 2 weeks (5 sessions in total) and the last 3.0 hours each. Students will work together in groups actively doing tasks such as practical demonstrations, measurements, calculations, and the use of graphical and analytical methods.

Guided assignments: students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures. They will be submitted at the beginning of every laboratory session to be discussed and analyzed. If assignments are submitted later, students will not be able to take the assessment test.

Autonomous work: students are expected to spend about 55 hours to study theory, solve problems, prepare lab sessions, and take exams.

Tutorials: the professor's office hours will be posted on the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

4.3. Syllabus

The course will address the following topics:

- 0. Introduction. The functions of electronics in mechanical engineering. Electronic systems.
- 1. Sensing and conditioning. Electronic sensors used in mechanical engineering. Operational amplifier: comparators and linear stages.
- 2. Digital electronics and microprocessor systems.
- 3. Power supplies and batteries. Diodes; and voltage regulators.
- 4. Electronic control of power systems. Bipolar transistors, MOS transistors, power stages.

Practical sessions

- Session 1 ? Laboratory instrumentation. Electrical measurements. Simulation of electronic circuits.
- Session 2 ? Sensing and amplification.
- Session 3 - Analogic PWM generator.
- Session 4 ? Sensing, control and visualizations using a microprocessor system.
- Session 5 ? Power supply and linear voltage regulation.
- Session 6 ? Small project: control of a DC motor using a microprocessor-based system

4.4. Course planning and calendar

The master and problem classes and the laboratory practice sessions are given according to the timetable established by the centre and is published prior to the start of the course.

The rest of the activities will be planned according to the number of students and will be announced sufficiently in advance.

Lectures are taught in the second semester of the third year of the degree. Specific dates for lectures, as well as the dates for the laboratory practices and exams will be made public at the beginning of the course, according to the timetable set by the Centre.