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Versión en español


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Course: 2023/2024

Electronics engineering fundamentals (14189)

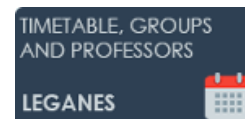
Bachelor in Mechanical Engineering (Plan: 446 - Estudio: 221)

Coordinating teacher: GARCIA CAMARA, BRAULIO

Department assigned to the subject: Electronic Technology Department

Type: Compulsory ECTS Credits: 6.0 ECTS

Course: 2º Semester: 2º


<https://aplicaciones.uc3m.es/consultaHorarios/porAsignatura.htm?ano=2023¢ro=2&plan=446&asignatura=14189&idioma=en>

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Requirements (Subjects that are assumed to be known)

- Electrical Power Engineering Fundamentals (2º Course, 1st Semester). It is strongly recommended to have it passed.

Objectives ()

By the end of this subject, students will be able to have:

1. knowledge and understanding of the theoretical fundamentals of electronics engineering and their practical applications;
2. awareness of the wider multidisciplinary context of electronics within industrial engineering;
3. the ability to apply their knowledge and understanding to identify, formulate and solve problems about electronics engineering and their main industrial applications by using both theoretical and practical established methods as well as basic electronic design rules for their real implementation.
4. the ability to design and conduct appropriate experiments about electronics engineering to characterize and implement basic electronic systems, to properly analyze and interpret the results/data obtained from an engineering point of view, and to draw conclusions about the electronic system performance;
5. the ability to properly apply the technical skills acquired for the experimental evaluation of an electronic system in an electronics engineering lab facility;
6. the ability to combine theory and practice to solve problems about electronics engineering.

Skills and learning outcomes

Link to document (https://aplicaciones.uc3m.es/web/reina/RESULTADOS_APRENDIZAJE/Idioma_1/2023/221.14189.pdf)

Description of contents: programme

THEORY:

TOPIC 1. Electronic signals and systems

- 1.1 Block diagram of real electronic systems and subsystems.
- 1.2 Designing and building-up an electronic system. Main requirements.
- 1.3 Electronic signal types and their parameters that describe them.
- 1.4 Review of electric circuit analysis and basic circuit theory.

TOPIC 2. Electronic instrumentation. Sensors and transducers

- 2.1 Lab instrumentation and measurement of electronic signals.
- 2.2 Electronic sensors. Classification.
- 2.3 Transducers. Classification.

TOPIC 3. Amplifiers and analog electronic subsystems

- 3.1 Description and modeling.
- 3.2 Concept of transfer function. Classification.
- 3.3 Operational amplifiers. Negative feedback (stable) topologies. Electronic applications.

TOPIC 4. Electronic components

- 4.1 Transistors: description, operation and applications.
- 4.2 Diodes: description, operation and applications.
- 4.3 Introduction to Power systems and energy conversion

TOPIC 5. Digital electronic subsystems and analog-to-digital (A/D) and digital-to-analog (D/A) conversion

- 5.1 Fundamentals of digital electronics. Numbering and coding in digital systems.
- 5.2 Boolean algebra. Basic logic gates. Boolean logic functions and representation.
- 5.3 Combinational and sequential digital circuits. Memories
- 5.4 A/D and D/A converters. Characteristics.
- 5.5 Introduction to integrated electronic circuits

LABORATORY

Implementation of some laboratory practices which deal with the fundamentals of Analog and Digital Electronics. Lab equipment handling and application of techniques to perform measurements on electronic circuits.

Learning activities and methodology

- Theory - Lectures (large group), problem resolution Seminars (small groups), individual tutorials, mentoring and student personal homework; oriented to theoretical knowledge acquisition and to understand the use of electronics through real applications.
- Laboratory practices oriented to practical knowledge related to the contents of the course.
- Small group sessions in lab and/or computer classrooms to promote the student self-learning and to encourage the self-knowledge through a PBL (problem-based learning) methodology, following the guidelines from the Higher Education European Space.
- Flipped classroom contents through a SPOC (Small Private Online Course) about lab skills.

Assessment System

The subject involves the following assessable contents:

- 4 practical sessions.
- Part 1 of the theoretical contents.
- Part 2 of the theoretical contents.

The activities of the assessment are:

1. Midterm exam. Students will be evaluated of Part 1 contents at a specific day within the semester.
2. Final Exam: The Final Exam has two differentiated parts (Part 1 and Part 2). The student will be exempt from being evaluated of Part 1 (theory/problems) within the Final Exam if the score achieved on the Midterm Evaluation was greater than or equal to 5 points/10 points.

The student must fulfill the below requirements to follow the Continuous Assessment:

- To attend to the practical sessions
- To do the Midterm Exam (Part 1 contents) of the subject that will be held within the semester.

ORDINARY EXAM

Two options:

1. If the student fulfills the continuous assessment process requirements, the Final score will be obtained from:

- a. Practical sessions (4,0 points).

- In case of having a mark lower than 3 points out of 10 in one practice, obtained final Lab mark will be multiplied by 0.75.
- In case of having a mark lower than 3 points out of 10 in two practices, obtained final Lab mark will be multiplied by 0.5.
- In case of having a mark lower than 3 points out of 10 in three practices or more, obtained final Lab mark will be multiplied by 0.25.

- b. Evaluation of Part 1 (3,0 points) which corresponds to the midterm exam if its score is greater or equal to 5 points. On the contrary, the score will be that of the corresponding part of the final exam.

- c. Evaluation of Part 2 (3,0 points) corresponds to the score of the second part of the final exam.

- d. The student must obtain a minimum score of 4 out of 10 (4 points/10 points) on each part of the subject (Evaluation of Part 1 and Evaluation of Part 2).

Final Grade= Practice + Evaluation of Part 1 + Evaluation of Part 2

2. If the student failed to fulfill any of the requirements to be considered within continuous assessment process, the final score (outside the continuous assessment process) will be obtained from, where the student must obtain a minimum score of 4 out of 10 (4 points/10points) on each part of the subject (Evaluation of Part 1 and Evaluation of Part 2).

Final Grade= Evaluation of Part 1 (3 points) + Evaluation of Part 2 (3 points)

RETAKE EXAM

Two options:

1. If the student fulfills the continuous assessment process requirements, the Final score will be obtained from:

- a. Practical sessions (4,0 points).

- In case of having a mark lower than 3 points out of 10 in one practice, obtained final Lab mark will be multiplied by 0.75.
- In case of having a mark lower than 3 points out of 10 in two practices, obtained final Lab mark will be multiplied by 0.5.
- In case of having a mark lower than 3 points out of 10 in three practices or more, obtained final Lab mark will be multiplied by 0.25.

- b. Evaluation of Part 1 (3,0 points) which corresponds to the midterm exam if its score is greater or equal to 5 points. On the contrary, the score will be that of the corresponding part of the final exam.

- c. Evaluation of Part 2 (3,0 points) corresponds to the score of the second part of the final exam.

- d. The student must obtain a minimum score of 4 out of 10 (4 points/10points) on each part of the subject (Evaluation of Part 1 and Evaluation of Part 2).

Final Grade= Practice +Evaluation of Part 1 + Evaluation of Part 2

2. If the student failed to fulfill any of the requirements to be considered within continuous assessment process, the final score (outside the continuous assessment process) will be obtained from, where the student must obtain a minimum score of 4 out of 10 (4 points/10 points) on each part of the subject (Evaluation of Part 1 and Evaluation of Part 2).

Final Grade= Evaluation of Part 1 (5,0 points) + Evaluation of Part 5 (5,0 points)

Students within the continuous assessment process will be finally graded with the best score obtained from either Option 1) or Option 2)

- % end-of-term-examination 30
- % of continuous assessment (assignments, laboratory, practicals...) 70

Calendar of Continuous assessment (https://aplicaciones.uc3m.es/web/reina/CALENDARIO_EVAL_CONTINUA/Idioma_1/2023/221.14189.pdf)

Basic Bibliography

- Thomas L. Floyd. Electronic Devices. Pearson Prentice Hall.
- Thomas L. Floyd. Principles of Electric Circuits. Pearson Prentice Hall.
- Thomas L. Floyd. Digital Fundamentals. Pearson Prentice Hall.

The course syllabus may change due academic events or other reasons.