Electronics engineering fundamentals

Academic Year: (2020 / 2021) **Review date: 09-07-2020**

Department assigned to the subject: Department of Electronic Technology

Coordinating teacher: SANZ GARCIA, CLARA MARINA

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

STUDENTS ARE EXPECTED TO HAVE COMPLETED

It is strongly recommended to have passed Electrical Power Engineering Fundamentals (2nd course, 1st semester) before the beginning of this subject.

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

By the end of this content area, 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 analyse 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.

DESCRIPTION OF CONTENTS: PROGRAMME

THEORETICAL PART

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.
3.4 Software for analog circuit simulation.

TOPIC 4. Electronic components and integrated circuits
4.1 Transistors: description, operation and applications.
4.2 Diodes: description, operation and applications.
4.3 Moore¿s Law and integrated electronic circuits manufacturing.

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 Software for digital circuit simulation.
5.5 A/D and D/A converters. Characteristics.

TOPIC 6. Power systems and energy conversion
6.1 Power sources.
6.2 Converters: CC/CC, inverters and rectifiers.

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.

- Computer-aided sessions in small groups using CAD tools for simulation of electronic circuits. The aim of these sessions is to encourage the use of the CAD tools to complete the theoretical-practical learning throughout the course.

- Small group sessions both in lab and 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.

Requirement to pass the subject:
- To obtain a minimum score of 3 out of 10 (3points/10points) on each part of the subject (Part 1 and Part 2).

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). The student should obtain a minimum score of 3points/10points on the practical sessions.
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 3 out of 10 (3points/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 3 out of 10 (3points/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). The students should obtain a minimum score of 3points/10points) on the practical sessions.
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 3 out of 10 (3points/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 3 out of 10 (3points/10points) 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 (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY

- Floyd, Thomas L Principles of electric circuits: Conventional current version, Ed. Pearson Prentice Hall, 2012
- Floyd, Thomas L. Electronic devices: conventional current version, Ed. Pearson Prentice Hall, 2012
- Floyd, Thomas.L Digital fundamentals, Pearson Prentice Hall, 2012