Electronics engineering fundamentals

Academic Year: (2023 / 2024) **Review date: 09/01/2024 10:58:03**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: VERGAZ BENITO, RICARDO

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

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

- Knowledge and understanding of the key aspects and concepts of electronics engineering
- The ability to apply their knowledge and understanding to identify, formulate and solve electronics engineering problems using established methods
- The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements
- The ability to design and conduct appropriate experiments, interpret the data and draw conclusions
- Workshop and laboratory skills
- The ability to combine theory and practice to solve electronics engineering problems

DESCRIPTION OF CONTENTS: PROGRAMME

THEORY:

TOPIC 1. Electronic signals and systems
- Block diagram of real electronic systems and subsystems.
- Designing and building-up an electronic system. Main requirements.
- Electronic signal types and their parameters that describe them.
- Review of electric circuit analysis and basic circuit theory.
- RC and CR filters. Charging and discharging a capacitor.

TOPIC 2. Electronic instrumentation. Sensors and transducers
- Lab instrumentation and measurement of electronic signals.
- Electronic sensors. Classification.
- Transducers. Classification.

TOPIC 3. Amplifiers and analog electronic subsystems
- Description and modeling.
- Concept of transfer function. Classification.
- Operational amplifiers. Negative feedback (stable) topologies. Electronic applications.
- Software for analog circuit simulation.

TOPIC 4. Electronic components, its use in electronics and small signal analysis
- Diodes: description, operation and applications.
- Transistors: description, operation and applications.
- 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
- Fundamentals of digital electronics. Numbering and coding in digital systems.
- Boolean algebra. Basic logic gates. Boolean logic functions and representation.

- Combinational and sequential digital circuits.
- A/D and D/A converters. Characteristics.

TOPIC 6: Small signal amplification
- Small signal models.
- MOSFET and BJT configurations and their usage
- Amplifiers in analog integrated circuits

PRACTICE :
Implementation of some practices which deal with the fundamentals of Analog and Digital Electronics. Equipment handling and application of some 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.
- Practices oriented to practical knowledge related with the contents of the course.
- Small group sessions both in lab and normal classrooms (with computer) 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 lab competences acquisition SPOC (Small Private Online Course)

ASSESSMENT SYSTEM

% end-of-term-examination/test:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

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 practices 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 practices 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 practices 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

% end-of-term-examination/test: 30

% of continuous assessment (assigments, laboratory, practicals…): 70

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 (4.0 points) + Evaluation of Part 1 (3.0 points) + Evaluation of Part 2 (3.0 points)

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:

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

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 practices 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 practices 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 practices 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 (4.0 points) + Evaluation of Part 1 (3.0 points) + Evaluation of Part 2 (3.0 points)

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:

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

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

BASIC BIBLIOGRAPHY

- Thomas L. Floyd Digital fundamentals, Pearson Prentice Hall..

- Thomas L. Floyd Principles of Electric Circuits, Pearson Prentice Hall..

- Thomas L. Floyd Electronic Devices, Pearson Prentice Hall..

- null Microelectronic Circuits , Oxford University Press. ISBN-10 9780199339136. ISBN-13 978-0199339136, 7th edition or higher. >2014

ADDITIONAL BIBLIOGRAPHY

- Adel S. Sedra, Kenneth Carless Smith Microelectronic Circuits, Oxford University Press , 2010 and later

- Norbert R. Malik Circuitos electro¿nicos : ana¿lisis, diseño y simulacio¿n, Prentice-Hall, 1996

BASIC ELECTRONIC RESOURCES

- dte . Curso de Certificación de Laboratorio de Electrónica / Electronics Lab Certification Course: http://spoc.uc3m.es