Electronics engineering fundamentals

Academic Year: (2019 / 2020) **Review date: 30-04-2019**

Department assigned to the subject: Department of Electronic Technology

Coordinating teacher: URRUCHI DEL POZO, VIRGINIA

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

STUDENTS ARE EXPECTED TO HAVE COMPLETED

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

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

- To know the purpose and operation of analog and digital electronic systems
- To be able to use electronic instrumentation and test circuits with it
- To know and use major electronic components

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.
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 with 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 an SPOC (Small Private Online Course) about lab skills.

ASSESSMENT SYSTEM

The subject involves the following gradable activities:

- 5 lab sessions (laboratory).
- Lab practice Individual Exam.
- Part 1.
- Part 2.

LAB ENABLING CERTIFICATE:
It is outside of the above gradable activities. It is an on-line course that must be passed through a lab certificate exam prior to the lab sessions. Compulsory for lab attendance.

PARTIAL EXAM:
Students will be evaluated of Part 1 contents at a specific day within the semester.

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 Partial Exam 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).

Requirements to be evaluated within the continuous assessment process:
The student must fulfill the below requirements:
- Attendance to the lab sessions (upon previously obtaining the Lab Enabling Certificate).
- To do the Partial Exam (Part 1 contents) of the subject that will be held within the semester.
- To obtain a minimum score of 3 out of 10 (3points/10points) in the Lab Practice Individual Exam.

ORDINARY EXAM
Two options:
1) If the student fulfills the continuous assessment process requirements, the Final score will be obtained from:

- Lab sessions (2.0 points) = averaged score from 5 Lab practices.

- Lab practice individual exam (1 point)

- Part 1 (3.5 points)
  - If Partial Exam score was greater than or equal to 5 points, the student will be exempted from being evaluated of Part 1 contents within the ordinary Exam.
  Part 1 score = Partial Exam score.
  - If Partial Exam score was greater than or equal to 5 points, the student has the option to be evaluated from Part 1 contents again. Part 1 final score will be the best mark between those obtained from Partial Exam and Part 1, respectively (This Part 1 score must be greater than or equal to 3 points to pass the subject).
  - If Partial Exam score was < 5 points, the Part 1 score will be that of obtained from the Ordinary Part 1 exam.

- Part 2 (3.5 points) = Part 2 score obtained within the Ordinary Part 2 exam.

FINAL SCORE = Lab Session + Lab Individual Exam + Part 1 + 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:

- Lab sessions (2.0 points) = averaged score from 5 Lab practices.
- Lab practice individual exam (1 point)
- Ordinary Exam (6 points), divided into:
  Part 1 (3 points)
  Part 2 (3 points)

FINAL SCORE = Lab Session + Lab Individual Exam + Ordinary Exam (Part 1 + Part 2)

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

RETAKE EXAM
Two options:
1) If the student fulfills the continuous assessment process requirements, the Final score will be obtained from:

- Lab sessions (2.0 points) = averaged score from 5 Lab practices.
- Lab practice individual exam (1 point)
- Part 1 (3.5 points)
  - If Partial Exam score was greater than or equal to 5 points, the student will be exempted from being evaluated of Part 1 contents within the Retake Exam.
  Part 1 score = Partial Exam score.
  - If Partial Exam score was greater than or equal to 5 points, the student has the option to be evaluated from Part 1 contents again. Part 1 final score will be the best mark between those obtained from Partial Exam and Part 1, respectively (This Part 1 score must be greater than or equal to 3 points to pass the subject).
  - If Partial Exam score was < 5 points, the Part 1 score will be that of obtained from the Retake Part 1 exam.

- Part 2 (3.5 points) = Part 2 score obtained within the Retake Exam.

FINAL SCORE = Lab Session + Lab Individual Exam + Part 1 + 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:

- Retake Exam (10 points), divided into:
  Part 1 (5.0 points)
  Part 2 (5.0 points)

FINAL SCORE = Retake Exam (Part 1 + Part 2)

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:	35
% of continuous assessment (assigments, laboratory, practicals…):	65

BASIC BIBLIOGRAPHY

- Thomas L. Floyd. Fundamentos de sistemas digitales., Pearson Prentice Hall..
- Thomas L. Floyd. Principios de Circuitos Eléctricos., Pearson Prentice Hall..
- Thomas L. Floyd. Dispositivos Electrónicos., Pearson Prentice Hall..