Electronic engineering fundamentals

Academic Year: (2023 / 2024) **Review date: 12-02-2024**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: RUIZ LLATA, MARTA

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Pysics II, Solid state fundamentals for engineering, Electromagnetism and optics, Signals, systems and circuits.

SKILLS AND LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB4. Students should be able to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.
CG1. Analyze and synthesize basic problems related to physics and engineering, solve them and communicate them efficiently.
CG2. Learn new methods and technologies from basic scientific and technical knowledge, and being able to adapt to new situations.
CG3. Solve problems with initiative, decision making, creativity, and communicate and transmit knowledge, skills and abilities, understanding the ethical, social and professional responsibility of the engineering activity. Capacity for leadership, innovation and entrepreneurial spirit.
CG5. Use the theoretical and practical knowledge acquired in the definition, approach and resolution of problems in the framework of the exercise of their profession.
CG6. Develop new products and services based on the use and exploitation of new technologies related to physical engineering.
CE13. Understand and handle solid state physical principles relevant to engineering and, in particular, semiconductors for application in electronic and photonic components, as well as the fundamentals and applications of analog and digital electronics and microprocessors.
CT1. Work in multidisciplinary and international teams as well as organize and plan work making the right decisions based on available information, gathering and interpreting relevant data to make judgments and critical thinking within the area of study.

RA1. To have acquired sufficient knowledge and proved a sufficiently deep comprehension of the basic principles, both theoretical and practical, and methodology of the more important fields in science and technology as to be able to work successfully in them.
RA2. To be able, using arguments, strategies and procedures developed by themselves, to apply their knowledge and abilities to the successful solution of complex technological problems that require creating and innovative thinking.
RA3. To be able to search for, collect and interpret relevant information and data to back up their conclusions including, whenever needed, the consideration of any social, scientific and ethical aspects relevant in their field of study.
RA6. To be aware of their own shortcomings and formative needs in their field of specialty, and to be able to plan and organize their own training with a high degree of independence.

OBJECTIVES

To know the fundamentals of electronic engineering, both analog and digital.
To know the fundamentals of active components in analog electronics and their use for amplification and other applications.
Knowledge of the fundamentals of electronic signal filtering.
Learning the fundamentals of power supply design.
To know the fundamentals of digital systems and microcontrollers.

DESCRIPTION OF CONTENTS: PROGRAMME

Introduction.

- Introduction to electronic engineering.
- Review of fundamental concepts (signals, systems, circuits and passive components).

Fundamentals of analog electronics:

Introduction to semiconductor-based devices.

- Introduction to the use of semiconductors in electronics.
- The diode.
- Circuits with diodes.

Active components. Amplification.

- Introduction to amplification and feedback.
- The bipolar junction transistor. Amplification.
- The MOSFET transistor. Amplification and applications.
- The operational amplifier. Comparators and amplifiers.

Electronic signal filtering.

- Review of frequency response.
- Design and implementation of passive and active filters.
- Filtering in electronic instrumentation

Electronic power supplies.

- Introduction to the design of power supplies.
- Basic topologies.

Fundamentals of digital electronics:

Fundamentals of Digital Systems:

- Binary digits, logic levels and digital waveforms
- Combinational and sequential logic functions: Basic arithmetic and logic functions. Storage functions. Counting function.

Introduction to microcontrollers:

- Microprocessor architecture.
- System architecture. Interrupts.
- GPIOs.
- Timers
- Introduction to microcontroller programming

LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES.
AF3. STUDENT INDIVIDUAL WORK OR GROUP WORK.
AF8. WORKSHOPS AND LABORATORY SESSIONS.
AF9. FINAL EXAM.
MD1. THEORY CLASS.
MD2. PRACTICAL CLASS.
MD6. LABORATORY PRACTICAL SESSIONS.

ASSESSMENT SYSTEM

FINAL EXAM. In which the knowledge, skills and abilities acquired throughout the course will be assessed globally. The percentage of assessment will be 40%. The exam will be divided into two parts, analog electronics and digital electronics, with the minimum grade required in each part being 3.5 points.

CONTINUOUS ASSESSMENT. It will include the laboratory sessions and two midterm exams. The

percentage of assessment of each part will be as follows:

15% - Midterm exam 1
15% - Midterm exam 2
15% - Laboratory sessions
15% - Deliverable exercises on digital electronics

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Thomas L Floyd Digital Fundamentals, Pearson.
- Thomas L. Floyd Electronic Devices, Prentice Hall.
- Thomas L. Floyd Principles of electric circuits, Prentice Hall.