Principles of computer engineering

Academic Year: (2024 / 2025) **Review date: 18-04-2024**

Department assigned to the subject: Computer Science and Engineering Department, Physics Department

Coordinating teacher: DOMINGUEZ REYES, RICARDO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Physics (First year, first term)

SKILLS AND LEARNING OUTCOMES

¿ Know DC electrical circuits and apply different circuit simplification methods.
¿ Apply electromagnetism to the generation of alternating current.
¿ Develop alternating current circuit techniques and their simplification.

OBJECTIVES

The objective of this course is that students know and understand circuits and basic components and the operation of a computer.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Mathematical Tools in physics

-Field C the complex numbers.

-Binomial form of complex numbers.Graphical interpretation.

-Operations with complex numbers.

-Other ways to express a complex number.

- Equation´s system solution

2. DC. Basic components of a circuit of cc.

-Charge movements in metals.

-Law of Ohm. Resistivity and conductivity.

-Power dissipated in a conductor. Joule law

-Energy in a circuit. FEM.

-Basic DC circuit components: resistors and capacitors

-Basic circuits for DC. in steady state.

3. Solving DC circuits.

-Resistances in series and parallel. Equivalent circuits

-Rules of Kirchhoff: circuit of a single mesh.

-Rules of Kirchhoff: circuits varies, s mesh.

4 Techniques and tools of analysis of circuits

-Analysis of circuits:

- Superposition theorem
- Substitution theorem
- Millman's theorem
- Thevenin's theorem
- Norton's theorem,
- Design tools. Spice.Workbench

-Analog circuit design

5. Faraday induction law

-Magnetic flux through a circuit.

-Induced EMF and Faraday law.

-Sense of the current induced in a circuit. Lenz's law.

-Examples: fem induced variable magnetic fields at the time.

-Examples: fem of movement.

-A inductance in a circuit. Magnetic energy.

-Foucolt currents. Principle of operation of the thermal elements of induction.

6. Current variables at the time. Alternating current.

-Inductance as a circuit element.

- Capacitance in a circuit

-Current variables at the time. Loading and discharging of a capacitor in an RC circuit.

-Inductance as a circuit element. RL circuits.

-Alternating current generators.

-Alternating current in resistance. Frequency and phase. Power. Effective values.

7. Resolution of AC circuits.

-Alternating current in RL and RC circuits. Inductive and capacitive impedances.

-Series RLC circuit. Resonance. Power.

-Applications: Electronics, tuners, filters, etc.

-Ferromagnetic materials. The transformer.

-Circuits in parallel.

- Millman's theorem

- Thevenin's and Norton theorem

LEARNING ACTIVITIES AND METHODOLOGY

Theoretical lessons and practical exercises were conducted in the classroom. (1.5 ECTS)
Two partials test will be made which will form part of the continuous assessment note. (1.5 ECTS)
There will be a practice in the laboratory. (0.5 ECTS)
Simulation practice using software tool. The tool will be presented to the students and will solve some exercises in class. A compulsory simulation exercise that will be part of the continuous assessment note will be raised. (1.5 ECTS)
Two mid-term exams. (0.5 ECTS)
There will be tutoring online and face-to-face weekly. (0.5 ECTS)

In this subject, students are not allowed to use artificial intelligence tools for the completion of the tasks or exercises proposed by the professor. In the event that the use of AI by the student results in academic fraud by falsifying the results of an exam or required work to accredit academic performance, the provisions of the Regulations of the Carlos III University of Madrid for the partial development of Law 3/2022, of February 24, on university coexistence, will be applied.

ASSESSMENT SYSTEM

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

50% of the mark in final exam: have theoretical and problem solving. Minimum score for continuous assessment (3.5/10).

50% in continuous assessment distributed in the following way:

30% of ongoing evaluation exercises proposed in a partial test
20% of ongoing practicec proposed and solved and test

Simulation tool and practical simulation exercise. It is mandatory to carry out the Pspice practice and the Faraday practice to have the continuous assessment to be considered.

BASIC BIBLIOGRAPHY

- Tipler Mosca Fisica para la ciencia y la tecnologia, reverte, 2010