Electronic components and circuits

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

Department assigned to the subject: Department of Electronic Technology

Coordinating teacher: PEREZ GARCILOPEZ, ANTONIA ISABEL

Type: Basic Core ECTS Credits : 6.0

Year : 2 Semester : 1

Branch of knowledge: Engineering and Architecture

STUDENTS ARE EXPECTED TO HAVE COMPLETED

Physics (1º, 1C),
Systems and Circuits (1º, 2C)

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

The objective of this course is to achieve the basic training of the student on the electronic instruments used in lab, the electronic devices and the electronic circuits, and the application of this knowledge to solve some engineering problems related to electronic components and circuits. (BOE 1.4).

In order to achieve this objective, it is the aim of this course that the student will obtain the following knowledge and abilities:

- A knowledge of how passive and active electronic devices work and their main applications
- A knowledge of the electronic instruments, the measuring methods and techniques
- An ability to analyze the main parameters of single and multi-transistor amplifiers in the small-signal domain
- An ability to know how differential amplifiers work and to analyze their response

The specific competences and the skills that are developed in this course are the following:

- An ability to apply the knowledge of circuits analysis tools, the analysis of electronic circuits with passive components, active devices and amplifiers, in transient regime and stationary regime, by using partial derivative equations and the response in the frequency domain.
- An ability to measure and characterize the electronic parameters associated to passive components and the biasing and small-signal parameters in amplifier circuits. In addition, an ability to interpret the results comparing them with manufacturer data sheets.
- An ability to solve real problems through orientated exercises that are related to each thematic block and global case studies that involve the total contents of the course.
- Knowledge of different instruments and measurement techniques and an ability to manage them in the laboratory, the use of commercial simulation tools and their application to characterize electronic circuits complimentary.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Electronic and Photonic Components
1.1 Passive components
1.2 Fundamentals of semiconductors
1.3 Problem resolution, electronic components in current applications
1.4 Laboratory Instrumentation and Measuring Techniques
1.5 MOSFET transistors
1.6 Photonic Devices
1.7 Problem resolution with electronic and photonic components in current applications
1.8 Microsystems
2. Electronic Signal Amplifiers
2.1 Basic concepts y parameters of amplifiers
2.2 CAD Tools for Electronic Circuits Simulation
2.3 Ideal OpAmp and Application Circuits
2.4 Problems resolution with Ideal OpAmp
2.5 Bias Point and Medium Frequency operation
2.6 Problem resolution with amplifiers at medium frequencies
2.7 Application examples with discrete components
2.8 Problem resolution of amplifiers with discrete components
2.9 Applications

2.10 Problem resolution with integrated amplifiers
3. Frequency response
3.1 Bandwidth concept, cutoff frequencies. Components affecting frequency response
3.2 Frequency behavior of amplifiers
3.3 Problems resolution
3.4 Case study

LEARNING ACTIVITIES AND METHODOLOGY

The training activities are organized as following:

- 40% Lectures (2.4 ECTS) where the main concepts are presented on the basis of mathematical tools and circuit analysis tools. The learning materials include the lecture notes, the classroom documentation, and the basic bibliography that is used as a reference for completing the themes and study them in depth.
- 40% Practical classes (2.4 ECTS) that are focused on solving exercises and case studies and continuous assessment. These classes are completed with the exercises and practical problems that are solved by the students at home. The methods of solving this cases are complemented with the use of computer simulation tools.
- 20% Laboratory sessions (1.2 ECTS) where the students work in groups (in pairs). They analyze and implement basic electronic circuits with real application, and measure their main parameters by using the instrumentation and the measurement techniques in the lab.
- Group tutorial: At least a group tutorial will be carry out the recovery week as revision and final exam preparation.

ASSESSMENT SYSTEM

The assessment is based on the following criteria:
i. Laboratory practices: They are compulsory. In these practices the knowledge acquired by the student will be assessed with the development of some practical cases, previously studied in the theory and problems lectures. These practical cases will be done in groups, and each group will have to write a report with the measurements and analysis of the results. (20% of the final score).
ii. Midterm exam including the analysis and/or design of circuits, and their most significant electronic characteristics. This midterm exam has a 35% weight in the final score.
iii. Practical cases study related to each thematic block, either experimental or written. Some of these results can complemented with simulations, solved in the lab or in practical sessions in the classroom. The mark of these activities on the final grade will be an extra bonus in the final score of the student if it follows the ongoing evaluation.
iv. Final Exam: The student's ability to analyze and/or design signal amplification electronic circuits, and their characterization. This exam has a weight of 45% in the final score if the student follows the ongoing evaluation. If the student does not follow the ongoing evaluation, then the weight is 60%. A minimum qualification of 4.0 is required in this final exam to pass the subject.

Percentage of Final Exam: 45%
Percentage of Evaluation of Other Activities: 55%

Extraordinary exam: Assessment can be fitted to continuous assessment process (with the same percentages as in ordinary exam) or with a final exam with the 100% of qualification

% end-of-term-examination:	45
% of continuous assessment (assigments, laboratory, practicals…):	55

BASIC BIBLIOGRAPHY

- - Adel S. SEDRA y Kenneth C. SMITH Microelectronic Circuits, Oxford University Press, 5th edition, ISBN: 978-0195142525, 2004
- - Albert P. MALVINO and David J. BATES Electronic Principles, McGraw-Hill, 7th edition, ISBN: 007-297527-X, 2007
- - Robert F. COUGHLIN, Frederick F. DRISCOLL Operational Amplifiers and Linear Integrated Circuits, Prentice Hall, 6th Edition, ISBN: 978-0130149916, 2000

ADDITIONAL BIBLIOGRAPHY

- - Adel S. SEDRA y Kenneth C. SMITH Microelectronic Circuits Revised Edition, Oxford University Press, 7th edition, ISBN: 978-0195338836, 2007

- - Jacob MILLMAN, Arvin Grabel Microelectronics, McGraw-Hill, ISBN: 978-0071005968, 1988

- - Paul HOROWITZ, Winfield HILL The Art of Electronics, Cambridge University Press, 2nd edition, ISBN: 978-0521370950, 1989