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Analog Electronics Lab

Academic Year: (2023 / 2024)   **Review date: 25-07-2023**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: LOPEZ FRAGUAS, EDUARDO

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electronics Engineering Fundamentals, Analog Electronics

OBJECTIVES

By the end of this content area, students will be able to have:

1.   Coherent knowledge of their branch of engineering including some at the forefront of the branch in analog electronics
2.   The ability to apply their knowledge and understanding of analog electronics to identify, formulate and solve engineering problems using established methods
3.   The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements
4.   An understanding of design methodologies, and an ability to use them
5.   The ability to design and conduct appropriate experiments, interpret the data and draw conclusions
6.   Workshop and laboratory skills
7.   The ability to select and use appropriate equipment, tools and methods
8.   The ability to combine theory and practice to solve problems of analog electronics
9.   An understanding of applicable techniques and methods in analog electronics, and of their limitations

DESCRIPTION OF CONTENTS: PROGRAMME

1. Design methodology for analog electronic systems.
Necessary concepts to address the subject's final Project.

2. Advanced analog electronics concepts that will be reinforced during the projects development:
    2.1 Stability and compensation
    2.2 Real opamps,
    2.3 LC and other advanced oscillators, PLLs and VCOs
    2.4 Noise, noise models, analysis, linearity.

3. Analysis, design, simulation and implementation of an electronic system including analog components such as sensors, amplifiers, filters and oscillators....

4. Technical documentation elaboration and presentation.

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will include:
 - Magisterial Classes, where the students will be presented with the basic knowledge they must acquire. Students will be supplied with lecture notes and key reference texts which will enable them to complete and acquire a more in depth knowledge of the subject.
- Problems Classes, these are aimed at the solving of exercises and examples within the context of real case studies. These classes will be complimented with the resolution of practical exercises on behalf of the student. Active learning methodology.
- Laboratory Practical Sessions
- Woking lab Projects: design and development in the lab. PBL methodology. Encouraging service-learning with application-oriented Projects.
- Projects presentation in a professional-like environment.
- Group tutorials

ASSESSMENT SYSTEM

CONTINUOUS ASSESSMENT. (70 %)
The teamwork implemented Project and the individual acquired skills will be assessed following the next topics:
  - Preliminary design. Specifications.
  - Simulations.
  - Implemented subsystems.
  - Assembled complete system. Working.
  - Generated documents.
  - Presentation.

FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course, solving practical cases related to the subject contents, as well as the knowledge acquired in the lab. (30%)

In case of not passing in the ordinary call, the extraordinary exam will have a 100 % of the final mark, being similar to the aforementioned final exam.

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

BASIC BIBLIOGRAPHY

 - National Semiconductor AN-20: An Applications Guide for Op Amps, National Semiconductor, 2009 - www.national.com/analog
 - Paul Horowitz and Winfield Hill The Art of Electronics, Cambridge University Press, 1989. Biblioteca: L/S 621.38 HOR.
 - Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer Analysis and Design of Analog Integrated Circuits, John Wiley & Sons. L/S 621.38.049.77 GRA (3rd. ed), 2001
 - Ron Mancini Op Amps for Everyone (free on www.ti.com), Texas Instruments, 2002

 - Sergio Franco DESIGN WITH OPERATIONAL AMPLIFIERS AND ANALOG INTEGRATED CIRCUITS, McGrawHill, 2015
 - T.C. Carusone, D. A. Johns, K. W. Martin Analog Integrated Circuit Design, John Wiley and Sons, 2021

BASIC ELECTRONIC RESOURCES

 - Analog Devices . Filter Design Tool: https://tools.analog.com/en/filterwizard/

 - Analog devices . Tutorials: http://www.analog.com/en/education/education-library/tutorials/analog-electronics.html

 - T.C. Carusone, D. C. Johns, K.W. Martin . Analog Integrated Circuit Design: https://learning.oreilly.com/library/view/analog-integrated-circuit/9780470770108/Titlepage.html
 - electronicdesign . electronicdesign: http://www.electronicdesign.com/technologies/analog