

60923 - Advanced analog systems and electronic instrumentation

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	533 - Master's Degree in Telecommunications Engineering
ECTS	5.0
Course	1
Period	First semester
Subject Type	Compulsory
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

The process of teaching and learning designed for this subject is based on the following. It will involve three different training activities with increasing student participation as the course progresses: lectures, laboratory sessions and workshops (T6 activities).

- Face-to-face sessions will have an eminently practical orientation. In the more theoretical lectures, the basis of the advance analog design will be presented, setting out the fundamental aspects of the design flow. In the specific exercise sessions, the focus will be to insist on the methodology to be subsequently applied in the laboratory sessions, encouraging the active participation of the student.
- The second training activity will focus on the laboratory sessions in small groups, where the autonomous work of the

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student will be encouraged to achieve results in the design of advanced analog systems. The required material to develop these labs will be provided to the student well in advance.

- The third activity (T6) is workshop orientated, where the autonomous student work will be encouraged. The required material to develop these activities will be provided to the student well in advance.

5.2.Learning activities

The program, offered to the students to achieve the learning goals, includes the following activities:

IN PERSON ACTIVITIES.

- **Lectures (A01) and exercises and cases solving (A02)** (30h.): In this activity, the fundamental contents of the subject will be presented, with a practical orientation based on the design of electronic systems. This activity will take place in person. The necessary materials will be available to students through the ADD.
- **Laboratory sessions (A03)** (20h.): This activity is structured in different sessions, covering a total of 20 in-person hours. The scripts will be available to students in the ADD well in advance. In these sessions, the required simulation tools and electronic instrumentation will be used, so that students will acquire the skills and abilities necessary to address the design and experimental verification of advanced analog systems and electronic instrumentation.
- **Evaluation tests (A08):** Set of theoretical and experimental tests and reported work that are used in the evaluation of the student progress. Evaluation activity includes performing a global test.

NOT IN PERSON ACTIVITIES.

- **Workshops and/or seminars (T6):** In this activity both T6 type activities and the reports elaboration associated to lab sessions are included. In order to meet the requested result, students will have the material provided by the teacher, manufacturers of integrated circuits and on-line resources. The student autonomy, the quality of the solution, and the participation of each of the group members will be considered in the evaluation process for each job.
- **Study (T7):** This activity includes personal work aimed at achieving adequate pursuit of the subject, conducting lab sessions and the proposed works and the tutoring process.

5.3.Program

The distribution into thematic units of the theoretical program of the subject is as follows:

- UNIT 1: Introduction
- UNIT 2: Integrated Circuits (CIs): submicronic technologies
- UNIT 3: Amplification
 - o Feedback: stability and compensation
 - o Single-supply operation
 - o Application-specific AOs
- UNIT 4: Active filters
- UNIT 5: Analog-digital interface

5.4.Planning and scheduling

Both theoretical classes and laboratory sessions are held according to the schedule set by the centre (available on the corresponding website). All the activities will be planned depending on the number of students and will be announced well in advance.

Each teacher will inform of the particular tutoring hours.

5.5.Bibliography and recommended resources

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1. Basic teaching materials. Available in <http://add.unizar.es> (To access this resource, the student must be enrolled in the subject).

- **Slides.** They are considered the notes of the subject.
- **Practices scripts.**
- **Supplementary teaching materials.** Set of useful materials for the course: catalogues of manufacturers, component data sheets, CAD tools manuals, etc.

2. Reference books:

- Analysis and Design of Analog Integrated Circuits; P.R. Gray, P.J. Hurst, S.H. Lewis and R.G. Meyer; John Wiley & Sons, 2010.
- Analog Integrated Circuit Design; D. Johns, K. Martin; John Wiley & Sons, Inc., New York, 1997.
- Design of Analog Filters: Passive, Active RC and Switched Capacitor; R. Schauman, M.S. Ghauri and K.R. Laker; Prentice-Hall, 1990.
- Switched Capacitor Circuits; P.E. Allen, E. Sanchez-Sinencio; Van Nostrand Reinhold Company, 1984.
- Microelectronics Circuits; S. Sedra and K. C. Smith; Oxford University Press, 5th Edition, 2005.
- CMOS Circuit Design, Layout and Simulation; R. Jacob Baker; Wiley-IEEE Press, 3rd Edition, 2010.
- Design of Analog CMOS Integrated Circuits; B. Razavi; McGraw-Hill, 2000.
- Analog Design for CMOS VLSI Systems; F. Maloberti, Kluwer Academic Publishers, 2001.
- Operation and Modeling of the MOS Transistor; Y. Tsividis; Oxford University Press, 2nd Edition, 1999.
- CMOS Sigma-Delta Converters: Practical Design Guide; J.M. de la Rosa, R. del Río; Wiley-IEEE Press, 2013; ISBN 978-1-119-97925-8.