VNIVERSITAT DE VALÈNCIA

Course Guide
43851 Microelectronics design

COURSE DATA

Data Subject	
Code	43851
Name	Microelectronics design
Cycle	Master's degree
ECTS Credits	5.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
2174 - Master's Degree in Telecommunications Engineering	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
2174 - Master's Degree in Telecommunications Engineering	5 - Microelectronics design	Obligatory

Coordination

Name	Department
CALPE MARAVILLA, JAVIER	242 - Electronic Engineering
REIG ESCRIVA, ABILIO CANDIDO	242 - Electronic Engineering

SUMMARY

The purpose of this module is the acquisition of basic skills and knowledge related to microelectronics design. The theoretical contents required to achieve a complete introduction to microelectronics design and its technological implications will be described. The laboratory sessions will complete and reinforce the skills in analog circuit design

PREVIOUS KNOWLEDGE

DRAFT COPY

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

The previous skills required to follow this modules are those acquired alter completing the Studies in the degrees in Ingenieria Industrial, the negree in Ingeniería Electrónica en Telecomunicación and the degree in Ingeniería Telemática.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2174 - Master's Degree in Telecommunications Engineering

- To have critical thinking capabilities to investigate independently and self-critically, and to search and utilize information for documenting ideas.
- To have the ability of standing up for fair criteria with rigor and arguments, reporting them publicly in a clear way and in a multilingual environment.
- To have the ability to participate in diffusion forums, journals, conferences, etc. and to work cooperatively and effectively in transnational teams.
- To have the capability to identify and solve the critical points to conduct an effective technology transfer, transforming theoretical results into products and services that are useful for the society.
- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Be able to access to information tools in other areas of knowledge and use them properly.
- To be able to assess the need to complete the scientific, historical, language, informatics, literature, ethics, social and human background in general, attending conferences, courses or doing complementary activities, self-assessing the contribution of these activities towards a comprehensive development.
- Ability to design and build integrated circuits.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Upon completion of this module the student will achieve the general and specific competences and skills described in section II in this guide

DRAFT COPY

DESCRIPTION OF CONTENTS

1. Introduction to analog microelectronic design

Introduction to the semiconductor industry. Manufacturing Technologies and processes.

2. CMOS design

Manufacturing processes and design criteria

3. Single stage CMOS amplifiers

Common source configuration. Source follower configuration. Common gate configuration. Cascode configuration

4. CMOS differential amplifiers

Basic differential pair. Differential pair with MOS loads. Gilbert multiplier. Noise.

5. Basic design blocks.

Voltage and current references. Basic power mirrors. Mirrors cascodo current.
Study of current mirrors before different loads

6. Operational amplifier

Gain. CMRR. Limitations. Response time

7. Conditioning circuitry

Voltage and current references. Bias circuits. Gain adjustment and power shifting. Input protection. Sample and hold circuits. Clock distribution. Switches and multiplexers

8. Data Converter

Digital to Analog Converters (DAC). Basic DAC architectures. Calibration techniques for high precision DAC. Test methodologies. Analog to Digital Converters (ADC). Basic ADC architectures

DRAFT COPY

WORKLOAD

ACTIVITY	Hours	% To be attended
Theoretical and practical classes	46,00	100
Tutorials	4,00	100
Development of group work	5,00	0
Development of individual work	5,00	0
Study and independent work	18,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	7,00	0
Preparation of practical classes and problem	8,00	0
Resolution of case studies	22,00	0
TOTAL	**125,00**	

TEACHING METHODOLOGY

The learning strategy comprehends a range of different activities

MD1.- Lectures. The lectures will develop the subjects in a progressive manner, building on existing knowledge whilst introducing new material in a well-paced manner, emphasizing the most important elements, their relevance for academia and industry. Student participation, being fundamental for the transfer of knowledge during lecture hours, will be actively sought.

MD2.- Applied activities. These assignments complement the more theoretical lectures, allowing the students to apply the concepts and tools learnt in the lectures, as well as their own readings. Team collaboration is encouraged for the solution of assignments. It might cover different activities:

(AF2)

- Problem and questions solving sessions in the classroom
- Discussion session and problems resolution previously analyzed by the students
- Laboratory sessions,

(AF3) Personal work. This autonomous task involves preparation of material before the lectures, for the assignments, as well as for the exam. These tasks must be done individually and is conceived to reinforce the autonomous work.

DRAFT COPY

(AF4) Grading. Grading will take into account attendance to the lectures, assignments, exam or exams, and presentation to the class of a research problem. (AF2) This might include the presentation of team works. The lab sessions will be graded too.

UV's e-learning platforms (Aula Virtual) will be used to communicate with students. It will also provide access to the material used in the lectures, such as slides, and to the homework assignments.

EVALUATION

Assessment of student learning will be conducted using the following evaluation:

For those students who demonstrate a continuous and effective participation in the proposed activities, the evaluation of their learning will be carried out as follows:

- SE1.- Perform an exam that may consist of both theoretical and practical issues as problems: 60.0%
- SE2.- Evaluation of work experience and memories of practice: 30.0%
- SE3.- Continuous assessment of each student, based on participation and level of involvement of students in the teaching-learning process, taking into account regular attendance at planned classroom activities and resolution of issues and problems posed periodically: 10.0%.

Those students who have not demonstrated a continuous and effective participation in the proposed activities must be submitted to a final theoretical-practical exam from which the final note will be issued. In second call, the internship note will be maintained, if approved.

In any case, the system of evaluation will be ruled by the established in the Regulation of Evaluation and Qualification of the University of Valencia for Degrees and Masters. (http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf).

REFERENCES

Basic

- B. Razavi, Design of Analog CMOS Integrated Circuits. McGraw-Hill.
- R.J. Baker, H.W. Li, D.E. Boyce, CMOS circuit Design, Layout and Simulation, IEEE Press Series on Microelectronic Systems.
- R. Gregorian, G.C. Temes, "Analog MOS Integrated Circuits for Signal Processing". Wiley (1986)
- T. C. Carusone, D. A. Jones, K. W. Martin. "Analog Integrated Circuit Design". Wiley 2Ed (2012).
- D. M. Binkley. "Tradeoffs and Optimization in Analog CMOS Design". Wiley (2008)
- R. Van de Plasche, CMOS Integrated Analog-to-Digital and Digital-to-Analog Converters, Kluwer Academic Publishers, 2nd Ed., 2003.

DRAFT COPY

- R.J. Baker, CMOS Mixed-signal Circuit Design, Wiley-IEEE Press, 2002.
- P.G.A. Jespers, Integrated Converters, D to A and A to D Architectures Analysis and Simulation Oxford University Press, 2001.
- B. Razavi, Principles of Data Conversion System Design John Wiley & Sons Inc, 1995.
- R. Schreier, G.C. Temes, Understanding Delta-Sigma Data Convertes, John Wiley & Sons Inc, 2005
- W. Kester, Analog-Digital Conversion, Analog Devices, Free for download.
- P.E. Allen, D.R. Holberg. CMOS analog circuit design. Oxford University Press.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available

DRAFT COPY