

## SUBJECT TEACHING GUIDE

1081 - Design and verification of integrated circuits

Master's Degree in Telecommunication Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in Telecommunication Engineering			Type and Year	Compulsory. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline					
Course unit title and code	1081 - Design and verification of integrated circuits				
Number of ECTS credits allocated	5	Term	Semester based (2)		
Web	<a href="https://moodle.unican.es">https://moodle.unican.es</a>				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA				
Name of lecturer	JOSE ANGEL MIGUEL DIAZ				
E-mail	joseangel.miguel@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO JOSE A. MIGUEL DIAZ (S3080)				
Other lecturers	JOSE LUIS ARCE DIEGO FELIX FANJUL VELEZ				

### 3.1 LEARNING OUTCOMES

- Acquire knowledge in the design and verification of integrated electronics circuits and systems

#### 4. OBJECTIVES

Acquire the required knowledge for identifying the most representative electronics circuits.
Acquire knowledge in the design and analysis of integrated circuits, including fundamental blocks like amplifiers, filters, A/D converters, D/A converters, etc.
Learning the skills to properly use Computer Assisted Design (CAD) tools to design mixed analog-digital integrated circuits.
Understanding test methods for Integrated Circuits.
Acquiring experience in the design, analysis and implementation of analog Integrated Circuits, experimentally checking their specifications by measurements done in the laboratory, and comparing the collected datasets to the behavioral responses calculated theoretically, as well as obtained by SPICE-based electrical simulators.

#### 6. COURSE ORGANIZATION

CONTENTS	
1	Introduction to the Integrated Circuit Design: Mixed-Signal (analog and digital) and heterogeneous. Cad for analog Integrated Circuits
2	Fabrication process of Integrated Circuits. Introduction to Micro-Electro-Mechanical-Systems (MEMS).
3	Analog Modules. Design of Integrated Analog Filters. PLDs
4	Data Converters. Analog-to-Digital (ADC) and Digital-to-Analog (DAC) converters.
5	Verification and Design-for-Test Techniques.
6	Integration of heterogeneous systems. Examples: Biomedicine, Telecommunication System (bluetooth), LoC

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Written exam and oral presentations.	Others	No	Yes	30,00
Laboratory Work	Laboratory evaluation	No	Yes	30,00
Final exam.	Written exam	Yes	Yes	40,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>If the minimum acceptable grade is not obtained in any of the evaluation activities, then the highest possible grade would be a 4,9.</p> <p>Any passing grades given during the evaluations will be valid until the “Convocatoria Extraordinaria” of the course.</p> <p>In order to pass the course, a passing grade in the laboratory class is required as well.</p> <p>In order to provide a safe and accessible learning environment, the course may not be in-person. If that is the case, then the course will be either an online course or a hybrid course (a mix of in-person meetings and online activities).</p> <p>If the course is delivered online or hybrid, then class activities will be done via Aula Virtual (Moodle), email, Microsoft Teams, and/or any other software that the University of Cantabria permits or provides.</p> <p>Any tutoring session/discussion with students will be delivered online or hybrid via email or the Aula Virtual’s forum . If need be, the use of Microsoft Teams and/or any other software that the university provides or permits maybe used.</p> <p>Any online or hybrid evaluations will be based on the “Evaluación con Soporte Virtual” for each graded assignment . The weight percentage for each graded assignment will remain the same.</p> <p>All students must have a computer, webcam and microphone or a mobile phone with camera, access to the internet, and Microsoft Teams and/or any other software that the University of Cantabria provides or permits.</p>				
<b>Observations for part-time students</b>				
<p>For part-time students, the percentages assigned to the evaluations are added to the written exams.</p> <p>For any part-time student whose schedule is incompatible, individual online meetings will be carried out.</p> <p>If any part-time student who for justified reasons cannot attended the scheduled lab sessions, the possibility of passing the lab component through practical exams that will be held during the “Convocatoria Ordinaria” and “Convocatoria Extraordinaria”</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
<b>BASIC</b>
R. Jacob Baker, "CMOS: circuit design, layout and simulation", 3ª edición, John Wiley & Sons, 2010.
Phillip E. Allen y Douglas R. Holberg, "CMOS analog circuit design", 3ª edición, Oxford University Press, 2011.
K. Iniewki, "CMOS biocircuits: where electronics meet biology", 1ª edición, John Wiley & Sons, 2011.