

## SUBJECT TEACHING GUIDE

### G1472 - Circuit and Systems Simulation

#### Degree in Telecommunication Technologies Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Optional Subjects				
Course unit title and code	G1472 - Circuit and Systems Simulation				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	<a href="https://moodle.unican.es/">https://moodle.unican.es/</a>				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
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Other lecturers	SERGIO MIGUEL SANCHO LUCIO

### 3.1 LEARNING OUTCOMES

- After the finish course the student has sufficient knowledge and ability to analyze and design radio frequency and microwave devices both at the system level (top-down) as a circuit level (bottom-up) using CAD / CAM tools business.
- With this course students will be trained, of any of the three mentions in the use of simulators to cover all needs for design and analysis of any circuit and / or system.

#### 4. OBJECTIVES

The aim of this course is to learn to handle the most significant simulators for systems and circuits in current telecommunication systems. After a brief introduction on the history of radio, a revision of certain basic aspects for the development of the subject is made. The actual content of the course is divided into two blocks depending on the type of technology to use: system-level simulation, or circuit level simulation.

The aim of the system simulation is to provide students with sufficient knowledge to analyze and design systems and subsystems used for telecommunications

The objective of circuit simulation is to provide students with a basic knowledge to analyze and design communication circuits. Besides an introduction to electromagnetic simulation 2D, 2.5D and 3D will be made to simulate waveguide devices and antennas

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	<p>Topic 1: INTRODUCTION TO COMMUNICATION SYSTEMS Brief History of Communications. Definition of communication bands. Generic architecture of communications systems. Unwanted signals. Transmission without distortion. Classification of telecommunication systems</p> <p>Topic 2: COMMUNICATION SYSTEMS SIMULATION Circuits and Systems Simulation: Genesys Agilent, Agilent ADS and AWR Microwave Office.</p> <p>Topic 3: MICROWAVE WAVEGUIDE DEVICES. Microwave passive waveguide devices Microwave: combiners, dividers (splitters), circulators, directional couplers, impedance inverters, Hybrid Filters.</p>
2	<p>Topic 4: Introduction to circuit simulation Brief history of the circuit simulators. Circuit simulators classic: PSPICE and Electronic Workbench.</p> <p>Topic 5: ADVANCED CIRCUIT SIMULATORS Simulators Advanced Circuits: Keysight Genesys, Keysight ADS and AWR Microwave Office.</p> <p>Topic 6: ELECTROMAGNETIC SIMULATORS 2D EM simulator (Empower), 2,5D EM simulator (Momentum) and 3D. (Keysight EMPro, HFSS, CST). Simulation of waveguides and antennas.</p>

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Evaluation using an assesment about all practical class-problems, simulations of this designs, made by the student.	Laboratory evaluation	No	Yes	40,00
Continuous evaluation The methodology is the continuous evaluation, both individual and group activities are evaluated. The continuous assesment include 100% of the evaluation of the subject, and requires the delivery of the problems and the realization.	Work	No	Yes	60,00
<b>TOTAL</b>				<b>100,00</b>

### Observations

#### Continuous evaluation

The methodology is the continuous evaluation, both individual and group activities are evaluated. The continuous assesment include 100% of the evaluation of the subject, and requires the delivery of the problems and the realization of the labs and classroom simulation. The contents of evaluation have a note from 0 to 10. To pass the course requires 5.0  
The average of all assesment activities.

The following shows in detail the process of continuous evaluation mentioned in the previous paragraph:

#### 1 - Testing Classroom

Differentiated test or control in each thematic block is performed.  
The total score of tests in classroom get the average of the tests performed.

#### 2 - Evaluation Classroom Practics + Problems + Scripts

Each practice will be evaluated at the end of it.  
The total score of practics is obtained from the average of each of the practics + scripts them.

#### 3 - Total Continuous Assessment Rating

Classroom Test score ..... 60%  
Rating Practics ..... 40%

#### 4 - Comments:

The student that has passed the subjectby continuous evaluation does not have to take the final exam of the course unless you want up note. In this case you can only take into account the final exam grade. In this final exam it will be added 10% of the average grade of paragraph 3, provided they have passed the 7 over 10 on continuous assesment, saturating the total mark + continuous examination in 10 out of 10.

#### Final exam

1 - A written examination of problems and issues will have two distinct parts corresponding to the two thematic blocks , which will be graded by the teachers who have taught for each thematic block theory is performed. Students who present the final exam must be submitted problems, problems and simulation practics.

#### 2 - Total Rating final exam:

Written exam score ..... 75%  
Rating most practical problems simulation .... 25%

The remote evaluation of the works, laboratory practical exercises and written tests is foreseen, in the event that a new health alert by COVID-19 makes it impossible to carry out the evaluation in person.

Observations for part-time students

This subject has been followed the convergence criteria of the European Higher Education Area (EHEA) regarding the ongoing assessment and evaluation form. Checks and test effected by theme (subject exams, small practices and design issues). Therefore although class attendance is not mandatory, it is highly recommended, as it provides better monitoring and understanding of theoretical concepts that have been put later into practice in resolving batteries problems and small practices or jobs simulation proposed in class for continuous evaluation.

**8. BIBLIOGRAPHY AND TEACHING MATERIALS**

BASIC

1. Collin, R.E., "Foundations for Microwave Engineering", McGraw-Hill, NY, 1992.
2. David M. Pozar, "Microwave engineering" ed. Addison- Wesley Publishing Company.Reeding M.A., 1993
3. G. Matthaei, L. Young, E.M.T. Jones, "Microwave filters, impedance-matching networks and coupling structures", Ed. Artech House, 1980.
4. Jack Smith. "Modern Communication Circuits". McGraw Hill
5. D. Marcuse, Theory of Dielectric Optical Waveguides , 2Ed. Academic Press, Boston, 1991.
6. R.G. Hunsperger, Integrated Optics, 6Ed. Springer, Berlin, 2009.
7. K.J. Integrated Optoelectronics, Springer- Verlag, Berlin, 1993.
8. K. Iga & Y. Kokubun, Integrated Optics, Taylor & Francis, Boca Raton, 2006.
9. Agilent Genesys User's Guide. Disponible on line en <http://www.home.agilent.com> .
10. Agilent ADS User's Guide. Disponible on line en <http://www.home.agilent.com> .
11. AWR Microwave Offices User's Guide. Disponible on line en <http://web.awrcorp.com>