SUBJECT TEACHING GUIDE

G828 - High Frequency Technology

Degree in Telecommunication Technologies Engineering
First Degree in Telecommunication Technologies Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering First Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3 Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electronic Systems Design				
Course unit title and code	G828 - High Frequency Technology				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	https://moodle.unican.es/				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
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Other lecturers	ANTONIO QUINTELA INCERA LUIS RODRIGUEZ COBO

3.1 LEARNING OUTCOMES
- At the end of the course, students will acquire sufficient knowledge to design and RF devices containing microwave passive components: attenuators, splitters and RF signal combiners.
- At the end of the course the student has sufficient knowledge to design optical and optoelectronic devices and analyze the operation this kind of devices.

4. OBJECTIVES

The purpose of this course is to learn the technical design of the most significant radio frequency circuits, microwave and optoelectronic used in current communication systems. After a brief introduction on the history of radio, a review of certain basic aspects for the correct development of the subject is made. This review content a set of knowledge, that have previously been discussed in other optative subjects during career (shown above in under "Previous recommended"), as the transmission lines techniques, two-port network theory, that given the degree of optional subjects and generally have not been carried out by all the students enrolled in this subject.
The actual content of the course has been divided into two parts depending on the type of technology use: RF and microwave circuits and optoelectronic devices.

The goal of RF technology is to provide students the sufficient knowledge to design devices RF and microwave passive components including directional couplers, attenuators, splitters, combiners and other microwave devices.

The aim of integrated optics technology is to provide students with a basic knowledge of design optical and optoelectronic devices and their function. Students learn to use the necessary CAD tools to analyze optical device structures: waveguides, laser diodes, optical modulators, networks based devices diffraction and resonant cavities.

6. SUBJECT PROGRAM

CONTENTS	
1	Topic 1: INTRODUCTION TO RADIO FREQUENCY TECHNOLOGY. Brief History of Radio Frequency. Definition of RF Bands. Uses and applications of Microwave Circuits with Transmission lines. The microstrip line.
2	Topic 2: RF PLANAR DEVICES Microwave passive devices in planar technology: splitters, circulators, directional couplers, impedance inverters, Hybrid circuits and Microwave Filters.
3	Topic 3: WAVEGUIDE DEVICES Microwave passive circuits in Waveguide: splitters, circulators, directional couplers, impedance inversors, Hybrid coax-waveguide circuits, waveguide filters.
4	Topic 4: INTRODUCTION TO INTEGRATED OPTICS Brief History of integrated optics. Mathematical formalism used in structures. Optical materials used. Glasses and polymers, semiconductors and metals.
5	Topic 5: OPTICAL WAVES IN MULTILAYER STRUCTURES Planar optical wave guides. Microwaveguides. Components and integrated optical devices. Manufacturing techniques.
6	Topic 6: INTEGRATED OPTICAL COMPONENTS Fundamentals of optical components. Directional couplers. Diffractive elements. Glasses. Optical functions: multiplexing, polarization filtering.
7	Topic 7: INTEGRATED OPTICS DEVICES AND SYSTEMS Electro-optical modulators, acousto-optical modulator. Laser diode. Optical amplifier. Receptor- optical emitter. Applications. Photonic communication systems and microwave.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
The methodology is continuous assessment, with both individual and group activities evaluated. The continuous assessment include 100% of the evaluation of the subject, and requires the delivery of the problems and practices.	Laboratory evaluation	Yes	Yes	40,00
The methodology is continuous assessment, with both individual and group activities evaluated. The continuous assessment include 100% of the evaluation of the subject, and requires the delivery of the problems and practices.	Activity evaluation with Virtual Media	No	Yes	60,00
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.	Written exam	Yes	No	0,00
TOTAL				100,00

Observations

Continuous evaluation
The methodology is the continuous evaluation, both individual and group activities are evaluated. The continuous assessment includes 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 assessment 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 practices is obtained from the average of each of the practices + scripts them.

3 - Total Continuous Assessment Rating Classroom Test score ..... 60% Rating Practices 40%

4 - Comments:

The student that has passed the subject by 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 assessment, 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 practices.

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. Ebiling, Integrated Optoelectronics, Springer-Verlag, Berlin, 1993.
8. K. Iga & Y. Kokubun, Integrated Optics, Taylor & Francis, Boca Raton, 2006.