

## SUBJECT TEACHING GUIDE

### M1590 - Radiofrequency Circuits

#### Master's Degree in Telecommunication Engineering

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Master's Degree in Telecommunication Engineering			Type and Year	Optional. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Optional Subjects				
Course unit title and code	M1590 - Radiofrequency Circuits				
Number of ECTS credits allocated	4	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES				
Name of lecturer	TOMAS FERNANDEZ IBAÑEZ				
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Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 1. DESPACHO (S142)				
Other lecturers	JOSE ANGEL GARCIA GARCIA				

### 3.1 LEARNING OUTCOMES

- Learning outcomes acquired by the student are directly related to the design, construction and measurement of components, systems and subsystems in the frequency band commonly known as RF, below in frequency value of the microwave band but above of what is called low frequency.

The student will understand the features of both the components used in this frequency band as the specific technologies used for their construction. Fundamentally, this frequency band is dedicated to mobile telephony, digital television, digital radio, etc.

#### 4. OBJECTIVES

The main objectives of this course are:

- Knowing the design, construction and measurement of components, systems and subsystems in the RF frequency band.
- Providing the student the knowledge of the main features that the components used in this frequency band as well as the different technologies used for the circuit manufacturing.

#### 6. COURSE ORGANIZATION

CONTENTS	
1	Introduction to the components of RF receivers and transmitters.
2	RF oscillators - Oscillator topologies, analysis and design strategy of RF oscillators. Voltage control oscillators (VCOs). Phase noise in oscillators.
3	Phase locked loop (PLL) - Components of a PLL. Linear model of a PLL. Phase Noise in a PLL. Frequency synthesis based on PLLs. PLLs type Charge Pump. Synthesis N-Fractional
4	Narrow band Amplifiers: Introduction - Small signal amplifiers - Two port network scattering parameters - Stability conditions - Amplifier Gain using scattering parameters - Transmission line narrow band amplifiers - CAD examples of narrow band transmission line amplifiers.
5	Mixers - Operation of a mixer. Mixer topologies; balanced and doubly balanced. Practical designs of RF mixers.

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Written exam of block 2.	Written exam	No	Yes	25,00
Written exam of block 3.	Written exam	No	Yes	25,00
Written exam of block 4.	Written exam	No	Yes	25,00
Written exam of block 5.	Written exam	No	Yes	25,00
Final written exam.	Written exam	Yes	No	0,00
TOTAL				100,00
Observations				
The final mark is calculated by the average of the partial marks obtained.				
The aim of the final exam is to recover the failed written exams during the semester.				
Observations for part-time students				
Teaching and evaluation methods, compatible with the personal circumstances that the student accredits, will be proposed.				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

- Microwave Mixers. Autor: S.A. Maas. Artech House, Inc
- Electronic Communication Techniques. Autor: Paul H. Young. Meril Publishing.
- Phase-Locked Loops. Application to Coherent Receiver Design. Autor: A. Blanchard. John Wiley and Sons
- Electronic Communications Technology. Autor: E.A. Wilson. Prentice Hall.
- RF/Microwave Circuit Design for Wireles Applications. Autor: Ulrico L. Rohde & David P. Newkirk. John Wiley and Sons
- Electrónica de Comunicaciones. Autor: M. Sierra Pérez, B. Galocha Iragüen, J. L. Fernández Jambrina y M. Sierra Castañer. Editorial Pearson-Prentice Hall.
- Microwave Transistor Amplifiers: Analysis and Design (2nd Edition), Guillermo Gonzalez. Prentice Hall.
- The RF and Microwave Circuit Design Cookbook, S. A. Maas, Artech House.