

## SUBJECT TEACHING GUIDE

### G104 - Functional Analysis

#### Double Degree in Physics and Mathematics Degree in Mathematics

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Mathematics			Type and Year	Optional. Year 5 Optional. Year 4
Faculty	Faculty of Sciences				
Discipline	Subject Area: Further Mathematical Analysis and Differential Equations Mention in Pure and Applied Mathematics				
Course unit title and code	G104 - Functional Analysis				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION				
Name of lecturer	JESUS ARAUJO GOMEZ				
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Office	Facultad de Ciencias. Planta: + 3. DESPACHO DE PROFESORES (3015)				
Other lecturers					

### 3.1 LEARNING OUTCOMES

- Show that a concrete expression defines (or not defines) a norm. Analyze the completeness of a normed space. Prove the basic properties of a bounded operator. Compute the norm of some bounded operators. Describe the dual space of some normed spaces. Applications of the dual space. Statements and proofs of the main theorems: Hahn-Banach, Banach-Steinhaus, open mapping and closed graph.

### 4. OBJECTIVES

Basic knowledge of functional analysis.

## 6. COURSE ORGANIZATION

### CONTENTS

1	Norms on a vector space. Normed spaces. Convergence of sequences. Completeness: Banach spaces. Examples. Bounded linear operators. Norm of an operator. Dual space. Examples. Separable spaces. Finite dimensional spaces. Strictly convex norms.
2	Hahn-Banach theorem. Applications. Reflexive spaces. The conjugate operator. Examples.
3	Baire's lemma and its consequences. Banach-Steinhaus, open mapping and closed graph theorems. Applications.

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
A two hours written exam.	Written exam	Yes	Yes	30,00
Two short exams.	Written exam	No	Yes	70,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
To pass this subject, the student should pass two partial exams. Otherwise he should pass a final global exam.				
<b>Observations for part-time students</b>				
Partial time students may choose not taking the partial exams.				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

A. Vera , P. Alegría. Un curso de análisis funcional; teoría y problemas. AVT 1997.