SUBJECT TEACHING GUIDE

G104 - Functional Analysis

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2023-2024

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	MANUEL GONZALEZ ORTIZ
E-mail	manuel.gonzalez@unican.es
Office	Facultad de Ciencias. Planta: + 0. DESPACHO PROFESORES (0053)
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
TOTAL				100,00

Observations
To pass this subject, the student should pass two partial exams. Otherwise he should pass a final global exam.

Observations for part-time students
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.