SUBJECT TEACHING GUIDE

G107 - Further Analysis

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2026 - 2027

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	G107 - Further Analysis				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web	https://personales.unican.es/graneror/index.html				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	RAFAEL GRANERO BELINCHON
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Office	Facultad de Ciencias. Planta: + 1. DESPACHO (1049)
Other lecturers	

3.1 LEARNING OUTCOMES

To get used to some tools and techniques of mathematical analysis. In particular, Fourier series and transforms, functional spaces that appear in the study of partial differential equations. Finally, the students will leran about some of the common ideas when studying differential equations.

4. OBJECTIVES

To learn some techniques in harmonic analysis and functional analysis

6. COURSE ORGANIZATION

CONTENTS	
1	L^p spaces, Fourier series, Fourier transform
2	Sobolev spaces, Sobolev inequality, Trace operator, singular integrals
3	Poisson equation, Lax-Milgram Lemma. Existence and uniqueness of solution,
4	Heat equation, existence and uniquenes, convergence to equilibrium, Moser iteration.
5	Oral exposition of the project

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessment	%
Project	Work	No	Yes	60,00
Exposition	Others	Yes	Yes	40,00
TOTAL				100,00
Observations				
The grade in the extraordinary session will correspond exactly to 100% of the grade obtained in the extraordinary exam.				
Observations for part-time students				
Part time students can chose between the porject and its exposition or a unique final exam at the end of the course				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Lieb, E. H., & Loss, M. (2001). Graduate studies in mathematics. Analysis, 14.

Evans, L. C. (1998). Graduate studies in mathematics. In Partial differential equations. Am. Math. Soc..

Apuntes de la asignatura facilitados por el profesor