SUBJECT TEACHING GUIDE

G59 - Mathematical Methods I: Differential Equations

Degree in Physics

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	Degree in Physics			Type and Year	Compulsory. Year 2
Faculty	Faculty of Sciences				
Discipline	Subject Area: Advanced Mathematics for Science Central Module				
Course unit title and code	G59 - Mathematical Methods I: Differential Equations				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Knowledge Field	Physics and astronomy				
Web	https://moodle.unican.es/course/view.php?id=3164				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	DIANA STAN
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Other lecturers	

4. OBJECTIVES
Translate various real situations in terms of differential equations , assessing the need to acquire mathematical knowledge to solve these equations.
Understand and acquire fluency in handling the basic concepts and procedures of differential equations.
Developing a clear perception of situations that are different , but that show analogies that allow modeling them through differential equations of the same type .
Extract qualitative information about the solution of an ordinary differential equation, without the need to solve it.
Know and correctly apply various methods to solve differential equations , choosing the most appropriate for the type of equation.

6. SUBJECT PROGRAM

CONTENTS	
1	FIRST ORDER DIFFERENTIAL EQUATIONS Topic 1. Introduction to Ordinary Differential Equations. Cauchy problem. Topic 2. First order linear ODE and reducible. Topic 3. Non-linear first order ODE.
2	SYSTEMS OF DIFFERENTIAL EQUATIONS Topic 4. Linear ODE systems
3	HIGHER ORDER DIFFERENTIAL EQUATIONS Topic 5. Linear ODE: general theory. Topic 6. Linear ODE: resolution methods. OTHER METHODS FOR RESOLUTION OF ODEs Topic 7. Power series type solutions TOpic 8. Existence and uniqueness theorems. Picard's approximation method.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Partial exam 1 evaluates the first block of the course.	Written exam	No	Yes	33,00
Partial exam 2 evaluates the second block of the course.	Written exam	No	Yes	33,00
Final Exam evaluates the third block of the course.	Written exam	Yes	Yes	34,00
TOTAL				100,00

Observations

The assessment of this subject will be organized by content blocks: Block 1, Block 2, and Block 3.
Blocks 1 and 2 will be assessed through midterm exams throughout the academic year. These blocks may be retaken during the regular exam session, with the condition that the final grade for each block will be the most recent one obtained, whether it is higher or lower than the previous one. In other words, the exams taken during the regular session for Blocks 1 and 2 will replace the corresponding continuous assessment exams.
Block 3 will be assessed exclusively through the exam corresponding to the regular exam session.
Each exam will last one hour.
The final grade for the course will be the average of the grades obtained in the three blocks.
In the resit session, students may choose to take the exam for any of the blocks they wish. In that case, the final grade for each block will be the most recent one obtained, following this order of priority: resit session, regular session (if the student chose to retake the exam), and continuous assessment

Observations for part-time students

Part-time students can choose between being examinated as the other students by continuous evaluation and final exam, or they can choose by doing only the final exam.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

O. Ciaurri, "Instantáneas diferenciales", Universidad de la Rioja, 2013.

M. Braun, "Ecuaciones Diferenciales y sus Aplicaciones", Grupo Editorial Iberoamericano, 1990.