SUBJECT TEACHING GUIDE

G59 - Mathematical Methods I: Differential Equations

Degree in Physics

Academic year 2022-2023

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)	
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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Office	Facultad de Ciencias. Planta: + 3. DESPACHO DIANA STAN (3004)
Other lecturers	

3.1 LEARNING OUTCOMES
- Learning and recognizing the most important types of differential equations (ordinary, partial, linear, autonomous ...) and mathematical problems (Cauchy problem, boundary valued problem) that arise in Science and Engineering.
- Extract qualitative information about the solution of an ordinary differential equation, without the need to solve it.
- Handle some theorems that allow guaranteeing the existence and uniqueness of the solution of the Cauchy problem.

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. COURSE ORGANIZATION	
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	HIGHER ORDER DIFFERENTIAL EQUATIONS Topic 4. Linear ODE: general theory. Topic 5. Linear ODE: resolution methods.
3	SYSTEMS OF DIFFERENTIAL EQUATIONS Topic 6. Linear ODE systems
4	The final exam will consist of both theoretical and practical questions and problems. The use of a sheet with formulas will be allowed in order to enhance the reasoning and not memorizing. Those students who have failed the continuous evaluation, will be able to recover the mark after the final exam.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Partial exams represent the continuous evaluation. The exam will consist of both theoretical and practical issues and problems and will focus on topics seen up to the time of the partial exam. Notes will not be allowed. Student may use a sheet with formu	Written exam	No	Yes	25,00
Partial exams represent the continuous evaluation. The exam will consist of both theoretical and practical issues and problems and will focus on topics seen up to the time of the partial exam. Notes will not be allowed. Student may use a sheet with formu	Written exam	No	Yes	25,00
Final Exam. The exam will consist of both theoretical and practical issues and problems and will focus on topics seen throughout the entire course. Notes will not be allowed. Student may use a sheet with formulas with the aim of enhancing the qualities o	Written exam	Yes	Yes	50,00
TOTAL				100,00

Observations

The final grade is calculated with the formula max $(0.25 * EP1 + 0.25 * EP2 + 0.5 * EF, EF)$, where $EP1$ = first partial exam grade, $EP2$ = second partial exam grade, EF = final exam grade. Therefore the final grade will be the maximum between (the weighted average of the partial and final exams grades) and the grade of the final exam. In this way, the partial exams can be retaken in the final exam. To pass the course it is always necessary to obtain a mark in the final exam greater than or equal to 3.5 and a final grade greater than or equal to 5.
An examination of characteristics similar to the final examination will be carried out in the extraordinary call and calculated with the same formula taking into account the continuous evaluation.

Observations for part-time students

The evaluation for part-time students will be the same as for the other students.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

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

J. C. Bellido Guerrero, A. Donoso Bellón y S. Lajara López, "Ecuaciones Diferenciales Ordinarias", Paraninfo, 2014.