SUBJECT TEACHING GUIDE

G59 - Mathematical Methods I: Differential Equations

Degree in Physics

Academic year 2023-2024

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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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	SYSTEMS OF DIFFERENTIAL EQUATIONS Topic 6. Linear ODE systems
3	HIGHER ORDER DIFFERENTIAL EQUATIONS Topic 4. Linear ODE: general theory. Topic 5. Linear ODE: resolution methods.
4	Topic 7. Power series type solutions Topic 8. Existence and uniqueness theorems. Picard's method of successive approximations
5	Final Exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Partial exams represent the continuous evaluation.	Written exam	No	Yes	24,00
Partial exams represent the continuous evaluation.	Written exam	No	Yes	24,00
Final Exam.	Written exam	Yes	Yes	52,00
TOTAL				100,00

Observations

GRADING PROCEDURE:

The student's final grade in the ordinary call will be the highest between:

(A) The final exam grade.

(B) The weighted average between the grades of the partial exams (24% each) and the final exam grade (52%).

The grading process has been designed so that, if the student demonstrates at the end of the teaching period that they have acquired an adequate mastery of the subject and obtains a good grade in the final exam, their grade in the subject will not be affected by continuous evaluation. This way, students are given an opportunity to improve their grade in continuous evaluation during the ordinary call (option A).

On the other hand, if the continuous evaluation through the weighted average results in an improvement of the grade obtained in the final exam, the final grade will be calculated using the weighted average (option B).

To pass this course, it will be necessary to obtain a final grade greater than or equal to 5 (out of 10) and a grade in the final exam greater than or equal to 3 (out of 10), in both options (A) and (B).

In the extraordinary call, the procedure will be the same as in the ordinary call, taking into account continuous evaluation.

Each test consists of theoretical questions and practical exercises or problems. Each exam will include all the material covered in class up to the evaluation date. Students will not be allowed to use notes, but they will be permitted to have a formula sheet to encourage reasoning over memorization. The evaluation criteria will include the appropriate presentation of the problem, the degree of resolution, the precision of the calculations, the clarity of the presentation, and the correct use of mathematical language.

Current regulations of the university establish that when a student has not carried out evaluation activities whose weight exceeds 50% of the subject grade, they will appear as not presented in their record, and when they have carried out tests that represent said 50% or more, the corresponding grade will appear in the record. The weighting of the various evaluation methods is set so that those who do not take the final exam obtain the grade of not presented.

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.