SUBJECT TEACHING GUIDE

G59 - Mathematical Methods I: Differential Equations

Degree in Physics

Academic year 2020-2021

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	No	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.
- Translate some real situation problems in terms of differential equations.
- Acquire skills in solving differential equations and systems and correctly interpret the results.
- Solve first order linear differential equations and other equations reducible to them.
- Analyzing different nonlinear differential equations and knowing suitable methods for solving some simple cases.
- Find the solutions of higher order linear differential equations with constant coefficients and of other equations reducible to them (Cauchy-Euler equation).
- Solving systems of linear ordinary differential equations with constant coefficients.
- Find particular solutions of non-homogeneous linear equations and systems through the methods of variation of constants and indeterminate coefficients.
- Use the method of power series development in solving linear differential equations.

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: general theory. Topic 7. Linear ODE systems with constant coefficients.
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	%
Continuous evaluation	Written exam	No	Yes	40,00
Final Exam	Written exam	Yes	Yes	60,00
TOTAL				100,00

Observations

The final grade for the course will be the weighted average of the grades obtained in the Continuous Evaluation and the Final Exam. To pass the course it will be necessary to obtain a grade greater than or equal to 4 in the Final Exam and a final grade for the course greater than or equal to 5.

The tests corresponding to the Continuous Evaluation will be of the Moodle questionnaire type, attaching the complete solutions to the exercises. They will be carried out in a remote mode during a fixed period of time. If sanitary measures allow it, these tests may take place in the classroom presentially and they will be as a written exam.

The final exam will be presentially in the classroom and, if sanitary measures do not allow it, it will be replaced by a remote exam to be carried out during the schedule established by the faculty for the final exam.

In the extraordinary call, an exam with characteristics similar to the final exam will be carried out, the grade of which will represent 100% of the student's grade.

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

W. E. Boyce y R. C. DiPrima, “Ecuaciones Diferenciales Elementales y Problemas con Valores en la Frontera”, Limusa, 1998.

D. G. Zill y M. R. Cullen, “Matemáticas Avanzadas para Ingeniería, Vol1: Ecuaciones Diferenciales”, McGraw-Hill, 2008.

J.L. Varona, "Métodos clásicos de resolución de ecuaciones diferenciales ordinarias", Universidad de La Rioja, 1996.

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