SUBJECT TEACHING GUIDE

G321 - Further Calculus

Degree in Chemical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering			Type and Year	Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Mathematics Basic Training Module				
Course unit title and code	G321 - Further Calculus				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	https://www.giematic.unican.es/				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION
Name of lecturer	ANGEL COBO ORTEGA
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Other lecturers	

3.1 LEARNING OUTCOMES
- The student will learn the main concepts of multiple integration and will apply these concepts for solving practical problems.
- The student will learn the main concepts of vector calculus and will apply these concepts for solving practical problems.
- The student will learn how to solve line integrals and will know the most significant physical and geometric applications.
- The student will learn how to solve surface integrals and will know the most significant physical and geometric applications.
- The student will learn the basic concepts and resolution methods of first order differential equations.
- The student will learn the basic concepts and resolution methods of linear second order differential equations.
- The student will be able to modeling and solve some simple technical problems that involve differential equations.
- The student will learn Euler´s methods for obtaining a numerical approximation of the solution to an initial value problem and will implement this methods using the computer.
- The student will learn the main concepts of Laplace Transforms and will used them to solve initial value problems for linear differential equations.
- the student will learn the main concepts of partial differential equations and will be able to solve some of them using numerical methods.

4. OBJECTIVES
To introduce the student to some important basic concepts of Vector Calculus and Multiple Integration.
To introduce the student to the role of ordinary differential equations in engineering, and their methods of solution.
To introduce the student to the numerical methods for ordinary differential equations.
To introduce the student to the classical theory of Laplace Transforms and some of its applications to the analysis and design of engineering systems.
To introduce the student to the basic concepts of partial differential equations.
To be able to use mathematical software as an aid for solving problems.

6. COURSE ORGANIZATION

CONTENTS	
1	MULTIPLE INTEGRALS
1.1	Concept of double integral and calculation methods
1.2	Change of variables in double integrals
1.3	Practical applications of double integrals
1.4	Triple integrals
1.5	Change of variables: cylindrical and spherical coordinates
1.6	Change of variables: cylindrical and spherical coordinates
2	LINE AND SURFACE INTEGRALS
2.1	Scalar and vector fields
2.2	Parameterized curves
2.3	Line integral of scalar fields
2.4	Line integral of vector fields
2.5	Conservative fields
2.6	Green's theorem
2.7	Surfaces in space
2.8	Surface integrals of scalar fields
2.9	Surface integrals of vector fields
2.10	Divergence and Stoke's theorems
3	DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS
3.1	Concept of differential equations and application examples
3.2	Analytical solution of differential equations
3.3	Numerical solution of differential equations
3.4	Linear differential equations with constant coefficients
3.5	Systems of first order linear differential equations
3.6	Introduction to partial differential equations
3.7	Fourier and Laplace transforms
3.8	Application of Laplace transform to solve differential equations

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Assessment of the first thematic block.	Written exam	No	Yes	20,00
Assessment of the second thematic block	Written exam	No	Yes	20,00
Assessment of the third thematic block	Written exam	No	Yes	20,00
Monitoring activities in class	Others	No	Yes	20,00
Participation in virtual learning platforms	Activity evaluation with Virtual Media	No	Yes	20,00
Final exam (for students who have not passed the continuous evaluation)	Written exam	Yes	Yes	0,00
TOTAL				100,00

Observations

The course will have a continuous assessment process

Observations for part-time students

Part-time students will have a different evaluation process based on exams and practical work

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Materiales en formato electrónico disponibles en el curso virtual de la asignatura y cuadernos computacionales distribuidos a través de la plataforma Google Colab