SUBJECT TEACHING GUIDE

G424 - Calculus II

Degree in Mechanical Engineering
First Degree in Mechanical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA			
Degree	Degree in Mechanical Engineering First Degree in Mechanical Engineering	Type and Year	Core. Year 1 Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications		
Discipline	Subject Area: Mathematics Basic Training Module		
Course unit title and code	G424 - Calculus II		

Number of ECTS credits allocated	6	Term	Semester based (2)
Web	http://personales.unican.es/alvareze/CalculoWeb/CalculoII/index.html		

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	ELENA ESPERANZA ALVAREZ SAIZ
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Other lecturers	ANTONIO DIEZ PEDRERO

3.1 LEARNING OUTCOMES
- - Understand the concept of multiple integral using Riemann sums. - Calculate curvilinear and surface integrals and know the physical interpretation of these concepts. - Know and apply the main integral theorems of vector calculus. - Obtain Laplace transform of functions and know their properties. - Classify and solve some types of first order differential equations. - Solve second order differential equations, linear homogeneous and non-homogeneous equations. - Use mathematical software in problem solving as a tool of representation and calculation.

4. OBJECTIVES

Learn the main concepts of multiple integration and vector calculus. Apply these concepts to solve practical problems.
Learn the basic concepts of ordinary differential equations.
Know the theory and applications of the Laplace transform.
Use mathematical software to help solve problems.

6. COURSE ORGANIZATION

	CONTENTS
1	Part 1. Multiple integration. Line integral. Surface integral
1.1	Topic 1. Multiple Integral 1.1 Double integrals over a rectangle. Geometric interpretation. Existence and properties. Double integrals over regular domains. Change of variables in double integrals. Change of variables to polar coordinates. Applications. 1.2 Triple Integrals over regular domains. Change of variables in triple integrals. Equations of common surfaces. Change of variables to cylindrical and spherical coordinates.
1.2	Topic 2: Vector Fields and line integrals. 2. Scalar and vector fields. Basic definitions. Differential operators. Conservative vector fields. Potential function. 2.2 Line integrals. Differential element of arc length in cartesian, parametric and polar coordinates. Line integrals of a scalar field on a curve. 2.3 Line integrals of a vector field on a curve. Green Theorem. Fundamental Theorem for line integrals. Theorem on conservative fields.
1.3	Topic 3: Surface integrals. 3.1 Definition of the differential element of surface in cartesian and parametric coordinates . 3.2 Surface integrals of scalar fields. Properties. Applications. 3.3 Surface integrals of vector fields or flux as a surface integral. Gauss Theorem or Divergence Theorem. Stokes Theorem.
2	Part II. Differential equations. LaplaceTransform.
2.1	Topic 4: Introduction to ordinary differential equations (ODE). 4.1 Definition of differential equation. Order and degree. General solution and particular solutions of an ODE. Modelling by ODE: examples. 4.2 Resolution of ordinary differential equations of first order: separable and reducible to separable equations; Exact equations and integrating factors; linear equations 4.3 Resolution of linear ordinary differential equations of second order . 4.4 Introduction to partial differential equations.
2.2	Topic 5. Laplace Transform. 5.1 Definition of Laplace transform of a function. Sufficient conditions of existence. Properties. Theorems. 5.2 Inverse Laplace transform. 5.3 Application of the Laplace transform to solve linear differential equations with constant coefficients and initial conditions.
2.3	Introduction to the Fourier Transform

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continuous evaluation - Part I	Others	No	Yes	50,00
Continuous evaluation - Part II	Others	No	Yes	50,00
Final exam for students who have not passed the continuous assessment	Written exam	Yes	No	0,00
TOTAL				100,00

Observations
In order to pass the subject in continuous or regular evaluation, it will be necessary that the notes of the 2 blocks are equal to or greater than 3 points out of 10. The weight of the parts are 50% for part I and 50% for part 2. The students who have not passed the subject in ordinary call will have to sit the whole syllabus in extraordinary period. The mark obtained in the exam will represent the complete grade. When the grade obtained in the ordinary call in a block is higher than 4 points out of 10, this note may be kept for the extraordinary call. In case of a lockdown imposed by the sanitary alert, the evaluation will be carried out using the telematics means offered by the University of Cantabria

Observations for part-time students
Part-time students can choose between the continuous assessment described above or opt to do the final exam. In the latter case, the exam mark obtained will represent the complete grade of the student for the subject.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC
Material proporcionado por el profesorado: - Página web de la asignatura: http://personales.unican.es/alvareze/ CalculoWeb/CalculoII/index.html - Pagina web con ejercicios interactivos Giematic UC: http://www.giematic.unican.es - Página de la asignatura en Moodle
Cálculo Vectorial. Parte II. Juan Guillermo Rivera. Elena Álvarez https://proyectodescartes.org/iCartesiLibri/materiales_didacticos/Calculo_III_parte2/index.html
Larson, R. y Edwards, B. H. Cálculo 2 de varias variables. Editorial Mc Graw-Hill. Disponible en la biblioteca: http://catalogo.unican.es
Nagle, R. K. y Staff, E. B. "Ecuaciones diferenciales con valores en la frontera". Editorial Addison-Wesley. Disponible en la biblioteca: http://catalogo.unican.es