SUBJECT TEACHING GUIDE

G422 - Calculus I

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	G422 - Calculus I			
Number of ECTS credits allocated	6	Term	Semester based (1)	
Web				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION
Name of lecturer	MARCO BRAVIN
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Other lecturers	EMMA MERINO CUE

3.1 LEARNING OUTCOMES

- - Know the graphic representation of elementary functions and identify their properties
- Apply the Taylor polynomial local approximation for real functions of one or several variables , classification of extremes, etc.
- Get the powers series expansion of elementary functions and find their interval of convergence.
- Interpret both the partial and directional derivative of a function of two variables geometrically.
- Calculate partial derivatives and apply the chain rule of functions of several variables.
- Identify the appropriate integration technique to calculate integrals of real functions of one variable.
- Calculate Riemann sums to approximate definite integrals. Apply the calculation of definite integrals to solve
- Calculate Fourier series of a periodic function

4. OBJECTIVES

- Know and understand the main concepts of differential calculus of one and several variables and the integral calculus of one variable.
- Use mathematical software as an aid to troubleshooting.

6. COURSE ORGANIZATION

	CONTENTS
1	Topic 1. Basic concepts 1.1 Real and complex numbers 1.2 Real functions of a real variable.. Definition. Domain and range. Graphs of elementary functions. Properties. Definition of continuity. 1.3 Derivative at a point: definition and geometric interpretation. The derivative as a rate of change. Calculation of derivatives. The tangent line. Linear approximation.
2	Topic 2: Integration of functions of one variable. 2.1 Primitives. Integration methods. 2.2 Integral of Riemann. Geometric interpretation. Integrability conditions. Properties. The Mean Value Theorem for integrals. Fundamental Theorem of integral calculus. Barrow's rule. Techniques of integration. 3.3 Applications of the definite integral.
3	Topic 3. Taylor Polinomials 3.1 Taylor polynomials. Definition. Taylor's formula. Approximation errors. 3.2 Applications. Extreme values of a function
4	Topic 4: Numerical series. Power series. 4.1 Infinite Series. Definition. Necessary condition of convergence of series. Special series: p-series and geometric series. Convergence tests. 4.2 Power series. Definition. Convergence. Representation of functions as power series.
5	Topic 5: Fourier Series. 5.1. Basic definitions. Fourier series of a periodic function. Dirichlet's sufficient conditions. Fourier series for odd and even functions. 5.2 Complex form of Fourier series.
6	Topic 6: Differential calculus of multivariable functions. 6. 1 Definition. Domain and range. Traces, level curves, contour maps and graphs. Continuity. 6.2 Partial derivatives. Directional derivatives: definition and geometric interpretation. Higher order partial derivatives. Differentiable function. The tangent plane and normal lines. Linear approximations. Gradients. The chain rule. Implicit functions.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Partial exam (Topics 1-3)	Written exam	No	Yes	30,00
Partial exam (Topics 4-6)	Written exam	No	Yes	30,00
Practical assessment with scientific software	Laboratory evaluation	No	Yes	25,00
Active participation in class	Others	No	No	15,00
Final exam for students who have not passed the continuous assessment	Written exam	Yes	Yes	0,00
TOTAL				100,00

Observations
The students who have not passed the subject in the ordinary period will have to sit the whole syllabus in extraordinary period.

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 a través del curso virtual
Cálculo Vectorial. Parte I. Juan Guillermo Rivera. Elena Álvarez https://proyectodescartes.org/iCartesiLibri/materiales_didacticos/Calculo_III/index.html
- Bradley, G.L. and Smith, K. Cálculo de una variable. Cálculo de varias varibles. Volúmenes I y II. Prentice Hall. Disponible en la biblioteca: http://catalogo.unican.es
- Larson, R. y Edwards, B. H. Cálculo 1 de una variable. Cálculo 2 de varias variables. (2 volúmenes) Editorial Mc Graw-Hill. Disponible en la biblioteca: http://catalogo.unican.es