SUBJECT TEACHING GUIDE

G422 - Calculus I

Degree in Mechanical Engineering

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Degree in Mechanical 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	G422 - Calculus I				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web	http://personales.unican.es/alvareze/CalculoWeb/CalculoI/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	

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	Part I
1.1	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.
1.2	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.
2	Part II
2.1	Topic 3. Taylor Polinomials 3.1 Taylor polynomials. Definition. Taylor's formula. Approximation errors. 3.2 Applications. Extreme values of a function
2.2	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.
2.3	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. Discrete spectrum of a function
3	Part III
3.1	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	%
Continuous evaluation - Part I	Others	No	Yes	30,00
Continuous evaluation - Part II	Others	No	Yes	35,00
Continuous evaluation - Part III	Others	No	Yes	35,00
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 3 blocks are equal to or greater than 3 points out of 10. The weight of the parts are 30% for part I, 35% for part 2 and 35% for part 3.

The students who have not passed the subject in February 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/CalculoI/index.html
- Pagina web con ejercicios interactivos Giematic UC: http://www.giematic.unican.es
- Página de la asignatura en Moodle

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