

SUBJECT TEACHING GUIDE

G36 - Mathematics II: Differential Calculus

Degree in Physics

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Degree in Physics			Type and Year	Core. Year 1
Faculty	Faculty of Sciences				
Discipline	Subject Area: Basic Mathematics for Science Basic Module				
Course unit title and code	G36 - Mathematics II: Differential Calculus				
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. MATEMATICAS, ESTADISTICA Y COMPUTACION				
Name of lecturer	BEATRIZ PORRAS POMARES				
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Other lecturers					

3.1 LEARNING OUTCOMES

- Solving real equations and inequalities with absolute values

- The knowledge and application of the following concepts: sequences and series of one and several variables and their convergence criteria, in particular for power series and therefore for Taylor series; limits and criteria for their existence for functions of several variables; continuity and differentiability and criteria for analyzing them.

- To be able to calculate partial derivatives, gradients, Jacobians, Hessians and to apply these ideas in problems involving changes of variables and implicit functions.

- Know the concept of the limit of a function at a point, criteria on its existence and evaluation methods for functions of several real variables; apply them to the study of continuity, derivability and differentiability of functions of several real variables.

- Calculate partial derivatives, gradients, Jacobian, Hessian, and apply them in problems about change of variables and implicit functions

- Solve simple problems related to the determination of relative and absolute maximum and minimum, and about conditioned extremes.

4. OBJECTIVES

To know, understand and handle a number of basic concepts and results concerning functions of one real variable:

- Sequences and series in \mathbb{R} ; study of their convergence.

- Taylor series

To know, understand and apply basic results about functions of several real variables: limits, continuity, partial derivatives and differentials..., and apply them in problems of implicit functions, maxima and minima.

6. COURSE ORGANIZATION

CONTENTS

1	<p>REAL NUMBERS: SEQUENCES AND SERIES OF REAL NUMBERS</p> <ol style="list-style-type: none"> 1. Real numbers, absolute values and inequalities. 2. Sequences in \mathbb{R} and limits (finite and infinite) of such sequences. 3. Common criteria to study the convergence of a sequence in \mathbb{R} and to calculate its limit if it exists: Sandwich rule, monotonous sequences (the number e), Stolz criterion, equivalences (Stirling formula).
2	<p>SERIES</p> <ol style="list-style-type: none"> 1- Series of real numbers and their convergence criteria. Geometric and armonic series. 2- Series of positive terms and any terms. Most common criteria for the study of their convergence: Gaussian, quotient, Leibniz. 3. Power series. Radius of convergence. 4. Taylor series. Annotation of the rest. 5. Approximation of functions.
3	<p>LIMITS AND CONTINUITY OF FUNCTIONS OF SEVERAL REAL VARIABLES.</p> <ol style="list-style-type: none"> 1. Introduction to functions of several real variables with values in \mathbb{R}^n. 2. Limit and continuity of functions of several real variables. 3. Directional and iterated limits. Limits in polar coordinates.
4	<p>DERIVATION OF FUNCTIONS OF SEVERAL REAL VARIABLES.</p> <ol style="list-style-type: none"> 1. Directional derivatives. Partial derivative. Gradient. Jacobian matrix. 2. Differentiable functions of several variables. 3. Properties of differentiable functions. Chain rule. Change of variables 4. Partial derivatives of higher order. Hessian matrix. 5. Derivation of implicit functions. 6. Extremes of real functions of several real variables. Conditioned extremes. Lagrange multipliers. 7. Taylor formula for real functions of several real variables.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Quiz on the content of chapter 1	Activity evaluation with Virtual Media	No	Yes	20,00
Quiz on the content of chapter 2	Activity evaluation with Virtual Media	No	Yes	20,00
Partial exam about chapters 1 and 2	Written exam	No	Yes	10,00
Quiz on the content of chapter 3	Activity evaluation with Virtual Media	No	Yes	20,00
Quiz on the content of chapter 4	Activity evaluation with Virtual Media	No	Yes	20,00
Partial exam about chapters 3 and 4	Written exam	No	Yes	10,00
TOTAL				100,00
Observations				
Continuous evaluation (ordinary call): 1st Questionnaire 2nd Questionnaire First partial + recovery first questionnaire) 3rd Questionnaire 4rd Questionnaire Second partial + recovery 3rd questionnaire + (recovery first partial or (+1) point in first partial) Extraordinary call: first partial recovery + second partial recovery				
Observations for part-time students				
The same evaluation type applies to part time students				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Material didáctico disponible en el Aula Virtual UC.

J.E. Marsden, A.J. Tromba. Cálculo Vectorial. Quinta edición. Pearson, Addison-Wesley, 2004.