

Academic Year: ( 2023 / 2024 )

Review date: 10-01-2023

Department assigned to the subject: Mathematics Department

Coordinating teacher: CATALAN FERNANDEZ, PABLO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Engineering and Architecture

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Calculus I  
Linear Algebra

**OBJECTIVES**

The aim of this course is to provide students the basic tools of differential and integral calculus of several variables. To achieve this goal students must acquire a range of expertise and capabilities.

**SPECIFIC LEARNING OBJECTIVES:**

- To understand the n-dimensional Euclidean space and in more depth  $n = 2$  and  $3$ .
- To know the properties of scalar and vector functions of several variables.
- To understand the concepts of continuity, differentiability and integrability.
- To be able to handle optimization problems using optimization techniques.
- To understand how to calculate double, triple, line and surface integrals.
- To know and apply the main theorems of vector calculus: Green, Gauss, Stokes.
- To understand how to apply the integral to calculate surface areas, volumes and solve some basic problems of Mathematical-Physics.

**SPECIFIC ABILITIES:**

- To be able to work with functions of several variables given in terms of a graphical, numerical or analytical description.
- To understand the concept of differentiable function and ability to solve problems involving the concept.
- To understand the concept of multiple integral, line and surface integral and its practical applications.

**GENERAL ABILITIES:**

- To understand the necessity of abstract thinking and formal mathematical proofs.
- To acquire communicative skills in mathematics.
- To acquire the ability to model real-world situations mathematically, with the aim of solving practical problems.
- To improve problem-solving skills.

**DESCRIPTION OF CONTENTS: PROGRAMME**

- 1.- The n-dimensional Euclidean space. Cartesian, polar, cylindrical and spherical coordinates.
- 2.- Scalar and vector functions of several variables. Limits, continuity and differentiability.
- 3.- Taylor's theorem. Optimization problems with and without constraints.
- 4.- Double, triple, line and surface integral.
- 5.- Theorems of Green, Gauss, Stokes and its applications .

**LEARNING ACTIVITIES AND METHODOLOGY**

Lecture sessions: 3 ECTS credits  
Problem sessions: 3 ECTS credits

## ASSESSMENT SYSTEM

Evaluation system, 40% continuous evaluation and 60% final exam.

The continuous evaluation will consist of some of the following methods: written controls, online questionnaires, submissions, video elaboration, in these videos the students will solve exercises or present group or individual work. Interactive tools such as Kahoot!, Wooclap, Breakoutrooms and Jamboard, among others, could be used.

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| <b>% end-of-term-examination:</b>   | 60 |
| <b>% of continuous assessment (assignments, laboratory, practicals...):</b> | 40 |

## BASIC BIBLIOGRAPHY

- HERNANDO, P. J. Clases de Cálculo II para Ingeniería, Versión 3.6, PDF, 2021
- Howard Anton, Irl C. Bivens, Stephen Davis, Calculus Multivariable, 9th ed., Wiley. & Sons., 2009
- Jarrold E. Marsden, Anthony Tromba. Vector Calculus, 6th ed., W. H. Freeman., 2013
- Larson, R., Edwards, B Calculus, 10th International ed., Brooks Cole, Cengage Learning, 2014
- P. J. Hernando Clases de Cálculo II para Ingeniería, Revisión 2.5, 2018
- Salas, S., Hille, E., Etgen, G. Calculus: one and several variables, 10th ed., Wiley, 2007
- Stewart, James Calculus, 8th ed., Cengage Learning, 2016
- Weir, Maurice D., Hass, Joel, Thomas, George B. Jr. Multivariable Thomas'calculus, Pearson Addison Wesley, 2014

## ADDITIONAL BIBLIOGRAPHY

- James Stewart Multivariable Calculus: Concepts and Contexts, Cengage Learning, 2009
- James Stewart Multivariable Calculus: Concepts and Contexts, 4 ed., Brooks/Cole, Cengage Learning, 2010
- Juan de Burgos Cálculo infinitesimal de varias variables, 2 ed., Mc Graw-Hill Interamericana, 2008
- Paul Charles Matthews Vector Calculus, Springer, 1998
- Ron Larson, Bruce H. Edwards, Robert P. Hostetler. Multivariable Calculus, Cengage Learning, 2006