## Calculus II

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| **Academic Year:  ( 2022 / 2023 )** | **Review date: 30-05-2022** |

**Department assigned to the subject: Mathematics Department**

**Coordinating teacher: DIAZ JIMENEZ, BOGAR**

**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

## OBJECTIVES
The student must be able to state, solve and understand, from a mathematical point of view, problems related to Engineering and of Electrical Power Engineering. First of all, a comprehensive approach to Euclidean spaces with a special emphasis in the two-dimensional and three-dimensional cases as well as their most relevant subsets will be done. He must handle the main properties of functions in several variables related to continuity, differentiability and integrability both in the scalar and vector cases. The study of problems related to optimisation, with and without constraints, constitutes a nice application of Taylor formula and local extrema. Iterated integrals on domains as well as the integration on lines and surfaces will provide the basic background for the analysis of areas and volumes, moments of inertia as well as heat flows. The student must know ordinary differential equations, concepts and problems, and be able to solve the main first and second order equations.

By the end of this content area, students will be able to have:
1.        Knowledge and understanding of the mathematical principles of calculus of several variables underlying electrical power engineering;
2.        The ability to apply their knowledge and understanding to identify, formulate and solve mathematical problems of calculus of several variables using established methods;
3.        The ability to choose and apply relevant analytical and modelling methods;
4.        The ability to select and use appropriate tools and methods to solve mathematical problems in terms of calculus of several variables;
5.        The ability to combine theory and practice to solve mathematical problems of calculus of several variables;
6.        Understanding of the applicable methods and techniques and their limitations.

## DESCRIPTION OF CONTENTS: PROGRAMME
The Euclidean space. Functions of several variables. Continuity and differentiability. Polar, spherical and cylindrical coordinates. The chain rule. Directional derivatives. Gradient, divergence and curl. Free and conditional optimization. Multidimensional Iterated integration. Changes of variables. Integration along trajectories. Integration on surfaces. Computation of areas, volumes, centers of mass , moments of inertia and. other applications of the integral. Theorems of Green, Stokes and Gauss. Introduction to differential equations. Laplace transform.

## LEARNING ACTIVITIES AND METHODOLOGY
The learning activities will be focused on
- Magistral sessions devoted to the presentation of the basic concepts and results of every chapter as well as some exercises. The theoretical background will be supported by the basic monographs listed in the bibliography.
- Problem sessions. Here we will solve questions and problems proposed in the magistral classes as well as individual homeworks in order to allow the self asessment of the students.
- Continuous Evaluation:
    · Two partial tests concerning Differential Calculos (Chapters 1-5) and Integral Calculus (Chapters 6-11).
    · Individual assignments to be solved at Home.
- Final exam.

## ASSESSMENT SYSTEM

The evaluation will be based in the following criteria:
- Partial evaluation controls (40%).
- Final examination (60%).

**% end-of-term-examination:**                                   60

**% of continuous assessment (assigments, laboratory, practicals…):**      40

## BASIC BIBLIOGRAPHY

- MARSDEN, TROMBA VECTOR CALCULUS, W. H. FREEMAN, 2003

- NAGLE FUNDAMENTALS OF DIFERENTIAL EQUATIONS, PEARSON-ADDISON WESLEY, 2008

- SALAS, S. CALCULUS: ONE AND SEVERAL VARIABLES, WILEY, 2007

- UÑA, SAN MARTIN, TOMEO PROBLEMAS RESUELTOS DE CALCULO EN VARIAS VARIABLES, THOMSON.

- ZILL D. A FIRST COURSE IN DiFFERENTIAL EQUATIONS WITH MODELING APPLICATIONS, BROOKS/COLE, 2013

## ADDITIONAL BIBLIOGRAPHY

- APOSTOL.  CALCULUS, John Wiley & Sons. .