

Academic Year: ( 2022 / 2023 )

Review date: 11-07-2022

Department assigned to the subject: Mathematics Department

Coordinating teacher: GUTIERREZ DIEZ, RICARDO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 1

Branch of knowledge: Engineering and Architecture

## OBJECTIVES

The student should acquire the background in calculus needed to understand and apply concepts and techniques for the solution of problems arising in the different areas of aerospace engineering.

### SPECIFIC LEARNING OBJECTIVES:

- To acquire the basic concepts related to real functions and their graphical representations.
- To understand the formal definition of limit and to learn how to compute indeterminate limits.
- To learn and apply the basic numerical root-finding methods.
- To understand the concepts of continuity and differentiation.
- To understand the Taylor expansion technique and its applications.
- To understand the concepts of local and global approximation of functions and to be able to solve interpolation problems.
- To understand the formal definition of integral and to learn basic integration techniques.
- To be able to apply integration methods to compute lengths, areas, and volumes.
- To understand the concept of ordinary differential equation and to know basic solution techniques for first order equations.
- To learn complex numbers and to be able to operate with complex numbers.

### SPECIFIC ABILITIES:

- To be able to handle functions given in terms of a graphical, numerical or analytical description.
- To understand the concept of differentiation and its practical applications.
- To understand the concept of definite integral and its practical applications.
- To understand the relationship between integration and differentiation provided by the Fundamental Theorem of Calculus.

### 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) Real numbers. Sequences and Series.
- 2) Real functions. Elementary functions and power series.
- 3) The integral. Integral of simple and elementary functions. The integral function.
- 4) The differential. Derivatives and their properties. The fundamental theorem of calculus.
- 5) Applications: Maxima and minima, local extrema. Taylor's formula.

## LEARNING ACTIVITIES AND METHODOLOGY

Lecture sessions (3 credits).

Problem sessions working individually and in groups (3 credits).

## ASSESSMENT SYSTEM

We follow a continuous-assessment system plus a final exam:

- The continuous-assessment part consists in a written examination contributing with weight 40% to the final mark. The mid-term examination will take place, approximately, at two thirds of the semester and it will be held in regular class hours, according to the current regulations.

- The final exam (contributing with weight 60% to the final mark) will be held at the end of the semester.

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

#### BASIC BIBLIOGRAPHY

- Gilbert Strang Calculus, Wellesley-Cambridge Press, 1991
- H. ANTON, I. BIVENS and S. DAVIS Calculus. Early Transcendentals Single Variable, John Wiley & Sons, 2009

#### ADDITIONAL BIBLIOGRAPHY

- J. Stewart Calculus, Thomson Brooks/Cole, 2009
- Juan de Burgos Román Cálculo Infinitesimal de una variable, McGraw-Hill, 1994
- R. Larson, R. Hostetler, B. Edwards Calculus, Houghton-Mifflin, 2006