Calculus I

Academic Year: (2021 / 2022) **Review date: 21-06-2021**

Department assigned to the subject: Mathematics Department

Coordinating teacher: IBORT LATRE, LUIS ALBERTO

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.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	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