Calculus II

Academic Year: (2020 / 2021) **Review date: 27-01-2021**

Department assigned to the subject: Mathematics Department

Coordinating teacher: ALVAREZ CAUDEVILLA, 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 student will be able to formulate, solve and understand mathematically the problems arising in Biomedical Engineering. To do so it is necessary to be familiar with the n-dimensional Euclidean space, making a special emphasis in dimensions 2 and 3, visualizing the more important subsets. He/she must be able to manage (scalar and vector) functions of several variables, as well as their continuity, differentiability, and integrability properties. The student must solve optimization problems with and without restrictions and will apply the main theorems of integration of scalar and vector functions to compute, in particular, lengths, areas and volumes, moments of inertia, and heat flow.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Differential Calculus in several variables
   - 1.1. R^n as an Euclidean space; topology
   - 1.2. Scalar and vector functions of n variables
   - 1.3. Limits and continuity
   - 1.4. Differentiability

2. Local properties of functions
   - 2.1. Higher-order derivatives
     - 2.1.1 Iterated derivatives
     - 2.1.2. Differential operators: divergence, curl, laplacian
     - 2.1.3. Taylor polynomial
   - 2.2. Free and constrained optimization
     - 2.2.1 Local extrema
     - 2.2.2. Global extrema: free optimization problems
     - 2.2.3. Lagrange multipliers

3. Integral Calculus in R^2 and R^3
   - 3.1. Double and triple integrals
   - 3.2. Changes of variables
   - 3.3. Applications

4. Integrals over curves and surfaces
   - 4.1. Line and path integrals
   - 4.2. Surface integrals
   - 4.3. Integral theorems of vector analysis

LEARNING ACTIVITIES AND METHODOLOGY

The learning methodology will include:
- Attendance to master classes, in which core knowledge will be presented that the students must acquire. The recommended bibliography will facilitate the students' work
- Resolution of exercises by the student that will serve as a self-evaluation method and to acquire the necessary skills
- Exercise classes, in which problems proposed to the students are discussed
- Tests
- Final Exam
- Tutorial sessions

- The instructors may propose additional homework and activities

ASSESSMENT SYSTEM

- Tests (40%)

- Final exam (60%)

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- J. E. Marsden and A. J. Tromba Vector Calculus, 6th. edition, W. H. Freeman, 2012

- M. D. Weir, J. Hass, and G. B. Thomas Thomas¿ Calculus, Multivariable, Addison-Wesley, 2010

ADDITIONAL BIBLIOGRAPHY

- J. Stewart Calculus, Cengage, 2008

- M. Besada, F. J. García, M. A. Mirás, and C. Vázquez Cálculo de varias variables. Cuestiones y ejercicios resueltos, Garceta, 2011

- M. J. Strauss, G. L. Bradley, and K. J. Smith Multivariable Calculus, Prentice Hall, 2002

- P. Pedregal Tercero Cálculo Vectorial, un enfoque práctico, Septem Ediciones, 2001

- R. Larson and B. H. Edwards Calculus II, 9th. edition, Cengage, 2009

- S. Salas, E. Hille, and G. Etgen Calculus. One and several variables, Wiley, 2007

- T. M. Apostol Calculus, Wiley, 1975