Calculus III

Academic Year: (2017 / 2018) **Review date: 29-04-2016**

Department assigned to the subject: Mathematics Department

Coordinating teacher: PABLO MARTINEZ, ARTURO DE

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I, Calculus II and Linear Algebra.

OBJECTIVES

The student will learn the basic topics of ordinary and partial differential equations:

1. Solving first order differential equations.
2. Solving higher order, linear differential equations.
3. Using Laplace transform to solve linear differential equations and systems.
4. Separation of variables in partial differential equations.
5. Finding solutions as Fourier series and generalized Fourier series.

DESCRIPTION OF CONTENTS: PROGRAMME

1. First Order Differential Equations.
   a. Definitions and examples.
   b. Elementary resolution methods.
   c. Applications.

2. Higher Order Differential Equations.
   a. Linear equations of order n with constant coefficients.
   b. Equations with variable coefficientes: order reduction and equidimensional equations.
   c. Relation between systems and linear equations.

3. Laplace Transform.
   a. Definition and properties.
   b. Transforming and anti-transforming.
   c. Application to the resolution of linear differential equations and systems.

4. Introduction to Partial Differential Equations.
   a. Initial and boundary values problems.
   b. Examples of PDEs of Mathematical Physics.
   c. Different kinds of equations and data.
   d. Classification of second order linear PDE's.

5. Method of separation of variables.
   a. Even, odd, and periodic extensiones of a function. Trigonometric Fourier series.
   b. Solving PDE's using separation of variables and Fourier series.
   c. Complex form of Fourier series.

6. Sturm-Liouville Problems.
   a. Self-adjoint Sturm-Liouville problems.
   b. Rayleigh's quotient. Minimization theorem.
   c. Solving PDEs using separation of variables and generalized Fourier series.
   d. Sturm-Liouville problems in several variables.

LEARNING ACTIVITIES AND METHODOLOGY

1.- Master classes, in which the theroretical concepts are presented, together with examples.
2.- Problem classes, to state and solve the proposed exercises.
3.- Selfevaluations.
4.- Partial controls.
5.- Final examination.
6.- Tutorials.

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

BASIC BIBLIOGRAPHY

- D.G. ZILL Ecuaciones Diferenciales con Aplicaciones de Modelado, sexta edición, Thomson, 1997

- G.F. SIMMONS, S.G. KRANTZ Ecuaciones Diferenciales, Teoría, técnica y práctica, McGraw-Hill, 2007

- R. HABERMAN Ecuaciones en derivadas parciales con series de Fourier y problemas de contorno, Prentice-Hall, 2003

- R.K. NAGLE, E.B. SAFF Fundamentos de ecuaciones diferenciales, 2ª edición, Addison-Wesley, 1992

ADDITIONAL BIBLIOGRAPHY

- C.H.EDWARDS Jr., D.E. PENNEY Ecuaciones Diferenciales Elementales y Problemas con Condiciones en la Frontera, 3ª edición, Prentice-Hall, 1993

- F. MARCELLÁN, L. CASASÚS, A. ZARZO Ecuaciones Diferenciales, Problemas de Contorno y Aplicaciones, McGraw-Hill, 1990

- G.F. SIMMONS Ecuaciones Diferenciales con Aplicaciones y Notas Históricas, McGraw-Hill, 1993

- J.R. BRANNAN, W.E. BOYCE Differential Equations with Boundary Value Problems: An Introduction to Methods and Applications, Wiley, 2010

- R. HABERMAN Elementary Applied Partial Differential Equations, 3ª edición, Prentice-Hall, 1987

- W. E. BOYCE, R.C. DI PRIMA Ecuaciones diferenciales y problemas convalores en la frontera, Limusa, 1998