Differential Equations

Academic Year: (2016 / 2017) **Review date: 18-04-2016**

Department assigned to the subject: Mathematics Department

Coordinating teacher: ROMERA COLMENAREJO, ELENA

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I & II, Linear Algebra

OBJECTIVES

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

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

DESCRIPTION OF CONTENTS: PROGRAMME

1. Differential equations of first order.
   1.1. Definitions and examples.
   1.2. Elementary methods of resolution.
   1.3. Applications.

2. Higher order differential equations.
   2.1. Linear differential equations of order n with constant coefficients.
   2.2. Equations with variable coefficients: order reduction and equidimensional equations.
   2.3. Relation between systems and linear equations.

3. Laplace transform.
   3.1. Definition and properties.
   3.2. Transforming and back-transforming.
   3.3. Application to the resolution of linear equations and systems.

4. Method of separation of variables.
   4.1. Initial and boundary problems. Examples of PDEs from Mathematical Physics.
   4.2. Different kinds of equations and data.
   4.3. Odd, even and periodic extensions of a function. Trigonometric Fourier series.
   4.4. Resolution of equations by separation of variables and Fourier series.
   4.5. Complex form of Fourier series.

5. Sturm-Liouville problems.
   5.1. Self-adjoint Sturm-Liouville problems.
   5.2. Rayleigh's quotient. Minimization theorem.
   5.3. Resolution of equations by separation of variables and generalized Fourier series.
   5.4. Sturm-Liouville problems in several variables.

LEARNING ACTIVITIES AND METHODOLOGY

1.- Master classes.
2.- Problem classes.
3.- Selfevaluations.
4.- Partial controls.
5.- Final exam.
6.- Tutorials.

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

BASIC BIBLIOGRAPHY

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- C.H. EDWARDS, D.E. PENNEY Ecuaciones diferenciales elementales, Prentice-Hall, 1994
- F. MARCELLÁN, L. CASASÚS, A. ZARZO Ecuaciones Diferenciales. Problemas Lineales y Aplicaciones, McGraw-Hill, 1990
- G.F. SIMMONS Ecuaciones diferenciales con aplicaciones y notas históricas, McGraw-Hill, 1991
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- M. BRAUN Differential equations and their applications, Springer, 1983
- R. HABERMAN Ecuaciones en derivadas parciales con series de Fourier y problemas de contorno, Prentice Hall, 2003
- R. HABERMAN Elementary Applied Partial Differential Equations, 3rd. ed. , Prentice Hall, 1987
- R.K. NAGLE, E.B. SAFF Fundamentos de ecuaciones diferenciales, Addison-Wesley Iberoamericana, 1992
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