

Academic Year: (2019 / 2020)

Review date: 30-01-2020

Department assigned to the subject: Mathematics Department

Coordinating teacher: MORO CARREÑO, JULIO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I, Calculus II and Linear Algebra.

OBJECTIVES

By the end of this course, students will be able to:

1. Know and understand the mathematical principles of the Theory of Differential Equations, both Ordinary and in Partial Derivatives, underlying Energy Engineering.
2. Apply their knowledge and understanding of the mathematical principles to identify, formulate and solve problems in Differential Equations by using established methods.
3. Combine theory and practice to solve Differential Equations problems.
4. Know and understand the methods and procedures of the Theory of Differential Equations, its area of application and its limitations.

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 coefficients: 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 solving linear differential equations and systems.
4. Introduction to Partial Differential Equations.
 - a. Initial and boundary problems.
 - b. Examples of PDEs of Mathematical Physics.
 - c. Different kind of equations and data.
 - d. Classification of second order, linear PDEs.
5. Method of separation of variables.
 - a. Even, odd, and periodic extensions of a function. Trigonometric Fourier series.
 - b. Solving homogeneous and non-homogeneous PDEs 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

The learning methodology consists of:

- lectures covering the most important topics defined in the course programe.
- Participation at class solving proposed problems in group or individually on the blackboard.

ASSESSMENT SYSTEM

1. Control exams.
2. Final exam.

% 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
- Eduardo Colorado Memoria Docente. Ecuaciones Diferenciales en Derivadas Parciales, Bubok Publishing S.L. · ISBN: 978-84-686-6787-4, 2015
- 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
- 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

BASIC ELECTRONIC RESOURCES

- Eduardo Colorado . Memoria Docente. Ecuaciones Diferenciales en Derivadas Parciales:
https://www.researchgate.net/publication/290096364_Memoria_Docente_Ecuaciones_Diferenciales_en_Derivadas_Parciales?_sg=UlgBFHXYliOBav0-37-wmqn8uHAcwOLHdzja2eESrO1DtdxtoF1AMKc-ez7LrA-jSSkT4xMmUwQnGH2c7YqyBV9REOHUzVuiwgGQuQb.6EQ4F3CUPp7J0IJOCxso0vbhu74G3ESJgOG2WFwFXNKEuFOUPZ-gAwa_gfZPoSKJtkc2mb8FRrvada8XvCS1nw