Calculus III

Academic Year: (2022 / 2023) **Review date: 21-09-2022**

Department assigned to the subject: Mathematics Department

Coordinating teacher: CASTILLO RIVERA, SALVADOR

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I,
Calculus II,
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 Linear Differential Equations.
   a. Linear equations of order n with constant coefficients.
   b. Equations with variable coefficientes: undetermined coefficients and variation of constants

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 extensiones of a function. Trigonometric Fourier series.
   b. Solving homogeneous and non-homogeneous PDEs using separation of variables and 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.

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

- G.F. SIMMONS, S.G. KRANTZ Differential Equations, Theory, Technique and Practice, McGraw-Hill Companies Inc., 2007
- R. HABERMAN Elementary Applied Partial Differential Equations, Prentice Hall, 3rd. edition, 1998

ADDITIONAL BIBLIOGRAPHY

- C.H.EDWARDS Jr., D.E. PENNEY Ecuaciones Diferenciales Elementales y Problemas con Condiciones en la Frontera, 3ª edición, Prentice-Hall, 1993
- D.G. ZILL. Ecuaciones Diferenciales con Aplicaciones de Modelado,, Thomson, sexta edición, 1997
- 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.K. NAGLE, R. KENT, E.B. SAFF, A.D. SNIDER Fundamentals of Differential Equations, Pearson Addison-Wesley, 7th ed. 2008
- W.E. BOYCE, R.C. DI PRIMA. Ecuaciones Diferenciales y Problemas con Valores en la Frontera. , Limusa, 1998