Advanced Mathematics

Academic Year: (2019 / 2020)   **Review date: 19-03-2019**

Department assigned to the subject: Mathematics Department

Coordinating teacher: MOLINA MEYER, MARCELA

Type: Basic Core ECTS Credits : 6.0

Year : 2 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 should be familiar with the most important techniques in complex variable functions. Specifically, he/she should understand and manage the following basic concepts:

1. Elementary functions of one complex variable
2. Integration in the complex plane
3. Power series expansions
4. Apllications of the residue theorem

The course is complemented with some basic topics in ordinary differential equations:

1. Solution of first order differential equations.
2. Solution of higher order linear differential equations.
3. Use of Laplace transform to solve linear equations with constant coefficients.

DESCRIPTION OF CONTENTS: PROGRAMME

1. FUNCTIONS OF ONE COMPLEX VARIABLE:
Complex numbers. Analytic functions. Cauchy-Riemann equations. Harmonic functions. Power series and elementary functions. Complex integration. Cauchy's theorem and applications. Laurent series and calculus of residues. The residue theorem and applications.

2. ORDINARY DIFFERENTIAL EQUATIONS:
Initial and boundary value problems. Existence and y unicity. Elementary solution methods. Linear equations and systems. Laplace Transform and applications.

LEARNING ACTIVITIES AND METHODOLOGY

The docent methodology will include:

1. MASTER CLASSES, where the knowledge that the students must acquire will be presented. To make easier the development of the class, the students will have written notes and also will have the basic texts of reference that will facilitate their subsequent work.

2. RESOLUTION OF EXERCISES by the student that will serve as self-evaluation and to acquire the necessary skills.

3. PROBLEM CLASSES, in which the proposed problems are discussed and developed.

4. PARTIAL CONTROLS.

5. FINAL EXAM.

6. TUTORIALS.

ASSESSMENT SYSTEM

The evaluation will be based in the following criteria:

- Partial evaluation controls (40%).
- Final examination (60%).

% end-of-term-examination: 60

% of continuous assessment (assigments, laboratory, practicals…):   40

BASIC BIBLIOGRAPHY

- LEVINSON, N., REDHEFFER, R. M., Curso de Variable Compleja, Ed. Reverté, Madrid, 1990

- PESTANA, D., RODRÍGUEZ, J. M., MARCELLÁN, F. Curso Práctico de variable compleja y teoría de transformadas, Pearson Educación, 2014
- SIMMONS, G.F Y S.G. KRANTZ Ecuaciones Diferenciales, Teoría, técnica y práctica, Ed. McGraw-Hill, México, 2007

ADDITIONAL BIBLIOGRAPHY

- CHURCHILL, R.V. y BROWN, J.W. Variable Compleja y Aplicaciones, Ed. McGraw-Hill, N.Y., 1992

- EDWARDS, C. H. Jr., PENNEY, D. E. Ecuaciones Diferenciales Elementales y Problemas con Condiciones en la Frontera, tercera edición, Ed. Prentice Hall México, 1993
- MARCELLÁN, F., CASASÚS, L., ZARZO, A. Ecuaciones Diferenciales, Problemas de Contorno y Aplicaciones, Ed. McGraw-Hill, Madrid, 1990
- NAGLE, R.K. Y SAFF, E.B. Fundamentos de ecuaciones diferenciales, segunda edición, Ed. Addison-Wesley, 1992

- PESTANA, D., RODRÍGUEZ, J. M., MARCELLÁN, F. Variable compleja, un curso práctico, Ed. Síntesis, 1999

- SPIEGEL, M.R. Variable compleja, Ed. McGraw-Hill, México, 1971

- VOLKOVYSKII, L.I., LUNTS, G.L. y ARAMANOVICH, I.G. A collection of problems in complex analysis, Ed. Dover, N.Y, 1991
- WUNSCH, A. D. Variable Compleja con Aplicaciones, segunda edición, Ed. Pearson Educación, México, 1999

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

BASIC ELECTRONIC RESOURCES

- Herbert Gross . Complex Variables, Differential Equations and Linear Algebra (only Chapter I and II):
https://ocw.mit.edu/resources/res-18-008-calculus-revisited-complex-variables-differential-equations-and-linear-algebra-fall-2011/part-i/