Differential Equations

Academic Year: (2022 / 2023) **Review date: 20-06-2022**

Department assigned to the subject: Mathematics Department

Coordinating teacher: MOSCOSO CASTRO, MIGUEL ANGEL

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I and II, Algebra

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.
d. Applications.
3. 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.
4. 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.
c. Complex form of Fourier series.
5. 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

AF1. THEORETICAL-PRACTICAL CLASSES. Knowledge and concepts students mustacquire. Receive course notes and will have basic reference texts.Students partake in exercises to resolve practical problems
AF2. TUTORING SESSIONS. Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher.Subjects with 6 credits have 4 hours of tutoring/ 100% on- site attendance.
AF3. STUDENT INDIVIDUAL WORK OR GROUP WORK.Subjects with 6 credits have 98 hours/0% on-site.
AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.
AF9. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course. It entails 4 hours/100% on-site
AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.
MD1. THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject`s main concepts are developed, while providing material and bibliography to complement

student learning
MD2. PRACTICAL CLASS. Resolution of practical cases and problem, posed by the teacher, and carried out individually or in a group
MD3. TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with teacher as tutor. Subjects with 6 credits have 4 hours of tutoring/100% on-site.
MD6. LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

ASSESSMENT SYSTEM

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

SE1. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course. The percentage of the evaluation is 50%.
SE2. CONTINUOUS EVALUATION. Assesses papers, projects, class presentations, and exercises throughout the course. The percentage of the evaluation is 50%.

REMARK: To pass the subject, the student MUST obtain at least 4 points out of 10 in the final exam.

BASIC BIBLIOGRAPHY

- J. C. Robinson An Introduction to Ordinary Differential Equations, Cambridge University Press, 2004

- Ll.N. Trefethen, A. Birkisson, and T. A. Driscoll Exploring ODEs, Society for Industrial and Applied Mathematics, 2018

- R. Haberman Elementary applied partial differential equations, Prentice Hall, 1998

ADDITIONAL BIBLIOGRAPHY

- B. M. Budak, A. A. Samarskii AND A. N. Tikhonov A Collection of Problems on Mathematical Physics, Pergamon Press, 1964

- G.B. Whitham Linear and Nonlinear Waves, John Wiley & Sons, 1999

- James C. Robinson Ordinary Differential Equations, Cambridge, 2013

- S. G. Krantz Differential Equations: Theory, Technique and Practice, Chapman and Hall/CRC Press, 2015