Integration and Measure

Academic Year: (2022 / 2023) **Review date: 18-05-2022**

Department assigned to the subject: Mathematics Department

Coordinating teacher: ROMERA COLMENAREJO, ELENA

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear Algebra (Course : 1 Semester : 1),
Differential Calculus (Course : 1 Semester : 1),
Integral Calculus (Course : 1 Semester : 2),
Vector Calculus (Course : 1 Semester : 2).

OBJECTIVES

To introduce the student in the study of modern integration methods, in particular the Lebesgue integral.
To know the convergence theorems on integration and the functional L^p spaces.
To apply these results to the differentiation of parametric integrals and in particular to the Fourier and Laplace transforms.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Integrals over curves and surfaces
2. Green's, Stokes' and Gauss' theorems
3. Set measure
4. The Lebesgue Integral
5. Monotone and dominated convergence
6. Lp spaces
7. Parametric integrals
8. Integral transforms: Laplace and Fourier

LEARNING ACTIVITIES AND METHODOLOGY

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THEORETICAL-PRACTICAL CLASSES. [44 hours with 100% classroom instruction, 1.76 ECTS]
Knowledge and concepts students must acquire. Student receive course notes and will have basic reference texts to facilitate following the classes and carrying out follow up work. Students partake in exercises to resolve practical problems and participate in workshops and evaluation tests, all geared towards acquiring the necessary capabilities.

TUTORING SESSIONS. [4 hours of tutoring with 100% on-site attendance, 0.16 ECTS]
Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher.

STUDENT INDIVIDUAL WORK OR GROUP WORK [98 hours with 0 % on-site, 3.92 ECTS]

FINAL EXAM. [4 hours with 100% on site, 0.16 ECTS]
Global assessment of knowledge, skills and capacities acquired throughout the course.

METHODOLOGIES

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.

PRACTICAL CLASS. Resolution of practical cases and problems, posed by the teacher, and carried out individually or in a group.

TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with a teacher as tutor.

ASSESSMENT SYSTEM

EVALUATION SYSTEMS

SE1 - FINAL EXAM. [60 %]
Global assessment of knowledge, skills and capacities acquired throughout the course.

SE2 - CONTINUOUS EVALUATION. [40 %]
Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course.

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

BASIC BIBLIOGRAPHY

- Folland, G.B. Fourier Analysis and its Applications, Wadsforth & Brooks/Cole, 1992
- Marsden, J.E., Tromba, A,J. Vector Calculus, W.H. Freeman and Company, 2003
- Rudin, W. Real and complex Analysis, Mc Graw-Hill (International Student Edition), 1970

ADDITIONAL BIBLIOGRAPHY

- Apostol, T.M. Mathematical Analysis, Addison-Wesley, 1974
- Bauer, H. Measure and Integration Theory, Walter De Gruyter, 2001
- Beerends, R.J., ter Morsche, H.G., vanden Berg, J.C., van de Vrie, E.M. Fourier and Laplace Transforms, Cambridge University Press, 2003
- Bogachev, V.I. Measure Theory, Volume I, Springer, 2007
- Gamkrelidze (Ed.) Analysis I (Encyclopaedia of Mathematical Sciences, Volume 13), Springer-Vergal, 1989
- Leadbette, R., Cambanis, S., Pipiras, V. A basic course in measure and probability, Cambridge University Press, 2014
- Pao, K., Soon, F., Marsden, J.E., Tromba, A.J. Vector Calculus (Solved Problems), W.H.Freeman & Co Ltd, 1989
- Pestana, D., Rodriguez, J.M., Marcellán, F. Curso Práctico de Variable compleja y teoría de transformadas, Pearson, 2014