

Integral Calculus

Academic Year: (2022 / 2023)

Review date: 27-07-2021

Department assigned to the subject: Mathematics Department

Coordinating teacher: DI COSMO , FABIO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Fundamentals of Algebra (Course 1 - Semester 1)

Linear Algebra (Course 1 - Semester 1)

Differential Calculus (Course 1 - Semester 1)

DESCRIPTION OF CONTENTS: PROGRAMME

1. Antiderivatives and the indefinite integral

Linearity property. Basic integrals. Initial value problem.

Techniques of integrations: Substitution method and integration by parts, the method of partial fractions. Trigonometric integrals and irrational expressions.

Strategies for integration.

2. The Riemann-Stieltjes integral

Definition and existence of the integral.

Properties of the integral. Change of variable.

Fundamental theorem of Calculus. Remainder term of Taylor polynomial.

Applications: Area, volume, density, average value, center of mass, work and energy.

Uniform convergence and integration.

Numerical integration: The trapezoid rule and Simpson's rule.

3. Integration of vector value functions.

Area between two curves. Arc length and area of surface of revolution.

Improper integrals. Applications: Probability and integration.

Integrals depending on parameters. Differentiation of integrals. Some special functions.

4. Integration in several variables.

Fubini's theorem. Integration over non-rectangular regions.

Mean value theorem. Application of multiple integrals.

Improper integrals. Integrals depending on parameters.

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

Final Exam: 60%. Global assessment of knowledge, skills and capacities acquired throughout the course.

Continuous Evaluation: 40%. Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course.

% end-of-term-examination:	60
% of continuous assessment (assignments, laboratory, practicals...):	40

BASIC BIBLIOGRAPHY

- A. Zorich Mathematical Analysis, Springer-Verlag (Volume I and II), 2004
- J. Rogawski and C. Adams Calculus: Early Transcendentals, W. H. Freeman and Company (Third Edition Volume I and II), 2015
- J.E.Marsden, J.Tromba Vector Calculus, W.H.Freeman and Company (Sixth Edition), 2012
- W. Rudin Principles of Mathematical Analysis, McGraw-Hill (Third Edition), 1976

ADDITIONAL BIBLIOGRAPHY

- D. Pestana, J.M. Rodríguez, E. Romera, E. Touris, V. Álvarez, and A. Portilla Curso Práctico de Cálculo y Precálculo, Ariel, 2007
- I.I Liashkó, A.K: Boiarchuk, Iá.G. Gai, G.P. Golovach Matemática Superior. Problemas Resueltos, URSS, 1999
- J. Steward Single and multivariable calculus, Cengage Learning (7th Edition), 2011
- M. Spivak Calculus, Publish or Perish, 2008
- S.L. Salas, G.J. Etgen, E. Hille Calculus: One and Several Variables, (10th Edition) John Wiley and Sons, 2007
- V.A. Ilyin, E.G. Poznyak Fundamentals of mathematical analysis, Mir, 1982