UAB
Universitat Autònoma de Barcelona

Multi-Variable Calculus

Code: 104387
ECTS Credits: 6

2024/2025

Degree	Type	Year
2503740 Computational Mathematics and Data Analytics	FB	1

Contact

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Prerequisites

Calculus in one real variable. Linear Algebra.

Teaching groups languages

You can view this information at the end of this document.

Objectives and Contextualisation

See the catalan document.

Learning Outcomes

1. CM01 (Competence) Work intuitively, geometrically and formally with the notions of limit, derivative and integral.
2. CM03 (Competence) Contrast the use of calculus with the use of abstraction in algebra and analysis to solve a real problem.
3. CM04 (Competence) Explain ideas and concepts of fundamental mathematics, communicating one's own reasoning to others.
4. KM01 (Knowledge) Identify the essential ideas of the proofs of some basic algebra and calculus theorems.
5. SM01 (Skill) Write small mathematical texts (exercises, solving theoretical questions, etc.) in an orderly and precise manner.
6. SM02 (Skill) Handle inequalities, number sequences and derivatives and integrals of functions in one and several variables.

Content

FIRST PART. **DIFERENTIAL CALCULUS**

- Basic geometric and topological notions in the Euclidean space. Limits
- Functions defined in R ^ n. Limits and continuity. Graphs and level sets.

- The concept of differentiability. Partial derivatives and directional derivatives.
- Local maximum and minimum of functions.
- Derivatives of a higher order. Taylor's formula
- Inverse function theorem. Implicit function theorem.
- Optimization subjected to constraints.. The Lagrange Multipliers Theorem

SECOND PART. INTEGRAL CALCULUS

- Riemann Integral of functions bounded in rectangles. Basic properties.
- Fubini's Theorem.
- Integration oon bounded sets.
- Chance of variable theorem. Meaning of the Jacobian.
- Elements of length and area, computation in noneuclidean coordinates. Integration on curves and surfaces.
- The classical theorems of Vector Analysis.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exams	6	0.24	
Problems sessions	10	0.4	
Theoretical sessions	27	1.08	
practice Sessions	12	0.48	
Type: Supervised			
Supervised problems	10	0.4	
Supervision	5	0.2	
Type: Autonomous			
Deliberations on the concepts treated in the classroom	35	1.4	
Homework	45	1.8	

Thirty sessions of theory, 11 of problems and 12 of practices with adequate software will be carried out.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Homework	5	0	0	CM01, CM03, CM04, KM01, SM01, SM02
Midterm exam	40	0	0	CM01, CM03, CM04, KM01, SM01, SM02
Midterm exam	40	0	0	CM01, CM03, CM04, KM01, SM01, SM02
Practice skills	15	0	0	CM01, CM03, CM04, KM01, SM01, SM02

Partial exams, evaluation of practices and delivery of problems.

Studnets can also ask for a unique evaluation.

Bibliography

- *Cálculo Vectorial.* J.E. Marsden y A.J.Tromba, Addison Wesley Longman
- Teacher notes.

Software

Sagemath

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	1	Catalan	second semester	morning-mixed
(SEM) Seminars	1	Catalan	second semester	morning-mixed
(TE) Theory	1	Catalan	second semester	morning-mixed