

27006 - Calculus II

Syllabus Information

Academic year: 2023/24

Subject: 27006 - Calculus II

Faculty / School: 100 - Facultad de Ciencias

Degree: 453 - Degree in Mathematics

ECTS: 15.0

Year: 2

Semester: Annual

Subject type: Compulsory

Module:

1. General information

The object of this module is the differential and integral calculus of functions of several variables, with attention to both the practical part and the theory. In particular: limits, continuity and differentiability; Taylor's formula, the study of extreme points; implicit function theorem; extreme points on manifolds; integration in \mathbb{R}^n , change of variable and Fubini's theorem; integration of functions and 1-differential forms on paths; integration of functions and 2-differential forms on surfaces.

The approaches and objectives of this module are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda; the learning activities could contribute to some extent to the achievement of the goals 4 (quality education), 5 (gender equality), 8 (decent work and economic growth), and 10 (reducing inequality).

2. Learning results

- Understand the algebra and the topology of \mathbb{R}^n .
- Comprehend the notion of differentiability, compute partial derivatives using the chain rule, and use the implicit function theorem.
- Compute and study the extreme values of functions in open subsets and manifolds in \mathbb{R}^n .
- State and compute multiple integrals, line integrals and surface integrals.
- Know the applications to other fields the notions of partial derivatives and multiple, line, and surface integrals.
- Handle software to solve problems and give geometric interpretations to the notions involved in the course.

3. Syllabus

1. Algebraic and topological properties in \mathbb{R}^n .
2. Functions of several real variables. Limits and continuity.
3. Partial derivatives and differentiability of real-valued and vector-valued functions. Higher order partial derivatives. Functions of class C^p .
4. Taylor's formula. Application to the study of extreme points.
5. Implicit and inverse function theorems, change of variables.
6. Extreme points on manifolds and the Lagrange multipliers rule.
7. Integration in \mathbb{R}^n . Differentiation under integral sign, change of variable and Fubini's theorem.
8. Integration of functions and 1-differential forms on paths. Poincaré's lemma.
9. Integration of functions and 2-differential forms on surfaces in \mathbb{R}^3 . Riemann-Green, Gauss-Ostrogradski and Stokes theorems.

4. Academic activities

Master classes: 102 hours.

Problem solving: 40 hours.

Computer classes: 8 hours.

Study: 210 hours.

Assessment tests: 15 hours.

5. Assessment system

There will be an assessment for each term. In order to pass the course it will be needed to pass each one of both terms. With this requisite, the final mark of the course will be the mean of the marks in both terms.

During the course there will be several short examinations and a global exam of the contents in each term. There will also be practical computer sessions.

The dates and the contents covered in each short examination will be announced in advance. It is estimated that there will be two short examinations in each term, although this number might change if the circumstances so require. The short examinations marks will have a total weight of 20 percent in the mark of the corresponding term.

There will be a global exam for the first term in January, in the date fixed by the Faculty of Sciences.

In each period of exams (May or June the first, June or July the second), in the dates fixed by the Faculty of Sciences, there will be a global exam for the first term and a global exam for the second term. There will be a computer practical exam with a computer for those who did not pass this part in the practical computer sessions during the course.

The mark of a passed term will be kept during the academic year. Those students who pass one of the terms will not have to take an exam of that term any more.

In no case the students' right, according to present regulation, to pass the course by taking one final global exam will be violated.