

## 27059 - Mathematical Analysis III

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 27059 - Mathematical Analysis III

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 647 - Degree in Mathematics

**ECTS:** 7.5

**Year:** 2

**Semester:** First semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The object of this module is the differential 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.

### 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  $\mathbb{R}^n$ .
- 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.

### 4. Academic activities

Master classes: 51 hours.

Problem solving: 20 hours.

Computer classes: 4 hours.

Study: 105 hours.

Assessment tests: 7.5 hours.

### 5. Assessment system

There will be a global exam in each of the exam periods (may/june and june/july), on the day agreed by the Faculty of Sciences. In these exams there will be a theoretical part, which will provide a mark  $T_1$  from 0 to 2 points. There will also be a practical part, which will provide a mark  $P$  from 0 to 8 points.

During the course there will be several short examinations. 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, although this number might change if the circumstances so require. The short examinations will provide a mark  $T_2$  from 0 to 2 points.

The work carried out in the (mandatory) computer practices will also be evaluated. Alternatively, 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 final grade will be  $C = \max(T_1, T_2) + P$ .

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

### 6. Sustainable Development Goals

4 - Quality Education

5 - Gender Equality  
8 - Decent Work and Economic Growth