Universidad Zaragoza

Year : 2019/20

27001 - Calculus I

Syllabus Information

Academic Year: 2019/20
Subject: 27001 - Calculus I
Faculty / School: 100 -

Degree: 453 - Degree in Mathematics

ECTS: 13.5
Year: 1
Semester: Annual
Subject Type: Basic Education
Module:

1.General information

1.1.Aims of the course

The course and the foreseen results correspond to the following setting and goals:

It is a basic course in the degree. The goal is that the student understands which kind of problems require the use of one variable calculus and how to make use of it to deal with this kind of problems.

1.2.Context and importance of this course in the degree

The course is included in the module of Initiation to Mathematical Analysis. It is advisable to have passed this course before continuing with other courses in this module. As a basic course, the knowledge of the contents in Mathematical Analysis I is convenient for most of the courses in later courses.

1.3.Recommendations to take this course

It is advisable the presence in the theoretical and practical lecures and work in a continuous way with the material, notes, scripts for practical lectures, and problem sheets provided by the instructor. It is also advisable to make use of individual tutorization, the schedule of which will be provided at the beginning of the course. the people who cannot follow the course in a presential way must inform the instructor and will be evaluated with exams corresponding to the official period in June.

2.Learning goals

2.1.Competences

After passing this course the student will be more competent to...

Develop in the handle of the goals described in the Learning outcomes section.

Among the general competences that the student graduated in mathematics acquires, we point out the following:

CG1. Having and comprehending knowledge in the area of Mathematics in a level that, starting from the education acquired in secondary studies, makes use of advanced texts and includes some aspects that imply knowledge from the vanguard in the study of Mathematics.

CT3. Distinguish, when in front of a problem, what is substantial and what is accesory. Formulate conjectures and reason in order to confirm them or refute them. Identify mistakes in incorrect reasonings, and so on.

CE1. Understand and make use of the mathematical language and methods. Know rigurous proofs of basic theorems in different branches of Mathematics.

CE3. Solve mathematical problems by basic calculus skills and other techniques.

2.2.Learning goals

In order to pass this course, the student must show the following:

He/She knows how to handle inequalities, sequences, and series.

He/She analizes and draws graphs of functions, deduces properties of a function from its graph, understands and works in an intituitive, geometric, and formal way with the notions of limit, derivative, and integral.

He/She computes derivatives of functions by using the chain rule.

He/She computes and studies extrem values of functions.

He/She computes integrals of functions.

He/She solves problems that imply the use of integration (computation of lengths, areas, volumes, areas of revolution bodies, and so on).

He/She understands the use of power series and their convergence.

2.3.Importance of learning goals

They provide a basic formation in the degree (see the Context and meaning of the subject in the degree).

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student will have to show that he has acquired the foreseen learning outcomes by the means of the following evaluation activities:

The course is divided in theoretical contents, problems, and practical sessions with a computer.

The evaluation of the theoretical part and the problems will have two parts: evaluation during the course and the exams. For the final mark, the evaluation during the course will be counted as a ten per cent. The exams will consist of a partial exam at the end of the first 4-months period and a final exam, both of them including theoretical contents and problems.

In the same way, there will be an exam regarding the practical sessions with the computer for those students who did not pass these practical sessions with their work in the class.

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving sessions, tutorials and autonomous work and study.

4.2.Learning tasks

This course is organized as follows:

- **Lectures**.
- **Problem-solving sessions**.
    - Also, smaller problem-solving sessions split in smaller groups will be held with the use of computers.
- **Tutorials**. Individual office hours requested by the student.
- **Autonomous work and study**.
- **Assessment tasks**. Mid-term exam and final exam.

4.3.Syllabus

This course will address the following topics:

- **Topic 1. Real numbers.**
    - Inequalities.
- **Topic 2. Sequences of real numbers**.
    - Convergence.
    - Computation of limits.
- **Topic 3. Series of real numbers**.
    - Series of non-negative terms.
    - Convergence criteria.

    - Series of any kind of terms.
    - Methods to sum series.
- **Topic 4. Continuity**.
    - Limits of functions.
    - Continuous functions.
    - Properties.
    - Weierstrass, Bolzano and Darboux theorems.
    - Classification of discontinuities.
- **Topic 5. Differentiability**.
    - Differentiation rules.
    - Rolle's and Mean Value theorem.
    - Extreme values of functions.
    - L'Hopital's rule.
    - Taylor's and Young's theorems.
    - Applications.
- **Topic 6. Integration**.
    - Riemann's integral.
    - Properties of the integral.
    - Fundamental theorems of Integral Calculus.
    - Applications of Integral Calculus.
    - Improper integrals.
- **Topic 7. Power series**.
    - Convergence of power series.
    - Differentiability and integrability of power series.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=27001&year=2019