UAB

Universitat Autònoma de Barcelona

2018/2019

Functions of a Real Variable

Code: 100087
ECTS Credits: 12

Degree	Type	Year	Semester
2500149 Mathematics	FB	1	A

Contact

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Use of languages

Principal working language: catalan (cat)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Josep Maria Burgués Badía

Francesc Mañosas Capellades

Joaquin Martin Pedret

Laura Prat Baiget

Albert Clop Ponte

Prerequisites

It is essential that the students are able to handle with algebraic manipulation of fractions, expressions that contain roots and powers, resolution of linear systems and basic arithmetic of numbers and polynomials. It is also recommended to know the elementary properties of trigonometrical functions. Finally, we hope that the student can do, without much difficulty, the graphic representation of relatively simple functions of one variable. We also presume that the person who attends this course is familiar with logical reasoning and who knows how to deny sentences or proposals.

The most important requirement is, however, a great curiosity to understand and deepen the concepts that will be studied.

Objectives and Contextualisation

The objective of the subject is that the student learns solidly the basic concepts of the Infinitesimal Calculus: functions of discrete variable (sequences) or continuous, the concepts of limit, derivative and the theory of integration. It is also a basic objective to achieve a certain skill in the manipulation and calculation of limits, derivatives and integrals and to know how to apply the fundamental theorems of this theory. Finally, there is also a generic educational objective: that the student begin to develop the ability to analyze and to reason rigorously.

Content

I. The real line.

II. Sequences of real numbers.

- Sequences. Limit. Monotonicity
- Accumulation points. Subsequences.
- The Bolzano-Weierstrass theorem
- Cauchy sequences.

III. Continuïty of one variable functions.

- Functions of one variable. Limits.
- Continuïty..
- Bolzano and Wierstrass theorems
- Monotone functions. Inverse function.

IV. Differential Calculus.

- Derivative of a function at a point. Derivative of a function. Algebraic properties.
- The chain's rule. Derivative of the inverse.
- Critical points, maxima and minima.
- Rolle's theorem. Mean value theorem. L'Hopital's rule.

V. Aproximation by Taylor's polinomial

- Contact order between fonctions
- Taylor polynomial. Properties
- Local study of a function.

VI. Riemann integral

- Computing areas. Lower and upper sums. Integrability. Integral
- Fundamental Theorem of Calculus
- Calculation of primitives
- Geometric and phisic applications of the integral