

Mathematical Analysis I

Calendar: 1st day semester

Contact Hours: 30h00 T + 22h50 PL + 15h00 O

Scientific Area: Matemática e Informática

Learning outcomes of the curricular unit

The goal is to carry on developing the mathematical reasoning initiated in secondary education, to be able to meet the demands of other curriculum units. On completing the curriculum unit, the students should have acquired the necessary skills in differential calculus and integration of functions of one variable, including the fundamental theorems of calculus.

Syllabus

Limits and continuity: Basics on real valued functions. Exponential and logarithmic function. Trigonometric inverse functions. Continuity and limit. Mean Value and Weierstrass Theorems.

Differential calculus: Derivative concept, rules; differentiability and continuity; higher order derivatives, applications. Rolle's, Lagrange's, Cauchy's and L'Hôpital's Theorem. Taylor's formula and its applications.

Integral calculus: Antiderivatives by inspection, by parts, by substitution and integration of rational functions. Integral calculus of real functions. Integrability conditions; properties of integrable functions. Indefinite integral, derivative of an indefinite integral, Fundamental Theorem of Calculus, Barrow's formula. Integration by parts and by substitution. Application of integral calculus to the computation of area, volume of revolution solids and curve length. Moments, center of mass and centroids.

Demonstration of the syllabus coherence with the curricular unit's objectives

The syllabus let the student learn the differentiation and integration techniques to functions of one variable.

Teaching methodologies (including evaluation):

Theoretical classes with lecturing periods with application examples followed by small tasks to be done by the students in order to consolidate the contents previously taught. Practical classes dedicated to problem solving, individually or in small groups.

The assessment will be done through a final written exam or, alternatively by student option, by two written tests each one contributing 50% to the final assessment.

Demonstration of the coherence between the teaching methodologies and the learning outcomes.

The teaching methodology, rather focused on problem solving, fulfills the purpose of giving the students the ability of applying calculus techniques that will be useful in other contexts.