

Mathematical Analysis I

Calendar: 1 st semester

Calendar: 60h TP + OT 15h

Scientific Area: Matemática e Informática

Learning outcomes of the curricular unit

The goal is to carry on developing the mathematical reasoning initiated in highschool education, in order to be able to meet the demands of other curricular units. On completing this curricular unit, 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

Os conteúdos permitem ao estudante aprender as técnicas de diferenciação e integração de funções de uma variável.

Teaching methodologies (including evaluation):

Aulas teóricas intercalando períodos de exposição de conteúdos com exemplos de aplicação e proposta de pequenas tarefas para os estudantes, para consolidação dos conhecimentos adquiridos. Aulas práticas dedicadas à resolução de exercícios propostos previamente, individualmente ou em pequenos grupos.

A avaliação será feita através de um exame final escrito ou, alternativamente por opção do estudante, realização de dois testes escritos a contribuir, cada um, com 50% da avaliação final.

Demonstração da coerência das metodologias de ensino com os objectivos de aprendizagem da unidade curricular

A metodologia de ensino, bastante vocacionada para a resolução de exercícios práticos, permite atingir o objectivo de dotar os estudantes de capacidade de aplicação de técnicas de cálculo que lhes serão úteis noutros contextos.

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.