Mathematical Analysis I

Calendar: 1st day semester

Contact Hours: TP 60h; OT 15h

Scientific Area: Mathematics and computer science

Intended learning outcomes (knowledge, skills and competences to be developed by the students):

The goal is to carry on developing the mathematical reasoning initiated in high school 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.

Evidence of the syllabus coherence with the curricular unit's intended learning outcomes:

The syllabus of the curricular unit allows the student to be familiarized with differentiation and integration techniques of functions of one variable, to be able to use them when requested in other specific curricular units of the course.

References:

Apostol, T. (1967). Calculus, Vol. I, second edition, Wiley.

Campos Ferreira, J. (2005). Introdução à Análise Matemática, Fundação Gulbenkian, 8a ed.

Larson, Hostetler e Edwards. (2006). Cálculo, Vol. 1, 8ª edição, McGraw-Hill.

Piskounov, N. (1997). Cálculo Diferencial e Integral, Vol. I,. Lopes da Silva Editora.

Sarrico C. (1997). Análise Matemática, Leitura e exercícios, 1ª edição, Gradiva.

Demidovitch B. (1997). Problemas e Exercícios de Análise Matemática, Editora Mir.

Ferreira M.; Amaral I. (1996). Matemática, Exercícios, Primitivas, Integrais, edições sílabo