Mathematical Analysis II

Calendar: 2nd day semester

Contact Hours: TP 60,0h; OT 15,0h

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 Mathematical Analysis I and apply it, in this case, to functions of several variables, 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 several variables, including the fundamental theorems of calculus. They should be able to solve some differential equations that appear in several applications of engineering as well.

Syllabus:

Functions of several variables: Domains; graphs. Topological notions. Limits in R2: geometric interpretation, concept, theorems. Continuity in Rn. Directional derivatives and its geometric interpretation. Partial derivatives and its geometric interpretation. Partial derivatives of higher order. Differentiability. Theorems on differentiability. Chain rule. Study of maxima and minimum of functions in Rn. Method of Lagrange multipliers. Multiple integrals: Double integrals. Applications to mechanics (mass, inertia moments). Interpretation of a double integral as a volume. Change of variable (polar coordinates). Triple integrals. Change of variables (cylindrical and spherical coordinates).

Differential equations: Definitions. First order differential equations. Change of variable in differential equations. N-th order differential equations. Linear differential equations with constant coefficients: complete and homogeneous. Applications.

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

The syllabus let the student extend the differentiation and integration techniques already taught in Mathematical Analysis I to functions of several variables. The student will also approach some types of differential equations and will learn how to model certain real phenomena.

References:

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

Azenha, A. e Jerónimo, M. A. (1995). Cálculo Diferencial e Integral em Rn. McGrawHill.

Apostol T. (1967). Calculus, Vol.I e II, Wiley.

Elon Lages, L. (1992). Curso de Análise, IMPA, Rio de Janeiro.

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