Mathematical Analysis II

Calendar: 2nd semester

Contact Hours: TP – 60,0; OT - 15,0

Scientific Area: Matemática e Informática

Learning outcomes of the curricular unit
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 also be able to solve some differential equations that appear in several applications of engineering

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. Stationary points in em 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.

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

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.

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.