**SAINT-ETIENNE
SCHOOL OF
ECONOMICS**

Quantitative methods III

Level: Bachelor's degree - Second year - L2
Semester: S3
Hours: 18 hours of lectures (CM) and 18 hours of practical work (TD)
Lecturer: Laurence GRAMMONT
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Course objectives:
The aim of this course is to study functions of several variables, with the main to find the possible extrema of these functions. To achieve this objective, a number of mathematical a number of mathematical notions. We'll start with functions in one variable. The mathematical concepts required to construct the construction of optimization results.
We will then generalize what we have seen in the case of one variable to two or more variables.
A number of fine-grained mathematical notions will be presented, leading to optimization theorems and methods for finding extrema.

Course outline:
1. One-variable numerical function
2. Reminder of linear algebra Diagonalization
    Eigenvalues, Eigenvectors
    Diagonalizable matrices
3. Functions of two variables
    Definition domain
    Representation of functions in two variables
    Distance, open, closed
    Limit and continuity
    First partial derivatives, gradient vector
    Differentiability, tangent plane and Taylor formula of order 1
    Derivatives of compound functions: chain derivation rule
    Homogeneous functions
    Second partial derivatives and Taylor formula of order 2
    Properties of symmetric matrices
    Convex and concave functions of IR2
4. Optimization
    Unconstrained optimization
    Constrained optimization
    Equality constraint
    Case of optimization on a closed system

Evaluation methods: Continuous assessment including two written exams.

Prerequisites (to be mentioned only if any): Linear algebra