The student who will attend and will be successfully examined in the System Optimization course will have acquired the basic knowledge of Mathematical Optimization theory that is essential to an Electrical and Electronic Engineer. He will be able to convert a physical optimization problem into a mathematical problem, categorize the kind of mathematical optimization problem he has to solve, choose the appropriate methodology for its solution and, and based on the outcome, will be able to take the right decisions and eventually design systems in an optimal manner. Optimization methodologies have very important applications in the field of Electrical and Electronic Engineering, in areas such as automatic control, telecommunications, signal processing, energy systems design etc. Having acquired all this knowledge base, students will be able to use and customize, if they wish, the optimization algorithms which can be found in popular mathematical software such as Matlab.

Part 1: Introduction to optimization theory
The concept of Optimization and its applications in Engineering Science. Conversion of a physical problem into a mathematical one.

Part 2: Linear Programming and Simplex Method
Linear optimization problems. Constraints in the form of linear inequalities and their graphic representation. Graphic solution. Simplex Method. The dual problem. The Transfer problem. The Assignment problem and the Hungarian method

Part 3: Convex Optimization
Local and global minima. Convex optimization and Quadratic Programming.

Part 4: Non-Linear Optimization Problems
Steepest descent method. Newton's Method. Levenberg-Marquardt method. Constrains. Lagrange Multipliers. Karush Kuhn Tucker conditions

Part 5: Multi-objective optimization
Weighting method. Solution dominance. Pareto front.

Part 6: Meta-heuristic optimization methods
Hill-climbing. Simulated annealing. Tabu search method. Evolutionary computation. Differential evolution.

Part 7: Project planning and scheduling
Project planning and scheduling (CPM and PERT methods)