Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
IND371	Operations Research I	5	4	0	0	4	5

Prerequisites	ING207
Admission Requirements	ING207

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	The aim of this course is to equip students with pertinent modeling and mathematical programming knowledge and skills for solving decision making problems.
Content	- Introduction - Stages of modeling - Introduction to linear programming - Graphical solution - Linear programming model - Assumptions of linear programming - Additional examples of linear programming - Simplex method - Algebra of the simplex method - Simplex method in tabular form - Artificial variables technique - Big M method - Two-phase method - Degeneracy; Alternative optimal solutions; Unbounded solution; Infeasible solution - Post-optimality analysis - Quiz I - Theory of the simplex method - Revised simplex method - Duality - Duality theory - Economic interpretation of duality - Complementary slackness theorem - Midterm - Presentation of an LP solver - Dual simplex method - Sensitivity analysis - Bounded variables technique - Transportation problem - Definition of the transportation problem - Finding an initial basic feasible solution - Transportation simplex method - Assignment problem - Quiz 2 - Network models - Terminology of networks - Shortest-path problem - Minimum spanning tree problem - Dynamic programming - Introduction - Principle of optimality - Examples of deterministic dynamic programming
References	- Hillier, F.S., Lieberman, G.J., Introduction to Mathematical Programming, McGraw-Hill, 1995. - Bazaraa, M.S., Jarvis, J.J., Sherali, H.D., Linear Programming and Network Flows, John Wiley & Sons, 1990. - Taha, H.A., Operations Research: An Introduction, Tenth edition, Pearson, 2017.

Theory Topics

Week	Weekly Contents
1	Stages of modeling; Introduction to linear programming; Graphical solution
2	Linear programming model; Assumptions of linear programming; Additional examples of linear programming
3	Simplex method; Algebra of the simplex method; Simplex method in tabular form
4	Artificial variables technique; Big M method; Two-phase method
5	Degeneracy, alternative optima, unbounded solution, infeasible solution; Post-optimality analysis
6	Theory of the simplex method; Revised simplex method
7	Duality; Duality theory; Economic interpretation of duality; Complementary slackness theorem
8	Midterm
9	Presentation of an LP solver; Dual simplex method
10	Sensitivity analysis; Bounded variables technique
11	Transportation problem; Finding an initial basic feasible solution; Transportation simplex method
12	Assignment problem
13	Network models; Terminology of networks; Shortest-path problem; Minimum spanning tree problem
14	Dynamic programming; Principle of optimality; Examples of deterministic dynamic programming