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

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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 - 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 1 - Theory of the simplex method - Revised simplex method - Duality - 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 densities operations in programming - Introduction - Principle of optimality - Examples of deterministic densities operations in programming - Introduction - Principle of optimality - Examples of deterministic densities operations in programming - Introduction - Principle of optimality - Examples of deterministic densities on the programming - Introduction - Principle of optimality - Examples of deterministic density of the programming - Introduction - Principle of optimality - Examples of deterministic density of the programming - Introduction - Principle of optimality - Examples of deterministic density of the programming			

- 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			