

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 | <ul style="list-style-type: none"> - 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 1 - 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 | <ul style="list-style-type: none"> - Hillier, F.S., Lieberman, G.J., Introduction to Mathematical Programming, McGraw-Hill, 1995. - Bazaraa, M.S., Jarvis, J.J., Sheralli, H.D., Linear Programming and Network Flows, John Wiley & Sons, 1990. - Taha, H.A., Operations Research: An Introduction, Sixth edition, Prentice-Hall, 1997. |

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 |

| Week | Weekly Contents |
|------|---|
| 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 |