Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
IND403	Network Models	7	3	0	0	3	4

Prerequisites	IND371
Admission Requirements	IND371

Language of Instruction	French
Course Type	Elective
Course Level	Bachelor Degree
Objective	The aim of this course is i) To ensure that the students learn the basic terminology related to graph theory, ii) To enable the student to evaluate how to model network flow problems that they may encounter in practice, iii) To enable the students to choose the appropriate method to solve a network flow model, and iv) To provide the students the ability to solve some special network flow problems encountered in practice. These problems, encountered in many areas such as production, logistics, supply chain, transportation, telecommunications, etc., can be modeled either directly or indirectly with network flow models, which are an important sub-branch of Operations Research. For this reason, the knowledge and skills to be acquired in this course will help graduate students both to solve the complex problems they will encounter in practice and to adapt to Industrial Engineering programs at the master's-doctoral level.
Content	1. Week: Course introduction 2. Week: Network models terminology 3. Week: Use of software for basic network models 4. Week: Minimum cost-flow problem 5. Week: Maximum flow problem 6. Week: Shortest path problem 7. Week: Assignment problem 8. Week: Midterm 9. Week: Minimum spanning tree problem 10. Week: Use of software for mixed-integer programming models 11. Week: Network simplex algorithm 12. Week: Traveling salesman problem 13. Week: Vehicle routing problem 14. Week: Project presentations
References	1. Ahuja, R.K., Magnanti, T.L., Orlin, J.L., “Network Flows: Theory, Algorithms, and Applications”, Prentice Hall, 1993. 2. Hillier, F.S., Lieberman, G.J., “Introduction to Operations Research”, McGraw-Hill, 2010. 3. Rosen, K.H., “Discrete Mathematics and Its Applications”, McGraw-Hill, 2007. 4. https://github.com/UfukBahceci/GraphUtilitiesPython 5. https://github.com/UfukBahceci/NetworkModelsLectureNotes

Theory Topics

Week	Weekly Contents
1	Course introduction
2	Network models terminology
3	Use of software for basic network models
4	Minimum cost-flow problem
5	Maximum flow problem
6	Shortest path problem
7	Assignment problem
8	Midterm
9	Minimum spanning tree problem
10	Use of software for mixed-integer programming models

Week	Weekly Contents
11	Network simplex algorithm
12	Traveling salesman problem
13	Vehicle routing problem
14	Project presentations