School of Engineering and Natural Sciences / Industrial Engineering (English)

2023 - 2024 Academic Year

NETWORK FLOWS and INTEGER PROGRAMMING

Syllabus

Course Description					
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
NETWORK FLOWS and INTEGER PROGRAMMING	IND3149140	Fall Semester	3+0	3	6

Prerequisites Courses	MODELLEME VE OPTİMİZASYONA GİRİŞ
Recommended Elective Courses	
Language of Instruction	English
Course Level	First Cycle (Bachelor's Degree)
Course Type	Required
Course Coordinator	Assoc.Prof. Yasin GÖÇGÜN
Name of Lecturer(s)	Assoc.Prof. Yasin GÖÇGÜN
Assistant(s)	
Aim	The students who succeeded the course will be able to identify and formulate Network problems; be able to identify and formulate Integer Programming problems; acquire basic skills to formulate and build integer and nonlinear programming models, and select and implement appropriate solution techniques.
Course Content	This course contains; A review of basic LP and introduction to Network Models, Transportation and transshipment models,Assignment models,Spanning tree Problems-Prim's algorithm, Kruskal's algorithm,Shortest Path Problems,Maximum Flow Problems Ford-Fulkerson Algorithm,,Multicommondity Flow, and network synthesis problems,Introduction to Integer Programming,Formulating Integer Programming Problems,Formulating (Mixed) Integer Programming Problems,Solving Integer Programming Problems- branch and bound method and cutting plane algorithm,Dynamic Programming-1,Dynamic programming -2,Review.

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
Students build transportation models	12, 13, 14, 6, 8, 9	A, E, G
Students build transshipment models.	12, 13, 14, 6, 8, 9	A, G
Students build assignment models.	12, 13, 14, 6, 8, 9	A, E
Students build network models using appropriate algorithms.	12, 13, 14, 6, 8, 9	E, G
Students solve integer programming models using appropriate algorithms	12, 13, 14, 19, 6, 8, 9	A, E, G
Students solve mathematical models using mathematical programming software.	12, 13, 14, 16, 6, 8, 9	A, E, G

Teaching Methods	12: Problem Solving Method, 13: Case Study Method, 14: Self Study Method, 16: Question - Answer Technique, 19: Brainstorming Technique, 6: Experiential Learning, 8: Flipped Classroom Learning, 9: Lecture Method
Assessment Methods	A: Traditional Written Exam, E: Homework, G: Quiz

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	A review of basic LP and introduction to Network Models	
2	Transportation and transshipment models	
3	Assignment models	
4	Spanning tree Problems-Prim's algorithm, Kruskal's algorithm	
5	Shortest Path Problems	
6	Maximum Flow Problems Ford-Fulkerson Algorithm,	
7	Multicommondity Flow, and network synthesis problems	
8	Introduction to Integer Programming	
9	Formulating Integer Programming Problems	
10	Formulating (Mixed) Integer Programming Problems	
11	Solving Integer Programming Problems- branch and bound method and cutting plane algorithm	
12	Dynamic Programming-1	
13	Dynamic programming -2	
14	Review	

Evaluation Methods	**Weight(%)**
Midterm Exam	30
General Exam	70

Resources

Taha, Hamdy A., Operations Research, 8th edition, 2007. ISBN: 0131360140;

Bazaraa M.S., Jarvis J.J., Sherali H.D., Linear Programming and Network Flows, 3 th Edition, ISBN 978-0-470-46272-0Ahuja R.K., Magnanti T.L., Orlin B.J.; Network Flows Theory, Algorithms, and Applications, Prentice Hall. ISBN-13: 978-0136175490

Winston, Wayne L., Operations Research: Applications and Algorithms, 4th edition, 2003. ISBN-13: 978-0534380588