

<b>Course Description</b>					
<b>Name</b>	<b>Code</b>	<b>Semester</b>	<b>T+A Hour</b>	<b>Credit</b>	<b>ECTS</b>
NETWORK FLOWS and INTEGER PROGRAMMING	IND3149140	Fall Semester	3+0	3	6
<b>Prerequisites Courses</b>	MODELLEME VE OPTİMİZASYONA GİRİŞ				
<b>Recommended Elective Courses</b>					
<b>Language of Instruction</b>	English				
<b>Course Level</b>	First Cycle (Bachelor's Degree)				
<b>Course Type</b>	Required				
<b>Course Coordinator</b>	Assoc.Prof. Yasin GÖÇGÜN				
<b>Name of Lecturer(s)</b>	Prof.Dr. Hakan TOZAN				
<b>Assistant(s)</b>					
<b>Aim</b>	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, select and implement appropriate solution techniques; and acquire the skill of using mathematical programming software such as GAMS, CPLEX and etc.				
<b>Course Content</b>	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, Multicommodity 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, Nonlinear programming, Lagrange multipliers and Kuhn-Tucker conditions to solve constrained nonlinear programming.				
<b>Course Learning Outcomes</b>			<b>Teaching Methods</b>	<b>Assessment Methods</b>	
identify and build transportation models			1, 12, 14, 15, 4, 6	A, C, E	
identify and build transshipment models.			1, 12, 14, 15, 4, 6	A, E	
identify and build assignment models.			1, 12, 14, 15, 4, 6	A, C	
identify and build network models and solve them using appropriate algorithms			1, 12, 14, 15, 4, 6	C, E	
identify and build integer programming models and solve them using appropriate algorithms			1, 10, 12, 14, 15, 4, 6	A, C, E	
identify and build nonlinear programming models and solve them problems using appropriate algorithms.			1, 12, 14, 15, 4, 6	A, C, E	
solve mathematical models using mathematical programming software, perform sensitivity analysis and report			1, 12, 14, 15, 2, 4, 6	A, C, E	
<b>Teaching Methods</b>	1: Lecture, 10: Brainstorming, 12: Case study, 14: Self-Study, 15: Problem solving, 2: Question - Answer, 4: Exercise, Practice, 6: Role Model, Making an example				
<b>Assessment Methods</b>	A: Written Exam, C: Homework, E: Quiz				
<b>Lecture Schedule</b>					
<b>Sequence</b>	<b>Topics</b>	<b>Preliminary Preparation</b>			
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	Multicommodity 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				
13	Nonlinear programming				
14	Lagrange multipliers and Kuhn-Tucker conditions to solve constrained nonlinear programming				
<b>Evaluation Methods</b>		<b>Weight(%)</b>			
Midterm Exam		30			
General Exam		70			

<b>Resources</b>
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 (Course notes and other material may be provided by the instructor)