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

2024 - 2025 Academic Year

INTRODUCTION to MODELLING and OPTIMIZATION

Syllabus

Course Description					
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
INTRODUCTION to MODELLING and OPTIMIZATION	IND2249050	Spring Semester	3+2	4	8

Prerequisites Courses	LİNEER CEBİR; LİNEER CEBİR VE DİFERANSİYEL DENKLEMLER
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 aim and objective of this course are to teach. how to formulate and analyze mathematical models (with selected real-world applications)and, mathematical tools to handle linear programming and network problems (the simplex method, duality, sensitivity analysis, and related topics, network models, and project scheduling).
Course Content	This course contains; Introduction to Model Building,Basic Linear Algebra,Introduction to Linear Programming,Convex Sets and Functions, Extreme Points and Optimality, Graphical Solution,Graphical Sensitivity Analysis and Computer Based Solutions,Simplex Algorithm,Simplex Algorithm: Artificial Starting Solutions,Simplex Algorithm: Artificial Starting Solutions and Special Cases in Simplex,Revised Simplex ,Special Simplex Implementations: Karus-Kuhn-Tucker Optimality Conditions,Duality and Sensitivity,Duality and Sensitivity: Dual Simplex,Transportation and Assignment Problems-1,Transportation and Assignment Problems-2.

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
Students define modeling concepts.	12, 13, 14, 16, 6, 8, 9	A, E, G, H
Students analyze mathematical models.	12, 13, 14, 16, 6, 8, 9	A, E, H
Students formulate problems using linear programming.	12, 14, 16, 21, 6, 8, 9	A, G
Students implement the Simplex algorithm.	12, 14, 16, 8, 9	G
Students define duality and sensitivity analysis.	12, 14, 16, 9	A
Students solve transportation and assignment models.	12, 14, 16, 6, 9	A

Teaching Methods	12: Problem Solving Method, 13: Case Study Method, 14: Self Study Method, 16: Question - Answer Technique, 21: Simulation Technique, 6: Experiential Learning, 8: Flipped Classroom Learning, 9: Lecture Method
Assessment Methods	A: Traditional Written Exam, E: Homework, G: Quiz, H: Performance Task

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	Introduction to Model Building	Examining the course textbook
2	Basic Linear Algebra	Examining the course textbook
3	Introduction to Linear Programming	Examining the course textbook
4	Convex Sets and Functions, Extreme Points and Optimality, Graphical Solution	Examining the course textbook
5	Graphical Sensitivity Analysis and Computer Based Solutions	Examining the course textbook
6	Simplex Algorithm	Examining the course textbook
7	Simplex Algorithm: Artificial Starting Solutions	Examining the course textbook
8	Simplex Algorithm: Artificial Starting Solutions and Special Cases in Simplex	Examining the course textbook
9	Revised Simplex	Examining the course textbook
10	Special Simplex Implementations: Karus-Kuhn-Tucker Optimality Conditions	Examining the course textbook
11	Duality and Sensitivity	Examining the course textbook
12	Duality and Sensitivity: Dual Simplex	Examining the course textbook
13	Transportation and Assignment Problems-1	Examining the course textbook
14	Transportation and Assignment Problems-2	Examining the course textbook

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

Resources
Taha, Hamdy A., Operations Research, 8th edition, 2007. ISBN: 0131360140Winston, 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)