YEDİTEPE UNIVERSITY
FACULTY OF ENGINEERING

COURSE DESCRIPTION FORM
2019/2020-1

COURSE INFORMATON				
Course Code	**ISE 222**	**Course Title**	**Operations Reseacrh 1**	
Semester	*Credits*	*ECTS*	*C +P + L Hour*	Prerequisites
2	**4**	**9**	**3+2**	**MATH 221**

Language of Instruction	**Course Level**	**Course Type**
English	Undergraduate	Core

Course Coordinator	
Instructors	Assoc. Prof. Dilek Tüzün Aksu
Assistants	Melike Yılmaz
Goals	This course aims to provide an introduction to the fundamental methods used in deterministic operations research with particular emphasis on modeling.
Content	Topics covered include introduction to linear programming (LP) and its applications, sensitivity analysis, algebraic solution of an LP, duality theorem, network models and modeling of integer programming (IP) problems and branch-and-bound method for solving IPs. Applications of deterministic models in various settings as well as modeling and solution of LPs using commercial software will also be discussed.
Contribution of the Course to the Professional Education	Students who take this course are able to build mathematical models to address problems they face in professional life. They also assume an active role in solving these problems and evaluate the results.

Course Learning Outcomes	**Detailed Program Outcomes**	**Teaching Methods**	**Assessment Methods**
Builds linear programs for optimization problems in different settings.	2a, 6c	1, 2, 3, 4	A, B, C, D
Solves linear programming models using graphical, algebraic and simplex methods.	1a,1b, 6c	1, 4	A, D
Makes sensitivity analysis and interpret results using the graphical method.	1a, 6c	1, 4	A, D

Defines the relationship between primal and dual problems, uses this relationship to obtain the optimal solution of linear programs and perform sensitivity analysis.	1a, 1b, 6c	1, 4	A, C, D
Identifies and models network flow problems that arise in different contexts such as transportation, assignment, maximum flow; solves these problems using problem specific methods.	2a, 2b, 6c	1, 2, 4	A, D
Models constraints and objective functions that can be formulated using integer variables.	2a, 6c	1, 2, 4	A, D
Can model linear and integer programming models using Excel Solver and GAMS and interpret the resulting outputs.	4a, 4b, 6c	1, 2, 3	A, C, D

Teaching Methods:	1: Lecture, 2: Lab Exercises, 3: Project, 4: Problem Solving
Assessment Methods:	A: Written Exam, B: Homework, C: Project, D: Quiz

COURSE CONTENT

Week	Topics	Study Materials
1	INTRODUCTION TO MODELING (CHAPTER 1)	Textbook, Course Notes, CITGO Petrolium Article
2	GRAPHICAL SOLUTION OF A LINEAR PROGRAM (CHAPTER 3)	Textbook, Course Notes
3	LINEAR PROGRAMMING APPLICATIONS (CHAPTER 3)	Textbook, Course Notes
4	THE SIMPLEX ALGORITHM (CHAPTER 4)	Textbook, Course Notes
5	GOAL PROGRAMMING (CHAPTER 4)	Textbook, Course Notes
6	A GRAPHICAL APPROACH TO SENSITIVITY ANALYSIS (CHAPTER 6)	Textbook, Course Notes
7	ALGEBRA OF THE SIMPLEX METHOD (CHAPTER 6)	Textbook, Course Notes
8	MIDTERM EXAM 1	Textbook, Course Notes
9	DUAL THEOREM AND ITS CONSEQUENCES (CHAPTER 6)	Textbook, Course Notes

10	TRANSPORTATION, TRANSSHIPMENT AND ASSIGNMENT PROBLEMS (CHAPTER 7)	Textbook, Course Notes
11	SHORTEST PATH AND MAXIMUM FLOW PROBLEMS (CHAPTER 8)	Textbook, Course Notes
12	MINIMUM COST NETWORK FLOW AND MINIMUM SPANNING TREE PROBLEMS (CHAPTER 8)	Textbook, Course Notes
13	SOLUTION OF IP PROBLEMS: BRANCH-AND-BOUND ALGORITHM	Textbook, Course Notes
14	MIDTERM EXAM 2	Textbook, Course Notes

RECOMMENDED SOURCES	
Textbook	OPERATIONS RESEARCH: APPLICATIONS AND ALGORITHMS, W. L. WINSTON, THOMPSON – BROOKS/COLE, 2004
Additional Resources	

MATERIAL SHARING	
Documents	Modeling case study, CITGO Petrolium article, GAMS tutorial, lab notes, lecture notes
Assignments	Homeworks (1-7)
Exams	Midterm (1-2), Quizzes (1-6), Final Exam

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Midterm 1	1	25
Midterm 2	1	20
Quizzes	6	25
Total		**70**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
Total		**100**

COURSE CATEGORY	Field Course

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES		
No	Program Learning Outcomes	check √
1a	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline,	√
1b	Ability to use theoretical and applied knowledge in these areas in complex engineering problems.	√
2a	Ability to identify, formulate, and solve complex engineering problems,	√
2b	Ability to select and apply proper analysis and modeling methods for this purpose.	√
3a	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result,	
3b	Ability to apply modern design methods for this purpose.	
4a	Ability to devise, select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice.	√
4b	Ability to employ information technologies effectively.	√
5a	Ability to design experiments for investigating complex engineering problems or discipline specific research questions,	
5b	Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.	
6a	Ability to work efficiently in intra-disciplinary teams,	
6b	Ability to work efficiently in multi-disciplinary teams,	
6c	Ability to work individually.	√
7a	Ability to communicate effectively in Turkish, both orally and in writing,	
7b	Knowledge of a minimum of one foreign language,	
7c	Ability to write effective reports and comprehend written reports, prepare design and production reports,	
7d	Ability to make effective presentations,	
7e	Ability to give and receive clear and intelligible instructions.	
8a	Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology,	
8b	Ability to continue to educate him/herself.	
9a	Consciousness to behave according to ethical principles and professional and ethical responsibility.	
9b	Knowledge on standards used in engineering practice.	

10a	Knowledge about business life practices such as project management, risk management, change management.	
10b	Awareness in entrepreneurship and innovation.	
10c	Knowledge about sustainable development.	
11a	Knowledge about the global and social effects of engineering practices on health, environment, and safety,	
11b	Knowledge about contemporary issues of the century reflected into the field of engineering.	
11c	Awareness of the legal consequences of engineering solutions.	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration	12	5	60
Hours for off-the-classroom study (Pre-study, practice)	14	5	70
Midterm examination	2	2	4
Homework	7	4	28
Project	1	50	50
Final examination	1	2	2
Total Work Load			214
Total Work Load / 25 (h)			8.6
ECTS Credit of the Course			9

Prepared by: Assoc. Prof. Dilek Tüzün Aksu	Preparation date: 01.09.19