COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Operations Research	**ESYE522**	**1**	**3**	**3**	**10**

Prerequisites	None

Language of Instruction	English
Course Level	M. Sc.
Course Type	Compulsory
Course Coordinator	
Instructors	Prof. Linet Özdamar
Assistants	
Goals	The goal of this course is to convey the basic mathematical concepts behind linear programming and enable students to develop their mathematical modeling skills while solving practical optimization problems.
Content	Linear programming, geometric concepts, simplex method, duality theory, assignment and transportation problems, network problems, mathematical modeling-linear and mixed integer models

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Student can classify a problem in terms of convexity and linearity.	5	1,2,4	A,D
2) Student can construct a mathematical model for a problem that is described in written or verbal form.	3,5	1,2,4	A,D
3) Student can check for model consistency, can analyze model outputs and complete modeling feedback loop.	5	1,2	A,D
4) Student can perform sensistivity analysis and interpret dual variables.	5	1,2,4	A,D
5) Student can code and implement models repoted in articles using GAMS modeling language.	3,5,8	1,2	D

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introduction to Linear Programming: geometric concepts, convex sets, systems of linear equations, review of linear algebra	Textbook
2	The Simplex Algorithm	Textbook
3	The Simplex Algorithm	Textbook
4	Sensitivity Analysis	Textbook
5	Duality Theory	Textbook

6	The Assignment Problem	Textbook
7	The Transportation Problem	Textbook
8	The Maximal Flow and Shortest Path problems	Textbook
9	The Minimal Cost Network Flow problem	Textbook
10	Examples of Mathematical Models	Textbook
11	Examples of Mathematical Models	Textbook
12	Case Presentations	Modeling practical applications
13	Case Presentations	Modeling practical applications
14	Paper Presentations	Literature survey

RECOMMENDED SOURCES	
Textbook	Linear Programming and Network Flows Mokhtar S. Bazaraa , John J. Jarvis , Hanif D. Sherali , 2009.
Additional Resources	Case studies: on sye522@gmail.com address

MATERIAL SHARING	
Documents	Case studies
Assignments	Six case studies
Exams	1 final

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Paper presentations	1	20
Case Studies	6	80
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		20
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		80
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM								
No	Program Learning Outcomes	Contribution						
		1	2	3	4	5		
1	Ability to reach knowledge in breadth and depth through scientific research in Industrial and Systems Engineering field; to have extensive knowledge about current techniques and procedures together with their constraints.							
2	Ability to complement and apply knowledge by scientific methods utilizing limited or missing data; to use knowledge in different disciplines effectively by blending them.							

3	Ability to formulate Industrial and Systems Engineering problems; to develop novel and original ideas and procedures for their solutions and to use innovative procedures in solutions.					**X**	
4	Awareness of new and developing applications in Systems Engineering; ability to investigate and learn these applications when required.						
5	Ability to design and apply analytical, and modeling and experimental based research; to solve and interpret complex situations encountered in this process.					**X**	
6	Ability to lead multi-disciplinary teams; to develop solution approaches in complicated situations and to take responsibility.						
7	Ability to develop novel and/or original ideas and methods; to develop innovative solutions for the design of systems, parts or the processes.						
8	Ability to communicate orally or in writing the process and the results of Industrial and Systems Engineering studies systematically and openly in national or international platforms.					**X**	
9	Ability to master a foreign language (English) at the European Language Portfolio B2 General Level to communicate orally or in writing.						
10	Ability to recognize social, scientific and ethical values in the process of collection, interpretation and publishing of data, and in all professional activities.						
11	Ability to visualize social and environmental dimensions of Industrial and Systems Engineering applications and to observe these dimensions in professional practice.						
12	Ability to develop appropriate methodology and procedures for the modeling, improvement, control and design of complex systems for a specified target.						

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	10	140
Paper presentation	1	2	2
Case study peraparation and presentation	6	10	60
Final examination	1	3	3
Total Work Load			247
Total Work Load / 25 (h)			9.88