

**ECTS COURSE INFORMATION FORM**

<b>Faculty</b>	<b>Faculty of Engineering</b>		
<b>Program</b>	<b>B.Sc. in Civil Engineering</b>	<b>Elective</b>	
	<b>B.Sc. in Computer Engineering</b>	<b>Elective</b>	
	<b>B.Sc. in Electrical-Electronics Engineering</b>	<b>Elective</b>	
	<b>B.Sc. in Industrial Engineering</b>	<b>Required</b>	
	<b>B.Sc. in Mechanical Engineering</b>	<b>Elective</b>	

<b>Course Code</b>	IE 202			
<b>Course Title in English</b>	Operations Research I			
<b>Course Title in Turkish</b>	Yöneylem Araştırması I			
<b>Language of Instruction</b>	English			
<b>Type of Course</b>	Flipped Classroom/Lecture			
<b>Level of Course</b>	Undergraduate			
<b>Course Category (by % of Content)</b>	Basic Science	Basic Engineering	Engineering Design	General Education
	-	75	25	-
<b>Semester Offered</b>	Spring			
<b>Contact Hours per Week</b>	Lecture: 3 hours	Recitation: -	Lab: -	Other: -
<b>Estimated Student Workload</b>	164 hours			
<b>Number of Credits</b>	6 ECTS			
<b>Grading Mode</b>	Standard Letter Grade			
<b>Pre-requisites</b>	MATH 211			
<b>Expected Prior Knowledge</b>	Prior knowledge in matrix theory			
<b>Co-requisites</b>	-			
<b>Registration Restrictions</b>	-			
<b>Overall Educational Objective</b>	To learn deterministic operations research methodologies			
<b>Course Description</b>	This course introduces the most widely used deterministic operations research methodologies. The following topics are covered: introduction to operations research & linear programming (LP); model formulation; graphical solution procedure; selected LP applications; Simplex method; big-M method; two phase method; special cases in Simplex method; matrix representation of the Simplex method; graphical sensitivity analysis; dual problem; duality theorems; complementary slackness theorem; economic interpretation of duality; dual Simplex method; post optimality analysis; transportation problem; assignment problem; modeling with integer programming; branch-and-bound method.			
<b>Course Description in Turkish</b>	Bu ders, en yaygın kullanımı olan deterministik yöneylem araştırması yöntemlerini tanıtır. Ders boyunca yöneylem araştırmasına giriş & doğrusal programlama; model formüle etme; grafik çözüm yöntemi; seçilmiş doğrusal programlama uygulamaları; Simplex yöntemi; büyük M yöntemi; iki faz yöntemi; Simplex yönteminde özel durumlar; Simplex yönteminin matris temsili; grafiksel duyarlılık analizi; eşlek problem; dualite önermeleri; tümler gevşeklik önermesi; dualitenin ekonomik yorumu; eşlek Simplex yöntemi; hassas analiz; ulaşım problemi; atama problemi; tamsayılı programlama ile modelleme; dal-sınır yöntemi konuları işlenir.			
<b>Course Learning Outcomes and Competences</b>	Upon successful completion of the course, the learner is expected to: 1. formulate linear programming/integer programming models; 2. solve and analyze linear programming problems; 3. comprehend the basics and usage of Simplex algorithm; 4. explain the relation between primal and dual solutions and give the economic interpretation of dual solutions; 5. follow solution techniques for specialized linear programming problems such as transportation and assignment problems;			

6. function effectively as a member of a team;
7. use OR software to solve mathematical models.

Relationship of the Course with the Student Outcomes	Level	Learning Outcome(s)	Assessed by
<b>Student Outcomes</b>	N=None S=Supportive H=High		Exam, Project, HW, Experiment, Presentation, etc.
(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	H	1,2,3,5	Exams, Mini-Project, Flipped Classroom Practice, Active Learning Activities
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors			
(3) an ability to communicate effectively with a range of audiences			
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts			
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	S	6	Mini-Project
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	S	4,7	Exams, Mini-Project, Flipped Classroom Practice, Active Learning Activities
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies			
<b>Prepared by and Date</b>	Asst. Prof. Hande Küçükaydın / December 2019		
<b>Semester</b>	Spring 2019-2020		
<b>Name of Instructor</b>	Asst. Prof. Hande Küçükaydın		
<b>Course Contents</b>	Week	Topic	
	1.	Introduction to Operations Research (OR) & Linear Programming (LP) Modeling	
	2.	Graphical LP Solution & Model Formulation	
	3.	Selected LP Applications & Introduction to Simplex Method	
	4.	Simplex Method	
	5.	Simplex Method, Starting Methods	
	6.	Starting Methods, Sensitivity Analysis	
	7.	Sensitivity Analysis, Duality	
	8.	Duality & Dual Simplex Method	
	9.	Post-Optimal Analysis	
	10.	Post-Optimal Analysis	
	11.	Transportation Problem	
	12.	Assignment Problem	
	13.	Modeling with Integer Programming	
	14.	Branch-and-Bound Method	
	15.	Final Exam/Project/Presentation Period	
	16.	Final Exam/Project/Presentation Period	
<b>Required/Recommended Readings</b>	<ul style="list-style-type: none"> <li>• Taha, H. A. (2017). Operations Research: An Introduction (10th Edition). Upper Saddle River, New Jersey: Pearson</li> </ul>		

	<ul style="list-style-type: none"> <li>Winston, W.L. (2003). Operations Research: Applications and Algorithms (4<sup>th</sup> Edition). Cengage Learning</li> </ul>												
<b>Teaching Methods</b>	Lectures/contact hours using "flipped classroom" as an active learning technique												
<b>Homework and Projects</b>	1 mini-project regarding the use of a linear programming solver.												
<b>Laboratory Work</b>	-												
<b>Computer Use</b>	Yes												
<b>Other Activities</b>	-												
<b>Assessment Methods</b>	<table border="1"> <thead> <tr> <th>Types of assessment</th> <th>Ratio (%)</th> </tr> </thead> <tbody> <tr> <td>Midterm Exam</td> <td>30</td> </tr> <tr> <td>Quizzes</td> <td>20</td> </tr> <tr> <td>Mini-Project</td> <td>15</td> </tr> <tr> <td>Final Exam</td> <td>35</td> </tr> <tr> <td>Total</td> <td>100</td> </tr> </tbody> </table>	Types of assessment	Ratio (%)	Midterm Exam	30	Quizzes	20	Mini-Project	15	Final Exam	35	Total	100
Types of assessment	Ratio (%)												
Midterm Exam	30												
Quizzes	20												
Mini-Project	15												
Final Exam	35												
Total	100												
<b>Course Administration</b>	<p>Instructor's</p> <p>-office and phone number: 5<sup>th</sup> floor, 212 3953631; office hours: TBA</p> <p>-email address: hande.kucukaydin@mef.edu.tr</p> <p><b>Exams and quizzes:</b> Closed book and closed notes.</p> <p><b>Rules for attendance:</b> YÖK regulations. You are responsible for the announcements made in class.</p> <p><b>Rules for late submission of assignments:</b> N/A</p> <p><b>Missing a quiz:</b> Provided that proper documents of excuse are presented, a make-up exam will be given for each missed quiz.</p> <p><b>Missing a project:</b> Project deadlines are always extendable up to 72 hours, with submissions late for (0,24] hours receive 70% of the credit they get, (24,48] hours receive 35% , and (48,72] receive 10%.</p> <p><b>Missing a midterm:</b> You are expected to be present without exception and to plan any travel around these dates accordingly. Medical emergencies are of course excluded if accompanied by a doctor's note. A note indicating that you were seen at the health center on the day of the exam is <u>not</u> a sufficient documentation of medically excused absence from the exam. <u>The note must say that you were medically unable to take the exam.</u> Provided that proper documents of excuse are presented, a make-up exam will be given for each missed midterm. If you fail to take the exam on the assigned day and do not have a valid excuse, you will be given zero (0) on the exam. Employment interviews, employer events, weddings, vacations, etc. are not excused absences.</p> <p><b>Eligibility to take the final exam:</b> YÖK regulations.</p> <p><b>Missing a final:</b> Faculty regulations.</p> <p>A reminder of proper classroom behavior, code of student conduct: YÖK Regulations Statement on plagiarism: YÖK Regulations (<a href="http://3fcampus.mef.edu.tr/uploads/cms/webadmin.mef.edu.tr/4833_2.pdf">http://3fcampus.mef.edu.tr/uploads/cms/webadmin.mef.edu.tr/4833_2.pdf</a>)</p>												

<b>ECTS Student Workload Estimation</b>	Activity	No/Weeks	Hours			Calculation	Explanation
		No/Weeks per Semester (A)	Preparing for the Activity (B)	Spent in the Activity Itself (C)	Completing the Activity Requirements (D)		
	Lecture/Flipped Classroom	14	1	3	1	70	A*(B+C+D)
	Quizzes	4	4	1		20	
	Midterm	1	20	2		22	A*(B+C+D)
	Mini-Project	1	5	20		25	A*(B+C+D)
	Final Examination	1	25	2		27	A*(B+C+D)
	Total Workload					164	
	Total Workload/25					6,56	
	ECTS					6	