

**IE 232 OPERATIONS RESEARCH I - MODELING (3 2 4) (ECTS: 6)**  
**Spring 2020 - Tentative Syllabus**

**Catalog Description.** This is the first of a series of three Operations Research courses in our curriculum. The emphasis is on the formulation of deterministic mathematical models rather than solution techniques. The topics covered are: overview of Operations Research and modeling, classification and examples of mathematical models, formulation of: linear programming models, integer and mixed-integer linear programming models, and network (flow) models.

**Prerequisite.** IE 101 Industrial Engineering Orientation.

**Course Objectives.** Main aims of this course are to introduce:

- an understanding of the Operations Research approach and mathematical modeling,
- formulation of linear programming models under static and dynamic settings,
- formulation of integer and mixed-integer programming models and to develop skills in representing conditions using integer variables,
- formulation of network (flow) programming models,
- usage of basic mathematical programming and optimization software packages/add-ins.

**Learning Outcomes.** On successful completion of the course, all students will develop:

1. skills in model construction and analysis of various problems,
2. skills in using mathematical programming and optimization software packages,
3. skills in report writing.

On successful completion of the course, all students will be:

4. involved in team work,
5. aware of ethical issues.

**Instructor.** Gonca Yıldırım, Office: L-320, Email: goncayildirim@cankaya.edu.tr  
Office Hour: Monday (12:20-13:10)

**Teaching Assistant.** Hasan Kavlak, Office: L-321, Email: hkavlak@cankaya.edu.tr  
Office Hour: Friday (15:20-16:10)

**Class Meeting Times and Locations.**

**Sections 1 & 2:** Monday (13:20-16:10) in L-A14

**Sections 3 & 4:** Tuesday (13:20-16:10) in L-A14

**Recitation & Lab Sessions and Locations.**

**Section 1:** Wednesday (15:20 - 17:10) in H-314

**Section 2:** Thursday (15:20 - 17:10) in H-314

**Section 3:** Thursday (15:20 - 17:10) in H-314

**Section 4:** Friday (09:20 - 11:10) in H-314

**Text.** Winston, W. L. (2003). *Operations Research: Applications and Algorithms*. 4th Ed. Cengage.

**Supplementary Texts.**

1. Hillier, F. S., and Lieberman, G. J. (2015). *Introduction to Operations Research*. 10th Ed. McGraw-Hill.
2. Taha, H. A. (2017). *Operations Research: An Introduction*. 10th Ed. Pearson.

**Class Website.** Moodle on <http://webonline.cankaya.edu.tr/>

**Honesty Policy.** All students admitted to Çankaya University should declare his/her understanding and belief in the Honor Code stated by the department for the examinations and assignments. This statement is a reminder to uphold your obligation as a Çankaya University student and to be honest in all work submitted and exams taken in this course and all others.

**If you conduct any dishonest act during an examination or for the completion of an assignment (i.e., cheating on an exam, using any extra material that you are not allowed to use during an exam, copying material off of someone else's homework or assignment, using solution keys from previous years, copying material from published and electronic sources without paraphrasing and/or citing appropriately), you will get a credit of zero on that particular exam or assignment. Necessary disciplinary action, as dictated by the rules of the University, will also be taken.**

**Class Policies.**

- **Please come to class on time. Latecomers will not be admitted**, as late arrivals disrupt the flow of the lecture. Please remember to turn off cellular telephones, tablets or any device that beeps or disturbs the class before you come to class.
- You are responsible for all announcements made in class and on class web page, as well as for printing the lecture notes and other materials from the class web page.

**Attendance requirements.** An attendance sheet will be distributed every hour (class, recitation, and lab hours included). Signing the attendance sheet every hour is your responsibility. It is best if you fully attend every hour. If you miss even a single hour, you may find it hard to understand the course material since the topics are interrelated.

**Course Requirements and Grading.** All exams will be closed books and closed notes.

- **10% Homework.** There will be two homework assignments, each is 5%.
- **15% Lab-work Assignments.** There will be two lab-work assignments, each is 7.5%.
- **35% Midterm Exam.** There will be one midterm exam.
- **40% Final Exam.** There will be a *comprehensive* final exam.

**Grading Policy.** Letter grades will be *mainly* based on the standard scale (i.e., catalog grading system) described in Çankaya University regulations. However, if your collected total weighted average is close to the higher cut-off point and depending on the gaps between the totals collected as well as your attendance and involvement in the class, a higher letter grade *may* be considered.

**Conditions leading to the letter grade NA.** Any of the following will lead to letter grade NA.

- If you fail to take the midterm exam (or its makeup), you will NOT be able to take the final exam and you will receive the letter grade NA.
- If you are eligible to take the final exam but fail to take it (or its makeup), you will receive the letter grade NA.

**Make-up Policy.** Makeup *may* only be considered for Midterm Exam and the Final Exam, with valid, verifiable, documented excuses ONLY.

**Software Requirements.** You need to download Gams (<http://www.gams.com/download>); Lindo (<http://www.lindo.com/downloads/lnd61.zip>); and enable Excel Solver add-in in Microsoft Excel, which are the primary software we will use.

**Course Topics.** A tentative outline and tentative assignment/exam schedule are given below and the instructor reserves the right to make changes as she sees necessary. The preparatory reading (examples in particular) from Lecture Notes should be completed before the corresponding class.

<b>Week</b>	<b>Reading</b>	<b>Topics</b>	<b>Assignment (Tentative)</b>
1		1. Introduction to Operations Research 2. Introduction to Linear Programming	
2	15-21	3. Modeling Linear Programs: <i>Product-Mix, Diet, Static Workforce Scheduling</i>	
3	25-26	3. Modeling Linear Programs: <i>Static Workforce-Scheduling Extensions 1, 2, 3, 4</i>	
4	27-36	3. Modeling Linear Programs: <i>Static Workforce-Scheduling Extensions 5, 6, Blending, Capital Budgeting</i>	HW1 assigned
5	39-48	4. Multi-Period Decision Models: <i>Single Product, Rolling Horizon, Multiple Products</i>	
6	49-53	4. Multi-Period Decision Models: <i>Backlogging, Lost Sales, Smoothing, Financial Models</i>	HW1 due
7	55-60	4. Multi-Period Decision Models: <i>Workforce Scheduling</i> 5. Introduction to Integer Programming: <i>Binary Variables</i>	Midterm Exam
8	61-66	5. Introduction to Integer Programming: <i>Binary Variables, Logical Conditions, Fixed Costs</i>	
9	70-72	5. Introduction to Integer Programming: <i>Disjunctions, Assignment</i>	
10	74-83	5. Introduction to Integer Programming: <i>Transportation, Transshipment, Set Covering, Cutting Stock</i>	
11	85-98	6. Linear and Other Mathematical Programming Tricks 7. Network Models: <i>Shortest Path</i>	
12	98-103	7. Network Models: <i>Shortest Path, Maximum Flow</i>	HW2 assigned
13	105-109	7. Network Models: <i>Minimum Cost Flow, Minimum Spanning Tree</i>	
14	109-113	7. Network Models: <i>Minimum Spanning Tree, Traveling Salesperson</i>	HW2 due

**NOTE THAT EVERYTHING ON THIS SYLLABUS IS SUBJECT TO CHANGE. STUDENTS WILL BE NOTED ABOUT SIGNIFICANT CHANGES.**