

**IE 232 OPERATIONS RESEARCH I – MODELING (3 2 4) (ECTS: 6)**  
**Spring 2017 - Tentative Syllabus**

This is the first of a series of three Operations Research courses in our curriculum and forms the basis for several other industrial engineering courses. The topics of this course include 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,
- to introduce formulation of linear programming models under static and dynamic settings,
- to introduce formulation of integer and mixed-integer programming models and to develop skills in representing conditions using integer variables,
- to introduce formulation of network (flow) programming models,
- to introduce usage of basic mathematical programming and optimization software packages/add-ins.

**Instructor.** Gonca Yildirim, Office: L-320, Email: goncayildirim@cankaya.edu.tr  
Office Hours: Mon (13:20-14:10), Tue (15:20-16:10)

**Teaching Assistant.** Hasan Kavlak, Office: L-321, Email: hkavlak@cankaya.edu.tr  
Office Hours: Thu (11:20-12:10), Thu (13:20-14:10)

**Class Meeting Times and Locations.**

**Section 1:** Wednesday (14:20-17:10) in L-A14

**Section 2:** Thursday (14:20-17:10) in L-A14

**Recitation & Lab Sessions and Locations.**

**Section 1:** Friday (11:20 - 13:10) in L-A14

**Section 2:** Friday (15:20 - 17:10) in L-A14

**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.** Late arrivals as well as walking out and in during the lectures 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. You are also responsible for printing the assignments and lecture notes 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.

**Homework assignments** will be done in **groups of size two or three**. Students will need to form their groups and submit their team information written and signed by all members to the teaching assistant until 12:00 on March 10th, 2017. Those students who did not submit any team information by this time and date will be assigned to teams (either existing or new ones).

All assignments will be collected at or prior to the assigned time on the assigned date. Late assignments will NOT be accepted and you will get a credit of zero in case you do not submit the assignment on time. Each student team is expected to submit their team's work as a single assignment, signed by all members involved. Should some submitted assignments be identical or be suspected to be identical to some other group(s)' assignment, all involved parties will receive a credit of zero on the particular assignment. No extra credit will be given for extra work and/or redoing assignments.

**Lab Hours and Lab-work Assignments:** One hour will be held every week for demonstrating software needed for this class. You will have two lab-work assignments for which you will have to work as a team (should be the same team for your homework). Lab-work assignments are related to modeling problems using several optimization software packages, and interpreting results. Some of the homework questions may be assigned as lab work. For the lab-work assignments, you are subject to the same rules and submission guidelines as for the homework assignments.

**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, I *may* consider giving you a higher letter grade.

**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 (e.g., illness with a doctor's report).

**Software Requirements.** You need to download Gams (<http://www.gams.com/download>) and Lindo (<http://www.lindo.com/downloads/lnd61.zip>), which are the primary software packages we will use. You may need to use other software which will be mentioned in class.

**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 (especially the examples) from Lecture Notes should be completed before the corresponding class.

Week/Day		Reading	Topics	Assignment/Exam
1	Feb 15, 16		1. Introduction to Operations Research 2. Introduction to Linear Programming	
2	Feb 22, 23	15-21	3. Modeling Linear Programs: Product-Mix, Diet, Static Workforce Scheduling	
3	Mar 1, 2	26-27	3. Modeling Linear Programs: Static Workforce-Scheduling Extensions 1, 2, 3, 4	
4	Mar 8, 9	28-38	3. Modeling Linear Programs: Static Workforce-Scheduling Extensions 5, 6, Blending, Capital Budgeting	HW1 assigned
5	Mar 15, 16	41-50	4. Linear Multi-Period Decision Models: Single Product, Multiple Products, Rolling Horizon	
6	Mar 22, 23	51-54	4. Linear Multi-Period Decision Models: Backlogging, Lost Sales, Production Smoothing	
7	Mar 29, 30	56-62	4. Linear Multi-Period Decision Models: Financial Models, Dynamic Workforce Scheduling 5. LP Tricks	HW1 due
8	Apr 5, 6	69-75	6. Introduction to Integer Programming: Binary Variables, Logical Conditions	Midterm Exam
9	Apr 12, 13	76-84	6. Introduction to Integer Programming: Fixed Costs, Disjunctions, Linearization	
10	Apr 19, 20	85-95	6. Introduction to Integer Programming: Assignment, Transportation & Transshipment, Set Covering	
11	Apr 26, 27	96-102	6. Introduction to Integer Programming: Cutting Stock 7. Network Models: Shortest Path	HW2 assigned
12	May 3, 4	102-107	6. Introduction to Integer Programming: Shortest Path, Maximum Flow	
13	May 10, 11	109-114	7. Network Models: Minimum Cost Flow, Minimum Spanning Tree	
14	May 17, 18	114-119	7. Network Models: Minimum Spanning Tree, Traveling Salesperson	HW2 due

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