Operations Research II
Introduction

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Instructor

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Who am I?

- Özgür Kabak, PhD.
  - Professor at Industrial Engineering Dept. of Istanbul Technical University (ITU)
  - Ph.D. from ITU
    - 2008
    - Modeling supply chain network using possibilistic linear programming and an application
  - Postdoc at Belgium Nuclear Research Centre (SCK.CEN), Mol, Belgium
    - Feb. 2009 – Feb. 2010
    - A fuzzy multiple attribute decision-making approach for nuclear safeguards information management
  - Research Interests
    - Mathematical Programming
    - Modeling Complex Systems
    - Fuzzy Decision Making
    - Group Decision Making

Communication

- We will use Ninova for all announcements and for sharing files.
- We will announce your grades on Ninova.
- We will announce and collect homework assignments on Ninova.
- For any course related questions you may contact me or the Teaching Assistants (TAs).
- TAs will introduce themselves next week.

Teaching Assistants

- Özcan Ballıkaya (oballikaya@itu.edu.tr)
- Hakan Ak (hakanak@itu.edu.tr)

Text

- Lecture notes downloadable at Ninova.
- Winston W.L. (2004) "Operations Research: Applications and Algorithms", Brooks/Cole – Thomson Learning
- Previous Exam questions downloadable at Ninova.
- Other references:
  - Taha H.A. (2003) "Operations Research: An Introduction", Pearson Education Inc.
  - Taha H.A. (2000) "Yoneylem Arastirmasi", Literatur Yayincilik (cev. Alp Baray and Sakir Esnaf)
  - Winston W.L., Albright S.C. (2001) "Practical Management Science", Duxbury Press, Wadsworth Inc.
  - Render B., Stair R.M. Jr., Hanna M.E. (2003) "Quantitative Analysis for Management", Pearson Education Inc.
  - Taylor B.W. III (2002) "Introduction to Management Science", Pearson Education Inc
  - Rardin R.L. (1998) "Optimization in Operations Research", Prentice Hall Inc.
  - Walker R.C. (1999) "Introduction to Mathematical Programming", Prentice Hall Inc.

Software

- We will use the following computer software packages for integer programming
  - GAMS
  - Excel Solver and OpenSolver
- Since you learnt in END331, we will not teach them in class.
- We also use python to formulate and solve Non-linear programming models and Dynamic programming recursions

Class Sessions

- Monday
  - The class starts at **14:30**
  - There will be three sessions with 2 breaks
  - will end around 17:30

- Please be on time to participate in sessions.

Rules

- The attendance is not mandatory.
- Please do not use your mobile phones during the course!
- Please put your phone inside your bag!

Schedule

Day #	Date	Topic	HW
1	2-Oct-23	Integer Programming, Formulating IP Problems	
2	9-Oct-23	Formulating IP Problems (cont.)	
3	16-Oct-23	Solving IP Problems	HW1
4	23-Oct-23	Solving IP Problems (cont.)	
5	30-Oct-23	Solving IP Problems using Software	HW2
6	6-Nov-23	Goal Programming	
7	13-Now-23	Goal Programming and Problem solving	
7	15-Nov-23	@18:00 Midterm Exam I	
8	20-Nov-23	Introduction to Non-Linear Programming	
9	27-Nov-23	Introduction to Non-Linear Programming (cont.)	HW3
10	4-Dec-23	Interior Point Methods, Deterministic Dynamic Programming	
11	11-Dec-23	Deterministic Dynamic Programming (cont.)	HW4
12	18-Dec-23	Probabilistic Dynamic Programming - Formulation	
13	25-Dec-23	Probabilistic Dynamic Programming - Solution	
	27-Dec-23	@18:00 Midterm Exam II	
14	1-Jan-24	Happy New Year!!	

Assessment

- 4 Homework Assignments 25%
- 2 Midterm exams 35%
- Final exam 40%

Thresholds

- If you do not complete the following requirements,

  you will receive a letter grade **VF**:

  - **One** of your midterm exam grades must be more than **30**
  - **Two** of your HW assignment grades must be more than **50**

- If your final exam grade is less than **30**
- or if your average grade is less than **40**,

  you will receive a letter grade **FF**

Homework Assignments

- Group assignment (max. 3 students)
- Distributed and collected via Ninova by TA's.
- Duration: 1 week

HW1
IP Formulation
Dates: Oct. 16 – Oct. 23

HW2
IP Solution
Dates: Oct.30 – Nov. 6

HW3
Non-linear programming / Interior point method
Dates: Nov. 27 – Dec. 4

HW4
Dynamic programming
Dates: Dec. 11 – Dec. 18

Schedule – Homework Dates

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Midterm Exams

- In class exam
- @18:00
- Duration: 90-120 minutes

Midterm Exam 1

- Topics that will be covered in the first 6 weeks
- Date: November 15 – It is on Wednesday

Midterm Exam 2

- Topics will be covered after the 7th week
- Date: December 27 – It is on Wednesday

Midterm Exam I

- It will cover the following topics:
  - Integer programming formulation
  - Integer programming solution
  - Goal programming

- It will be at Ayazağa Campus, possibly at MED building.

Midterm Exam II

- It will cover the following topics:
  - Non-linear programming
  - Interior Point Methods
  - Deterministic Dynamic Programming
  - Probabilistic Dynamic Programming

- It will be at Ayazağa Campus, possibly at MED building.

Final Exam

- It will cover all the topics covered during the class
  - Non-linear programming
  - Interior Point Methods
  - Deterministic Dynamic Programming
  - Probabilistic Dynamic Programming

The date and place of the exam will be announced by the Student Affairs on sis.itu.edu.tr !

Cheating and Plagiarism

- **Do not!**
- Studying together to understand the material is fine, but the work you hand in is to be your own.
- No cheating will be tolerated: A letter grade of **F** will be given!
- You can constitute a group of max 3 students to submit homework assignments. You will submit a unique report for your group (of course plagiarism among assignment groups is strictly forbidden).
- Texts taken directly from any source (internet, book, etc.) are considered plagiarism - cheating.

FAQs - Homework

- Q1: Can we work on the assignment and give a single report as a group of 4 students?
  - No, you cannot. You can constitute a group with at mot 3 students. In such submissions, students receive a 0.
- Q2: Can we work on the assignment and give two reports as two groups of 2 people?
  - No, you cannot. In this case, submissions are treated as cheating and students receive -100.
- Q3: We forgot to write the name of one of the group members on the assignment cover. Can we add it after submission?
  - No, you cannot add. Write the names of all students in the group on the submitted assignment cover.
- Q4: The time has expired while uploading the assignment to Ninova, can we send our submission via an e-mail?
  - No, you cannot. Assignments submitted on Ninova and no other ways are accepted.
- Q5: Can I change the group to which I submitted the first assignment for subsequent assignments?
  - Yes you can change it. You can be in a group with different friends for each assignment. The names written on the assignment cover are considered group members.
- Q6: We shared the questions with my group friends in the homework, but my friend does not answer his question, is it possible for me to be evaluated only based on my own question?
  - Your relationships between group members are your own business. Our advice is to do all the questions together. In assignments, you are evaluated on the parts you submit as a group.
- Q7: One of my assignment grades is above 50, one is 48 (<50), and the others are below 50 or not submitted. Can I take the final exam?
  - No, you cannot. To take the final exam, you must get at least 50 in at least two of the assignments.

FAQs – Exams and Grading

- Q1: Will you announce my exam grades on a question-by-question basis?
  - Yes. It will be announced on a question-by-question basis in Ninova.
- Q2: Will I have a chance to appeal my exam scores?
  - Yes. After the grades and answer key are announced, those who receive lower grades than expected will be able to object to their grades. The objection process will be announced in Ninova.
- Q3: My midterm exam grades are both below 30. One of them is 29. Can I take the final exam?
  - No, you will get VF. In order to take the final exam, you must get at least 30 points from one of the mid-term exams.
- Q4: My final exam score is 29. Will I pass the course?
  - No, you cannot pass. If your final exam score is below 30, you will fail the course.
- Q5: My final exam score is 50 but my average score is 39. Will I pass the course?
  - No, you cannot pass. If your average score is below 40, you will fail the course.
- Q6: My final exam sore is 25 but my average score is 50. Will I pass the course?
  - No, you cannot pass. See answer Q4.
- Q7: This is my second (or X^{th}) time taking this course. My average score is 39 (or my final exam score is 29 or my midterm exam scores are 29-29). Will I pass the course?
  - You cannot pass. See answer Q3, Q4, Q5.
- Q8: If I fail, my schooling will be extended (or I won't be able to take other classes or something else). My average score is 39 (or my final exam score is 29 or my midterm exam sores are 29-29). Will I pass the course?
  - You cannot pass. See answer Q3, Q4, Q5.

Scale for Letter Grades

- Letter grades are determined based on the performance of all students: Relative Grading!
- Last year's situation:

Letter Grade	Interval	Number of students	%
AA	>=80	13	9%
BA	69-79	21	14%
BB	65-68	12	8%
CB	57-68	19	13%
CC	50-56	20	13%
DC	45-49	5	3%
DD	40-44	6	4%
FF	<40	24	16%
VF		31	21%
	Total	151	100%

- You may download this introduction file from Ninova.