# DEPARTMENT OF INDUSTRIAL ENGINEERING

## IE 310 - OPERATIONS RESEARCH
### Fall 2020

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| **Type:** | CMPE required |
| **Class/Laboratory/PS schedule:** | Monday 11:00-11:50 (Online) Regular Lecture |
| | Wednesday 15:00-16:50 (Online) Regular Lecture |
| | Thursday 11:00-12:50 (Online) Problem Session |
| **Instructor:** | Kerem Can ÖZKISACIK, keremo@boun.edu.tr |
| | Alternative email: kerem.ozkisacik@mavenpartnersgroup.com |
| **Office Hours:** | Friday, 15:00-17:00 (via live Zoom session – Make sure that you have set an appointment prior to the office hour session.) |
| **Teaching Assistant:** | TBA |
| **Grader:** | TBA |
| **Prerequisite(s):** | Math 201 or equivalent |

## Course Description:

This course is designed to be an introduction to the most widely used deterministic operations research methodologies. The course will start by introducing mathematical modeling and optimization concepts and basic linear programming then move into duality theory. Emphasis will also be given to integer programming models and the branch and bound technique. Basic network models and their links with integer programming will be presented. Available software for solving these optimization problems will be discussed. The last part of the course consists in introducing non-linear optimization.

## References:

Lecture notes are essential.

The following textbooks are used while preparing the lecture notes. Students may refer to the following content for a better understanding of some lectures:

1. Operations Research, (Hamdy A. Taha, 8th Edition, Prentice Hall, 2007)
2. An Introduction to Linear Programming and Game Theory, Ch.1-7 (Paul R. Thie, Gerard E. Keough,3rd Edition, John Wiley & Sons, 2008)
3. Introduction to Operations Research, (F.S. Hillier, G.J. Lieberman, 9th Edition, McGraw-Hill, 2010)

## Course objectives

The primary objective of this course is to provide students with the basic tools of Operations Research in order to handle various engineering problems. Students are expected to acquire the ability of modeling real-life problems using Linear Programming and Integer Programming models. They are also provided with several algorithmic methods to solve the related models. The fundamental concepts of modeling, optimality and duality are thoroughly covered with the help of several real-life illustrations. This lecture also contains an introduction to network problems and non-linear optimization.

**Notes for Online Lectures:** Lectures and problem sessions will be conducted as Live Zoom sessions. Lecture notes will be shared via Moodle in form of presentation files right after the sessions. Students will follow the lecture notes. Students will be expected to read the related textbook sections before the lecture. Office hours will be held via Zoom upon booking during the given time period. Some lecture hours can also be devoted to QA sessions if needed.

On-line assessment (quizzes, exams) may require you to write your answer on paper, create a <u>PDF</u> file from it and submit the PDF file via Moodle. Please make sure that you can create good quality, small sized PDF files (using <u>your smart phone</u> or <u>computer</u>).
For more information check  https://distancelearning.boun.edu.tr

**Topics To Be Covered (Time plan is tentative):**

1. Week: Intro to O.R. and LP Modeling
2. Week: LP: Graphical Solution Procedure, LP: Model Formulation
3. Week: LP: Simplex Method
4. Week: LP: Simplex Method - Starting Methods
5. Week: LP: Matrix Form of Simplex, Revised Simplex, LP: Duality
6. Week: LP: Dual Simplex
7. Week: Sensitivity Analysis
8. Week: Integer Programming (IP): Modeling, IP: Cutting Plane Method
9. Week: IP: The Branch and Bound Method
10. Week: Network Problems
11. Week: Introduction to Non-Linear Programming
12. Week: Convex functions – Unconstrained Non-Linear Optimization
13. Week: Unconstrained Non-Linear Optimization

**Grading:**

Quizzes: (40%)  6 quizzes during live zoom lecture hours. No make-up for quizzes.
Assignments: (30%) 3 Assignments, will be submitted via Moodle.
Final Exam: (30%) (TBD*)

(*) We hope to invite you to the campus at the end of the semester for in-class exams. If this is not going to be possible due to the Covid-19 pandemic, we will announce alternative assessment modes.