INDUSTRIAL ENGINEERING DEPARTMENT

IE 305
Operations Research II
Spring 2016

Type:	Required
Credits/ECTS:	4 Credits / 7 ECTS
Class/Laboratory/PS schedule:	Monday 09:00-10:50 (M3100) – Regular class Tuesday 11:00-12:50 (M3120) – Regular class Friday 13:00-13:50 (M3100) – Problem session
Instructor:	Z. Caner Taşkın (caner.taskin@boun.edu.tr) Engineering Building, Room: M4017 Office Hours: T 09:00 – 11:00, T 13:00-15:00
Prerequisite(s):	IE 202 (Operations Research I), IE 255 (Probability for Industrial Engineers) or equivalents.

Course Description:
This is an introductory level course to the most widely used nonlinear mathematical programming methods and analysis of random processes. The first part of the course starts with simple single-dimensional optimization and follows a path with gradually increasing complexity towards multi-dimensional constrained optimization. The second part presents some decision making procedures under uncertainty such as probabilistic dynamic programming, then focuses on Markov models and Markov decision processes. Finally, fundamental properties of exponential distribution, Poisson processes and queuing problems are discussed.

Textbook(s) / other required material:
The following books are reserved at the library for this course. Although none of them covers all the course topics, you may find them useful at certain sections of the course as supporting textbooks.

- "Introduction to Operations Research" Frederick Hillier and Gerald Lieberman, 2010.
- "Operations Research, An Introduction" Hamdy Taha, 2007.
- "Nonlinear Programming: Theory and Algorithms" Mokhtar S. Bazaraa, Hanif D. Sherali, and C. M. Shetty, 2006.
- "Introduction to Probability Models" Sheldon Ross.

Course objectives (and program outcomes):
By the completion of the course, the students will be able to;

- Formulate nonlinear optimization problems
- Apply linearization techniques
- Solve nonlinear optimization problems using analytical and/or numerical methods
- Formulate problems as dynamic programming problems
- Understand and analyze stochastic processes

- Use stochastic analysis to make optimal decisions under uncertainty

Considering these objectives, this course mainly addresses the following student outcomes of the industrial engineering undergraduate program;

- *Student Outcome (c):* An ability to design diverse systems including manufacturing, service, logistics, financial and information, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- *Student Outcome (e):* An ability to identify, model, formulate and solve industrial engineering problems
- *Student Outcome (k):* An ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering practice.

Outline:

Week	Date	Topic	Comments
1	8/2	Nonlinear modeling and examples	
2	15/2	Nonlinear optimization in one variable	
3	22/2	Convexity	
4	29/2	Nonlinear unconstrained optimization	
5	7/3	Constrained nonlinear optimization	
6	14/3	Deterministic dynamic programming	
7	21/3	Probabilistic dynamic programming	
8	28/3	Markov Chains	
9	4/4	Markov Chains	
10	11/4	Markov Decision Process	
11	18/4		Spring Break
12	25/4	Exponential Distribution & Poisson Process	
13	2/5	Queuing Theory	
14	9/5	Queuing Theory	Last day of classes: 13/5

Grading:

- Homework / Quiz 25%
- Midterm 35%
- Final 40%

Prepared by, and date of preparation: Z. Caner Taşkın, January 2016