New Jersey Institute of Technology

[Department of Mechanical and Industrial Engineering]

[EM 602102] [Management Science]

[Spring 2024]

Instructor: Ikhmeis, Ph.D.IE

[M 06:00 – 08:50 AM]; [CKB 341]

[si8@njit.edu]

[Office: GITC 303 / Phone: (347)-453.4124]

Office hours: [Monday] [4:45 –5:45 PM], or by appointment

Prerequisite Knowledge

Prerequisite: undergraduate calculus and probability and statistics.

Course Description

This course will introduce the basic models in operations research. The students will learn to formulate, analyze, and solve mathematical models motivated by real-world problems. Topics include linear programming, integer programming, transportation and network models, Dynamic programming, Queueing, and Inventory Modeling.

Course Objectives

The course intends to prepare students understanding and applying operation research optimization algorithms and technique principles to solve and interpret results. At the end of the semester, the students should be able to:

- Understanding the general principles underlying the various types of optimization techniques (e.g., Linear Programming, Network Optimization, Integer programming and Dynamic Programming, etc.…), how to interpret results and how to decide which method to use in any case.
- Learn how to formulate, analyze, and solve mathematical models
- Understand and perform manual solution using the simplex method for solving linear programming (LP)
- Understand duality problem of LP and perform sensitivity analysis
- Formulate and solve special linear programming problems, the transportation problem, assignment problem, and network models

- Formulate and understand integer programming models and perform manual solution using the branch -and-bound algorithm and cutting plane algorithm
- Understand the recursive nature of dynamic programming via the decomposing a problem into more manageable subproblem to obtain optimal solution
- Use software programming and MS Solver to solve various Operation Research problems introduce during the semester

General Policies:

Students are responsible for reading the associated chapters and assigned materials and reviewing key concepts, terms, definitions, discussion questions, and topics in the chapters.

- Attendance is mandatory
- No incomplete grade will be given
- No late submittal of assignments/exams, solution will be posted immediately on the due date of the assignment
- Students must submit all assignments/exams via Canvas only. Assignments attached to emails sent directly to the professor will not be accepted.

Canvas

We are going to use Canvas throughout the semester to distribute all course material. Submissions are also going to be collected through Canvas. You can access your Canvas account with your UCID and password.

- Each week's contents are organized through modules.
- A module will include lecture notes, discussions, and homework, and any other resources available for the lecture on hand.

Provided material on Canvas: PowerPoint Slides, Videos, Reading Material, Homework problems

Course Structure

- The course mode is Face-to Face

Required Textbook

Operation Research, An Introduction 11th Edition, by Hamdy A Taha, ISBN-13: 9780137625864

https://www.pearson.com/store/en-us/pearsonplus/p/9780137625727.html

Homework:

This will be based on the course text and lecture. This is an individual effort and must be done without collaboration.

Homework will be submitted to the course NJIT canvas website before the day and time it is due with late submissions counted as a zero.

Exams:

- There will be one midterm and one final exam
- All exams will be "in-class" and "closed book"
- A missed exam will be counted as a zero

This Will be based on the course text and lecture. This is an individual effort and must be done without collaboration.

Exams will be during a specified time interval and no make-up exams will be given unless a note is received by the instructor from the Dean of Students office.

Course Assessment Criteria

- Homework and Participations, [25%]
- Midterm Exam [03/08/2024], [35%]
- Final Exam [05/05/2024], [40%]

Your final grade in the class will be determined based on the summation of the number of points that you acquire. The following point spread corresponds to the following grade.

Total	< 50	50	65	75	85	90
Grade	F	C	C+	B	B+	A

Students with disabilities

Students with disabilities need accommodations of any nature so as to have a fair opportunity to perform in the class need to contact the counseling center. Staff at the counseling center will determine what constitutes a reasonable accommodation and inform the instructor of what it is.

Academic Integrity

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at
http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf Links to an external site.**.**

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu."

[Week], Date (2023)	Topic / Reading Material	Reading	Notes
[1] 01/22	Introduction "Linear Programming/Problem Formulation Graphical, and Algebraic solution"	Ch. 1 & Ch2	Homework assignment will be announced at the end of the lecture.
[2] 01/29	LP: The Simplex Method (Maximization Problem)	Ch.3	
[3] 02/05	LP Minimization Problem (Big -M and The Two-Phase Methods	Ch.3	
[4] 02/12	LP: Duality and Sensitivity Analysis	Ch.4	
[5] 02/19	Transportation and Assignment problems**	Ch.5	
[6] 02/26	Network Optimization Models	Ch.6	
[7] 03/04	Homework Solutions and Midterm Exam** Review		
[8] 03/18	**Midterm Exam**		
[9] 03/25	Integer Programming	Ch.9	
[10] 04/01	Dynamic Programming	Ch.12	
[11] 04/08	Inventory Modeling	Ch.13	
[12] 04/15	Queuing Models	Ch.18	
[13] 04/22	Queuing Models	Ch.18	
[14] 04/29	**Homework Solutions and Final Exam Review**		
[15] 05/06	**Final Exam**		