IE 430
Logistics Systems Planning and Design

Course Syllabus
Fall 2022-2023

Instructor
İhsan Sadati E-mail: msadati@sabanciuniv.edu
Office Location: SBS G024
Office Hours: by appointment (in-person/Zoom)

Teaching Assistant
Nima Moradi E-mail: nimamoradi@sabanciuniv.edu
Office Location: FENS 1034
Office Hours: by appointment (in-person/Zoom)

Course Schedule
Lectures: Mondays 11:40 am-12:30 pm (FENS-G032), Wednesdays 10:40 am-12:30 pm (FENS G032)
No Recitation

Course Content
Planning and analysis of logistics systems, data collection methods, facility location/allocation, comparative analysis of different modes and intermodal transportation, fleet planning, and vehicle allocation, vehicle routing.

Recommend or Required Reading

Textbook

- Introduction to Logistics Systems Management. G. Ghiani, G. Laporte and R. Musmanno, 2013 (Publisher: John Wiley & Sons). **eBook available online**

Reading

- Introduction to Logistics Systems Planning and Control. G. Ghiani, G. Laporte and R. Musmanno, 2004 (Publisher: John Wiley & Sons). [TS161 .G45 2004]
- Facilities Design, 3rd edition. S. Heragu, 2008 (Publisher: CRC Press). [TS177 .H47 2008]
- Supply Chain Engineering. M. Goetschalckx, 2011 (Publisher: Springer). [HD38.5 .G586 2011] **eBook available online**

Objectives

The objective of the course is to give the students a solid understanding of the analytical modeling and solution approaches in logistics planning problems and design issues in logistics systems. We will use mathematical programming approaches to model and solve the planning and control problems arising in transportation and distribution logistics, including (but not limited to) single and multiple facility location/allocation problems, logistics networks design for long-haul freight transportation, transportation modes, and multi-modal transport, and vehicle routing and scheduling. We will develop and employ both exact and approximate methods to solve optimization problems and implement computerized applications. Proficiency in operations research and capability of using CPLEX or GUROBI solvers and coding with computer programming is required.

Learning Outcomes

- Identify and state the basic principles and concepts of logistics systems design & model location problems and solve them using optimization software and tools.
- Develop her/his own algorithms to solve location problems efficiently.
- Develop her/his own algorithms to solve long-haul freight transportation problems efficiently
- Conduct challenging technical projects involving modeling and algorithmic solution approaches & work in a team managing challenging logistics systems design projects.

Grading

Lecture Participation	5%
Assignments	15%
Term Project	15%
Midterm Exam	25%
Final Exam	40%
Total	100%

- The instructor might adjust this grading scheme if necessary.

Attendance & Lecture Participation Grade

- We want students to explain their thoughts and recommendations clearly and engage in constructive discussions with others.
- Each student's class participation (i.e., comments, questions, answers, discussions with other students, etc.) will be graded.
- Attendance to lectures is **mandatory** and will be tracked.
- Attendance records **start after the add-drop period**.
- The attendance policy is as follows: missing more than 30% of sessions: ~~**Failure (F grade) in the course**~~. **The lecture participation grade will be set to zero.**
- Please email the TA if you will miss (or have missed) a class session with a valid reason. The TA will keep track of the attendance records.

Assignments

- We will have ~~**Two/**~~**Three** assignments during the semester.
- Late deliveries will not be accepted, and the maximum number of collaborating students is ~~**3**~~ **5**.

Term Project:

- The students need to develop their coding capabilities. Hence, there will be a group project assignment. The students are required to use Python. Install Anaconda from https://www.anaconda.com/products/distribution. You can follow the guide uploaded to SU Course) to model and solve their assigned problem. The project will be assigned in the second half of the semester. **The maximum number of collaborating students is ~~3~~ 5**. Students will present their work in the last week of the semester.

Exams

- One Midterm Exam and one Final Exam.

Make-up Exam Policy

- You have to have a valid reason for not taking an exam. If proof such as a medical report is not brought to me before or within the first three days of the exams, you will NOT be given a make-up exam and will be assumed to score 0 in the missed exam. The make-up exams may need to be scheduled after the final exam, which may be comprehensive.

Tentative Course Outline

Week	Topics
1 (Week of Oct 3)	Single-commodity single-echelon continuous location problems
2 (Week of Oct 10)	Single-commodity single-echelon discrete location problems
3 (Week of Oct 17)	Single-commodity two-echelon discrete location Problems The multicommodity case
4 (Week of Oct 24)	Python-Gurobi Tutorial
5 (Week of Oct 31)	Location-covering problems p-center problems
6 (Week of Nov 7)	**Midterm Exam**
7 (Week of Nov 14)	Long Haul Freight Transportation
8 (Week of Nov 21)	The travelling salesman problem (TSP)
9 (Week of Nov 28)	Vehicle routing problem (VRP)
10 (Week of Dec 5)	Heuristics for VRP
11 (Week of Dec 12)	Meta-heuristics for VRP
12 (Week of Dec 19)	Extension of VRP I
13 (Week of Dec 26)	Extension of VRP II ~~& Term project presentations~~
14 (Week of Jan 2)	Term project presentations