Course Syllabus

TR-GY 8023A: Urban Transport & Logistics Systems – FALL 2016

Instructor

Joseph Chow, Ph.D., P.E.
Email: joseph.chow@nyu.edu
Office Hours Wed 4-6PM, RH400B

Location/Time

JAB 773
Tue/Thu 5:00 – 6:15PM

Textbook:

1. Bradley, Hax, & Magnanti, 1977 (BHM77). Applied Mathematical Programming. (available free online: http://web.mit.edu/15.053/www/)
2. Larson, R.C., Odoni, A.R., 1981 (LO81). Urban Operations Research, Prentice-Hall, NJ (available free online: http://web.mit.edu/urban_or_book/www/book/)

Useful References

1. Hillier, F.S., Lieberman, G.J., 2009. Introduction to Operations Research, 9th Ed., McGraw Hill. Available at NYU Dibner Library Course Reserve: T57.6 .H53 2010
2. Ahuja, R.K., Magnanti, T.L., Orlin, J.B., 1993. Network Flows: Theory, Algorithms, and Applications.
3. *References to be provided during the semester*

Calendar Description

This course provides graduate students with operations research methods to solve logistics problems faced by decision-makers for congested urban infrastructure. Optimization and evaluation methods covered include linear programming, network flow, integer programming, vehicle routing, facility location, functions of random variables, Markov processes, (point, spatial, and Jackson) queueing, and queue tolling. Students will design and analyze a toy system related to one of the following applications: public transport, shared mobility, ITS applications, freight deliveries, traffic operations.

Learning Objectives

At the end of this course, the successful student will be able to:

1. Determine the most appropriate optimization methods to apply to an urban transport or logistics problem.
2. Design and evaluate transport system operational strategies.
3. Describe an urban transport or logistics system as a network.

Course Evaluation

5 Assignments	60% (12% each)
Project proposal	10%
Design project	30%
Total	100%

Course Content

Week		Lecture Topics	**Due Dates**
1	Sept 6, 8	Introduction to course Intro to Linear Programming	
2	Sept 13, 15	Simplex method, duality	
3	Sept 20, 22	Network flow: shortest path, multicommodity flow, Dijkstra's algorithm	**ASN #1 DUE**
4	Sept 27, 29	Nonlinear programming: traffic assignment, Frank-Wolfe algorithm	
5	Oct 4, 6	Integer Programming, Branch and bound algorithm	**ASN #2 DUE**
6	Oct 11, 13	Minimum spanning tree, Traveling salesman Problem, Christofides' algorithm	**Project Proposal Due**
7	Oct 18, 20	Vehicle routing problem, Clarke-Wright savings method, dial-a-ride problem, HAPP	
8	Oct 25, 27	Facility location, dynamic relocation	**ASN #3 DUE**
9	Nov 1, 3	Dynamic programming, probability review	
10	Nov 8, 10	Random processes, Markov chains	**ASN #4 DUE**
11	Nov 17	Stochastic queueing (class cancelled on Nov 15)	
12	Nov 22	Stochastic queueing, queue tolls	
13	Nov 29, Dec 1	Spatial queueing, Jackson queues, MC simulation	**ASN #5 DUE**
14	Dec 6, 8	Server location with queue delay	
15	Dec 15	Peer Review of Project Reports (no class on Dec 13)	**PROJECT Due on Dec 13, Peer Review on Dec 15**

Description of grade breakdown:

- There are 5 assignments over the course of the semester, each worth 12%. **Students may work together, but collaboration must be acknowledged in their submissions, and each student has to submit their own assignment. Plagiarism will not be tolerated.**
- All assignments are due on the Friday at noon of that week (e.g. ASN #1 is due Sept 23 at noon). I will grade the assignments over the weekend and discuss them on the following Tuesday class.
- There is one term project
    - (10%) In Week 6, students have to submit a proposal of what transport system they plan to design – this will be treated like a proposal for a call for proposals from a public agency; the proposal should provide a background to support why the project is needed, a feasible data source for estimating the parameters of the system and status quo, and a general description of the methodology to be used to design the system, with expected outcomes. I will forward these proposals to the other students.
    - (30%) During the last week of the semester (prior to grade submission) students need to submit their final reports detailing the system that they designed, including sensitivity analysis and measured improvements upon the status quo.

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.