Syllabus

ISE 754: Logistics Engineering — Fall 2019

Lecture: Monday and Wednesday, 11:45–1:00 p.m., Daniels 327

Instructor: Michael G. Kay
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Office Hours: Mon, Wed: 1:00–2:30 p.m.
or By Appointment

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Thu: 1:00–2:30 p.m.

Logistics engineering is concerned with all of the planning, implementation, and control related activities associated with the acquisition, transport, storage, and distribution of products and services. The logistics network, or supply chain, of a firm can extend from the acquisition of raw materials from the firm's suppliers to the distribution of finished products to its customers. Central to the study of logistics is the flow of material and information between the facilities of a supply chain—details of the production process within a facility are not of primary concern.

Course Description: This course will present the fundamental quantitative approaches that are used in the design and control of logistics systems, including modeling issues, design concepts, computational considerations, and the use of the MATLAB software package. This quantitative, or engineering, approach to logistics is meant to complement that of business logistics, which is concerned with the management of physical distribution and procurement processes and relationships, and supply chain management, which also includes the coordination of product design, marketing, sales, and finance, both within and between firms, to best support the operation of a firm's supply chain.

Prerequisites: ISE 453: Design of Production, Logistics, and Service Systems (alternatively, ISE 552: Design and Control of Production and Service Systems and ISE/OR 501: Introduction to Operations Research would be helpful)

Programming: This course will require some programming/scripting using MATLAB. Although prior experience programming in any language would be helpful, the basics of programming/scripting in MATLAB will be covered in class and in recorded videos that will be posted on the schedule.

Course Grading:

Homework	35% (breakdown within determined later)
Exam 1 and 2	40% (20% each)
Final Exam	25%

Required Text: None (all materials will be posted on the Course Schedule)

Software: MATLAB can be installed on your personal computer if you are an engineering student (see course homepage for link), and, as a student, Gurobi and Cplex can be downloaded free (see course homepage for link). You can download the Matlog logistics engineering toolbox from the course homepage.

Permanent Course Homepage: `http://people.engr.ncsu.edu/kay/ise754/` (for future reference, this page will remain available after the end of the semester)

Topics:

1. *Introduction.* Elements of the supply chain; review of business logistics; logistics system modeling; commercial logistics software; introduction to MATLAB.
2. *Facility location.* Great-circle distances and geocoding; minimum cost network flow; continuous single- and multi-facility minisum location; location-allocation.
3. *Freight transport.* Freight transportation systems; LTL tariffs and rates; one-time versus periodic shipments; independent truck transport charge; total logistics cost.
4. *Network models.* Transportation problem; minimum cost network flow; shortest path; road networks; multi-echelon, multi-period, multi-product production and inventory models; network and integer-programming formulations.
5. *Routing*. Multistop truckloads; traveling salesman problem; exact, approximation, and heuristic procedures; basic vehicle routing problem and extensions.
6. *Warehousing*. Basic warehousing operations; warehouse planning; information technology for coordinating a supply chain; activity profiling; order picking systems.

Course Schedule: A link to the web version of the ISE 754 Course Schedule is on the course homepage.

`https://people.engr.ncsu.edu/kay/ise754/ISE_754_Fall_2019_Schedule.html`

The schedule will be updated before and after each lecture, and will contain the topic, assignments, scripts, videos, and text readings for the lecture. The schedule should be checked on a regular basis. A diary of any MATLAB code demonstrated in class will be available on the schedule after class.

Homework: There will be several homework assignments required throughout the semester. These are group assignments (Groups of 2). Most of the assignments will require that you submit both the code that implements your solutions and a text file (diary) that illustrates the execution and output of your code. You should submit (via Moodle) all files used by your code and your submission should be concise and documented. There will be a reduction in the grade of any submission not following these guidelines.

Exams: Exams 1 and 2 will each be a take-home exam, starting at 12:30 p.m. near the end of the regular lecture period and ending at 9:00 p.m. the next day, at which time you should have submitted your exam materials electronically. A paper copy of the exam will be handed out in the classroom. After the exam is handed out, the Instructor will be available until 1:15 p.m. to address any questions regarding the intent of the exam problems.

Final Exam: The Final Exam will be in-class and will be open notes and closed computer. It will be comprehensive and include problems that can be answered using, at most, a nonprogrammable calculator.

Grade Boundaries: Minimum grade in course based on the following boundaries:

A+ :	100.0 – 96.7	B– :	83.3 – 80.0	D :	66.6 – 63.4
A :	96.6 – 93.4	C+ :	79.9 – 76.7	D– :	63.3 – 60.0
A– :	93.3 – 90.0	C :	76.6 – 73.4	F :	59.9 – 00.0
B+ :	89.9 – 86.7	C– :	73.3 – 70.0		
B :	86.6 – 83.4	D+ :	69.9 – 66.7		

Audit: Space permitting, you can audit this course. The only requirement for a successful audit is that you receive a grade of at least 70 on the Final Exam; no other assignments are required, although you are free to do the other assignments and, time permitting, have them graded.

Academic Integrity: All work turned in with your name is assumed to be only your own work or, if a group assignment, the work of you and your group members. The University policy on academic integrity can be found in the Code of Student Conduct (see Appendix L of the Handbook for Advising and Teaching: www.fis.ncsu.edu/ncsulegal/41.03-codeof.htm). It is understood and expected that a student's signature on any test or other assignment indicates that the student has neither given nor received unauthorized aid.

Instructor's Policies: Please contact the instructor regarding incomplete grades, penalties for late assignments, excused absences, and scheduling makeup work.

Reference Materials:

Ahuja, R.K., Magnanti, T.L., and Orlin, J.B. (1993). *Network Flows: Theory, Algorithms, and Applications*, Prentice-Hall.

Ballou, R.H., (2004). *Business Logistics/Supply Chain Management*, 5th Ed., Pearson.

Bartholdi, III, J.J., and Hackman, S.T., (2017). *Warehouse & Distribution Science*, version 0.98, https://www.warehouse-science.com/book/editions/wh-sci-0.98.pdf.

Chopra, S., and Meindl, (2016). *Supply Chain Management: Strategy, Planning, and Operations*, 6th Ed., Prentice-Hall.

Daganzo, C.F., (1999). *Logistics Systems Analysis*, 3rd Ed., Springer.

Daskin, M.S., (2013). *Network and Discrete Location: Models, Algorithms, and Applications*, 2nd Ed., Wiley (available as eBook from NCSU Libraries).

Francis, R.L., McGinnis Jr., L.F., and White, J.A. (1992). *Facility Layout and Location: An Analytical Approach*, 2nd Ed., Prentice-Hall.

Hopp, W.J., and Spearman, M.L. (2008) Factory Physics, Third Edition, McGraw-Hill, New York, NY

Larson, R.C., and Odoni, A.R. (1981). *Urban Operations Research*, Prentice-Hall.

Ravindran, A.R. and Warsing, Jr., D.P. (2013). *Supply Chain Engineering: Models and Applications*, CRC Press.

Simchi-Levi, D., Kaminsky, P., and Simchi-Levi, E., (2008). *Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies*, 3rd Ed., McGraw-Hill.