

Department of Industrial Engineering, University at Buffalo
IE 684 NETWORKS, ROUTING AND LOGISTICS

Instructor: Dr. Rakesh Nagi
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Class Schedule: Tu, Th: 11:00 - 12:20 p.m.
Room: 341 Bell Hall
Registration #: 287798

Course Overview

This graduate level course is a comprehensive coverage of a trinity of topics from: (i) *graph and network theory* that provide the modeling constructs to specify and algorithms to solve a large class of practical problems, (ii) *routing* that helps determine the sequence and timing when traversing these network structures, and (iii) the *business logistics* decisions that coordinate management of storing (inventory), handling, locating (location-allocation), distributing and mode/carriers selection. In effect, it provides the basics and definitions, elements, models and algorithms in Networks, Routing and Logistics (NRL) Management. It provides a core set of fundamentals, case applications, and in-depth literature studies, to lead to open research topics. The objective is to expose participants to NRL issues, and in a participatory setting, enable them to discuss and creatively synthesize these ideas to research projects of choice. It blends quantitative and qualitative material, from multiple disciplines of industrial and management engineering. The course will be conducted in a beneficial cooperative learning setting. Lectures, group discussions, research projects and participant presentations will constitute this course. The following topics will be covered.

Course Topics

- Introduction
- Network Optimization
 - Paths, Trees, and Cycles; Shortest Paths
 - Maximum Flows, Minimum Cost Flows
 - Multicommodity Flows; Lagrangian Relaxation and Network Optimization
- Routing
 - TSP, VRP, Inventory Routing
- Business Logistics
 - Analyzing, Designing, and Implementing Logistics Systems
 - Analytical Models for One-to-One/Many Distribution and Transshipment
 - Information Exchange and Supporting Technologies
 - Core competencies from a Business standpoint
- Several Research Articles and Case Studies

Basic Requirements

- Prerequisite of IE 505 Production Planning and Control or similar course
- Advanced Graduate standing in engineering or management
- Optimization (linear IE 572, discrete IE 573 are highly recommended)

Required Work and Grading Policy

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| 1. Homework | - | 4-5 assignments | 15% |
| 2. Class presentations | - | 2 lectures during the semester | 10% |
| 3. Research project | - | progress report, final report, presentation | 50% |
- A semester long project will be performed (and journal papers are encouraged to be published as a result). It should cover an in-depth literature survey related to the topic, and identify open topics from a research and/or practice perspectives. Methods covered in the course are encouraged to be applied to providing a solution to some part of the overall problem. Recommendations for further work should be included in the final report.
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| 4. Programming project | - | High level languages (C/C++, Java or VB) | 10% |
| 5. Exam | - | one midterm | 15% |
- (+/- Grading scheme will be employed)

Texts and Readings

1. Ravindra K. Ahuja, Thomas L. Magnanti, James B. Orlin, Network Flows : Theory, Algorithms, and Applications, Prentice Hall, 1993, ISBN: 013617549X. [Text]
2. Ballou, R.H., Business Logistics Management, 4th edition, Prentice-Hall, Englewood Cliffs, NJ, (1999). [Advanced (classical) Text for Business Logistics]
3. Johnson, J.C., Wood, D.F., Wardlow, D.L. and Murphy, P.R., Contemporary Logistics, 7th edition, Prentice Hall, Upper Saddle River, NJ, (1999). [More recent but basic text; includes some SCM]
4. Stock, J.R. and Lambert, D.M., Strategic Logistics Management, 4th edition, McGraw-Hill Irwin, New York, , (2001). [More recent but basic text; includes some SCM]
5. Daganzo, C.F., Logistics Systems Analysis, 2nd edition, Springer-Verlag, NY, (1996). [Mathematical models]
6. World Class Logistics: The Challenge of Managing Continuous Change, Council of Logistics Management, Oak Brook, IL, (1995). [Business competency viewpoint]
7. Gunn, T.G., In the Age of the Real-Time Enterprise: Managing for winning Business Performance with Enterprise Logistics Management, Oliver Wright Publications, Essex Junction, VT, (1994). [Executive level viewpoint]
8. Sarmiento, A.-M. and Nagi, R., "Recent Directions in Integrated Analysis of Manufacturing-Distribution Systems," *IIE Transactions on Scheduling and Logistics, special issue on Manufacturing Logistics*, 1999, Vol. 31(11), pp. 1061-1074. [Research Agenda viewpoint]