IE 459/500 – Special Topics: Supply Chain Engineering
Spring 2016

Instructor: Dr. Chase Murray
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Twitter: @chase_c_murray
Office: 309 Bell Hall
Office Hours: Posted on UBlearns.

Teaching Assistant (TA): See UBlearns for contact information, office hours, and office location.

• Credit Hours: 3
• Course Website: UBlearns will be used for all course grades, for e-mail, material distribution, etc.
• Class Meetings:
  • Lecture: M/W/F, 9:00 - 9:50am, NSC 222

Course Description:
This course explores fundamental concepts of industrial supply chain and logistics systems. Beyond understanding the individual constituents of such systems (including suppliers, production facilities, transportation systems, warehousing and distribution facilities), this course addresses the relationships among these entities. Operations Research techniques will be applied to develop quantitative supply chain models, to solve these models, and to interpret the corresponding solutions.

Prerequisites:
• Senior standing in Industrial & Systems Engineering (for IE 459)

Learning Objectives [and assessment methods]:
1. To develop familiarity with supply chain and logistics systems, and to understand the critical engineering problems faced by these systems.
   o [exam questions, homework assignments, and course project]
2. To develop the ability to create quantitative models for the design and control of supply chain and logistics systems.
   o [homework problem on "Supply Chain Modeling" topic, homework problem on "Logistics" topic]
3. To develop the ability to solve these problems using a variety of Operations Research techniques (including the use of Gurobi and the development of heuristics coded in a programming language).
   o [homework problem on “Inventory Systems” topic, homework problem on “Logistics” topic]
4. To improve the skill of analyzing and interpreting the solutions obtained from these quantitative models.
   o [course project]
Required Textbook:

Supplementary Materials:
- M. Watson, S. Lewis, P. Cacioppi, and J. Jayaraman (2014), Supply Chain Network Design: Applying Optimization and Analytics to the Global Supply Chain, Pearson Education.
- Journal articles from Transportation Science, Transportation Research, and Naval Research Logistics (among others).

Course Topics:
1. Introduction to Supply Chain Systems – What are the key components of the supply chain?
   - Major types of objectives for supply chain system design
   - Types of strategic configuration of supply chains and their respective advantages/disadvantages.
2. Supply Chain Models – Where to locate facilities and how products should flow through the supply chain?
   - Center of gravity models
   - Tactical supply chain planning models
   - Warehouse location models
   - Tools for visualizing elements of the supply chain on maps (QGIS)
3. Inventory Systems – How much inventory should be held at each echelon in the supply chain?
   - Quantitative methods for inventory location
   - Methods for forecasting future demand
   - Methods for data aggregation
   - Bullwhip effect
4. Logistics / Freight Transportation – *How do goods get delivered?*
   - Network-based optimization models
   - Vehicle Routing/Distribution
   - Truckload (TL) vs. Less-than-truckload (LTL)
   - Multimodal Transportation
   - Reverse Logistics (returns)
   - Green Logistics

5. Warehousing – *How should goods be stored and retrieved within distribution facilities?*
   - Material handling strategies
   - Basics of warehouse design
   - Order picking (batch vs. single command)
   - Cross docks

**Course Requirements/Evaluation:** Students will be evaluated based on the following:

<table>
<thead>
<tr>
<th>Item</th>
<th>Approximate Dates</th>
<th>Weight 459</th>
<th>Weight 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework Activities</td>
<td>Miscellaneous, approximately 3–5 throughout the semester.</td>
<td>15%</td>
<td>5%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>Most likely in March.</td>
<td>25%</td>
<td>25%</td>
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<tr>
<td>Survey Paper</td>
<td>(to be determined)</td>
<td>-</td>
<td>10%</td>
</tr>
<tr>
<td>Course Project</td>
<td>Deliverables throughout the 2nd half of the semester.</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Wednesday, May 11, 8:00 – 11:00am (NSC 222)</td>
<td>30%</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Final course grades** will be determined based on the following scale:

- Student’s Final Average $\geq 94.0\%$ A High Distinction
- Student’s Final Average $\geq 90.0\%$ A- High Distinction
- Student’s Final Average $\geq 87.0\%$ B+ Superior
- Student’s Final Average $\geq 83.0\%$ B Superior
- Student’s Final Average $\geq 80.0\%$ B- Superior
- Student’s Final Average $\geq 77.0\%$ C+ Average
- Student’s Final Average $\geq 73.0\%$ C Average
- Student’s Final Average $\geq 70.0\%$ C- Average
- Student’s Final Average $\geq 67.0\%$ D+ Minimum Passing Grade
- Student’s Final Average $\geq 60.0\%$ D Minimum Passing Grade
- Student’s Final Average $< 60.0\%$ F Failure

Do not expect your grade to be “rounded up.”
**Homework:** Homework assignments are designed to help you better understand the course material, and are aimed at helping you to understand the concepts required to complete the course project. Although you may discuss the assignments with your classmates, all work that you submit must be your own work. Homework assignments are due at the beginning of lecture on their due date. Late homework will not be accepted.

**Survey Paper & Presentation:** Students enrolled in IE 500 (graduate) must complete a survey paper related to one of the course topics (e.g., supply chain management, vehicle routing, warehousing, or logistics). A presentation will be given in class. Expectations for this assignment will be provided in class.

**Course Project:** The team-based course project will focus on applying (and extending) the techniques learned in class to a problem motivated by real-world challenges. The project will consist of multiple parts, with due dates throughout the semester:

- **Preliminary Report (20%)** – Submit a document that clearly describes the nature of the problem under consideration. The report should succinctly explain the importance of this problem, provide an overview of related problems (i.e., how can you leverage existing research to help you solve this problem?), and outline your course of action for modeling and solving this problem.
- **Final Report (60%)** – Submit a document that summarizes your model and solution approach to the problem. Experimental results should demonstrate the effectiveness of your approach and highlight important/interesting aspects of this problem.
- **Final Presentation (20%)** – Each team is expected to provide an in-class presentation of the research.

More details will be provided in class.

**Exams:** All exams will be closed-book and closed-notes, unless specified otherwise by the instructor.

**Exam Makeup Policy:** Exams must be taken on the dates scheduled. Unless there is a medical emergency, make-up exams will not be given. Proof will be required. Students with a valid excuse must notify the instructor prior to the date/time of the originally scheduled exam.

Make-up exams will take place at 7:00am on the Monday following the originally scheduled exam, unless the instructor specifies otherwise. An exam missed without a valid documented medical emergency excuse will result in a grade of zero (0) for that exam.

**Quizzes:** There will be no unannounced quizzes in this course.

**Professionalism:** UB SEAS aims to enhance the education of the students in various aspects of professionalism, and to elevate the standards of behavior that are expected from students. The goals are two-fold: (1) to improve the working and learning environment within SEAS, and (2) to best equip students for employment after graduation.

- Students are expected to use professional style in all communications, including email, with course faculty and teaching assistants. This includes the use of salutations and closings (including clear identification of the author) and correct grammar.
- Students are expected to arrive prior to the start of class, and to remain for the duration of the class.
• Students are expected to refrain from the use of cell phones or other electronic devices unless they are clearly linked to class purposes (e.g., note-taking). Cell phones must remain off or muted.

Attendance: While attendance is highly recommended, it will not be an explicit factor in the course grade.

Grade Disputes: If you disagree with the manner in which an assignment was graded, you may request a re-evaluation of your assignment within two (2) weeks of the due date of that assignment. A re-evaluation request should consist of two (2) components:

• Page 1: A photocopy of the graded assignment.
• Page 2: A detailed explanation, not exceeding one-half page in length, describing why you believe your answer was correct.

The instructor will consider each case at the end of the term, but only if it appears that it may change your final grade. Obvious arithmetic errors will be corrected immediately.

Accessibility Resources: If you require classroom or testing accommodations due to a disability, please contact Accessibility Resources (AR), located in 25 Capen Hall. AR can be reached by phone at (716) 645-2608 or by email at stu-accessibility@buffalo.edu. Please inform the instructor as soon as possible about your needs so that he can coordinate your accommodations. Please also visit http://www.buffalo.edu/accessibility.

Academic Honesty and Integrity:
The University at Buffalo has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for appropriate citation of sources, and for respect for others’ academic endeavors. By placing their name on academic work, students certify the originality of all work not otherwise identified by appropriate acknowledgments. Please take the time to visit http://academicintegrity.buffalo.edu.

If you fail to meet the UB policy and the instructor’s policy for academic honesty and integrity, you will receive an ‘F’ in the course, and may be subject to suspension or expulsion from the university. Violations include, but are not limited to:

• Cheating on an examination, homework assignment, quiz, etc. – This includes such things as copying from another’s paper, using unauthorized notes, calculators, etc., or giving or receiving unauthorized aid, such as trading examinations, whispering answers, passing notes, or using electronic devices to transmit or receive information.

• Plagiarism – This is using someone else's work without giving credit. It is, for example, using ideas, phrases, papers, laboratory reports, computer programs, data - copied directly or paraphrased - that you did not arrive at on your own. Sources include published works such as book, movies, web sites, and unpublished works such as other students' papers or material from a research service. In brief, representing someone else's work as your own is academically dishonest. The risk of plagiarism can be avoided in written work by clearly indicating, either in
footnotes or in the paper itself, the source of any major or unique idea or wording that you did not arrive at on your own. Sources must be given regardless of whether the material is quoted directly or paraphrased.

**Copying any part of another student's assignment and putting your name on it is plagiarism.**

- **Unauthorized collaboration** – This is working with or receiving help from others on graded assignments without the specific approval of the instructor. *If in doubt, seek permission from the instructor before working with others.* Students are encouraged to learn from one another: Form study groups and discuss assignments, but each assignment must be individual work unless specifically stated and turned in as a group assignment.

- You are encouraged to talk to one another about your assignments, however, all assignments must be done by the student(s) whose name is (are) on it!

- **Multiple submission** – This means using the same work to fulfill the academic requirements in more than one course. *Prior permission of the instructors is essential.*

Syllabus prepared by C. Murray

*Revision History:*

- 1/24/16 – Official version of syllabus posted on UBlearns.