Course Description: Inventory management is the cornerstone of supply chain management. The goal of this course is three-fold: (1) identify problems and challenges in inventory management, (2) introduce the main stream literature that mathematically models and solves these problems, (3) bring students to the frontier of this active research area. The course is targeted at graduate (M.S. or Ph.D.) students in the areas of operations management, operations research, industrial engineering and management science. To prepare students to do research and to train students for the job market, this course combines lectures, literature reading and seminars.

Topics covered (tentative)
- Economic lot sizing and lot scheduling models
- Basics of stochastic processes and Markov Decision Process
- Single and multi-echelon inventory models
- Game theory in inventory management
- Seminars – research frontiers

Prerequisite: It is recommended that students are familiar with the basic concepts of linear/non-linear optimization, probability and statistics.


Text Books:

Reference Book:
Course Policy

**Course Requirement:** Class grade is based on the following components with the stated weights:

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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tr>
<td>Homework</td>
<td>30%</td>
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<tr>
<td>Mid-term</td>
<td>30%</td>
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<tr>
<td>Presentations</td>
<td>30%</td>
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<tr>
<td>Referee/Discussant</td>
<td>10%</td>
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**Class Participation:** Class participation is necessary. If you cannot attend a class, please notify me *in advance* with a good reason and a solid proof, such as interviews and illness.

**Active Learning:** To prepare you for a successful career in either academic or industry, this course is planned so that you can get involved in research activities. You will prepare and make presentations, serve as a discussant, search and review literature.

**Presentations:** depending on enrollment, each student will read several research papers and present these papers as if you were the author. Some of the papers are selected by me while others are picked by you (it could be your own research paper) with my permission. In the presentation, you need to highlight the motivation and the potential social and/or economic impact, explain the research problem, the models, and the solution to the problem. You also need to compare to existing results and point out the contribution. The time limit for a presentation is 1 hour (including Q&A, prepare it as if it is your *job talk*!).

The presentations will be graded based on how well you motivate the research, how clear is the model and results, and how significant is the contribution.

**Discussants:** Besides presenters, each paper will have a discussant. The main task of a discussant is to provide a critique of the papers presented: the significance of the problem, the suitability of the model, the limitations of modeling assumptions and the role that those assumptions play in obtaining results, the significance of the results, and possible extensions. In addition, discussant should look for common themes or key issues that link the papers and enhance our understanding of the topic. Lastly, discussant is expected to raise challenging questions that would guide class discussion.

The discussants will prepare a referee report to the paper presented.

**Referee Report:** Papers submitted to refereed journal typically goes through a peer-review process, during which an associated editor (AE) assigns the paper to (at least) two referees. The referees will read the paper and provide suggestions to AE on either accepting or revising or rejecting the paper. A good referee provides constructive suggestions that allow the author to improve the paper. When you serve as a referee, remember one thing: *it is too easy to criticize a paper*; ask yourself two questions: what did I learn from this paper? How can I help the author(s) to improve the paper?
Judging Criteria on Papers

1. Potentially significant economical and/or social impact – A research that matters!
2. Insights and solutions are effective but not common sense – it is sophisticated.
3. New challenges, ideas and approaches – it is novel.
Weekly Schedule (Tentative)

1. **Introduction (9/3)**


Readings:
- S. Axsater 2006, Chapters 1 & 3

2. **Deterministic Models – Economic Lot Scheduling Problems (9/10)**

Content: EOQ Models.

Readings:
- S. Axsater 2006, Chapter 4 (4.1-4.4).

3. **Discrete-Time-Markov-Chain (9/17)**

Content: Discrete-Time Markov Chains with Finite Space State. Inventory Management Applications.

Readings:
- V. G. Kulkarni 1995, Chapter 2 (2.1-2.3), Chapter 3 (3.1, 3.2, 3.3, 3.5)

4. **Poisson Process (9/24)**

Content: Exponential Random Variables, Poisson Process, Little’s Law.

Readings:
- V. G. Kulkarni 1995, Chapter 5 (5.1, 5.2, 5.4)

5. **Continuous-Time Markov Chain (10/1)**

Content: Continuous-Time Markov Chains. Inventory Management Applications

Readings:
- V. G. Kulkarni 1995, Chapter 6 (6.1, 6.2, 6.3, 6.6), Chapter 7 (7.3).

6. **Markov Decision Process (10/8)**


Readings:
7. **Single and Multi-Echelon Inventory Systems (10/15)**

Content: Inventory System Evaluation and Optimization for Centralized Supply Chains.

Readings:
- S. Axsater (2006). Chapter 5, Chapter 10 (10.2-10.4, 10.6)

8. **Game Theory & Decentralized Supply Chains (10/22)**

Content: Information, Gaming and Contracts in Decentralized Supply Chains.

Readings:
- S. Axsater (2006). Chapter 10 (10.6)

9. **Mid-term (10/29)**

10. **Seminar 1: Project and Supply Chain Interfaces (11/5)**

Content: Collaboration, Development, Planning for One-Time Projects/Events.

- Xu, X., Y. Zhao 2014. Incentives and Coordination in Collaborative Projects. (Speaker – Xin, Referee – Irene Gerlovin)
- Johnson, A., X. Xu, Y. Zhao 2014. Transportation Planning for Special Olympics. (Speaker – Andy, referee – Boni)
- Gerlovin, I., Y. Zhao 2014. The Joint-Strike Fighter: Supply Chain Program Management to the Rescue! (Speaker – Irene Gerlovin, referee – Irene Akaab)

11. **Seminar 2: Socially Responsible Supply Chains (11/12)**

Content: Supply Chain Management for a Social & Economic Impact.
- Rafique, R., Y. Zhao 2014. Terrorist and Counter-Terrorists: A Big-Data Perspective. (Speaker – Raza, no referee)


13. Seminar 4: Innovation and Supply Chain Management (12/3)

Content: Innovation vs. Supply Chain Management.

- Rafique, R., K.G. Mun, Y. Zhao 2014. Apple vs. Samsung: Partner or Competitor? (Speaker – Arim Park, referee -- Boni)

14. Seminar 5: Big Data and Supply Management (12/10)

Content: Big-data, Supply Management


15. **Seminar 6: Sustainability and Social Networks (12/17)**

Content: Sustainable Supply Chains, and Social Networks


An experiment:

• Draw the social network of all students (linkedIn), identify patterns (topologies), and predict the productivity and career of each one.

• Department coauthor network, productivity and tenure.