Goal: The course covers fundamental probabilistic/stochastic models and their applications in price theory, distribution channel management and supply chain management. The theoretical focus is on discrete-time and continuous-time Markov processes, Poisson processes and their control theory. The managerial focus is on place (distribution), price and promotion of the 4Ps under an operational environment. It introduces essential demand and supply theories and analytical modeling techniques to doctoral students, bring them to the research frontier on the SC-marketing interfaces and grant them ability to publish on both operations management and marketing journals.

Prerequisite: Basic optimization techniques, elementary probability theory and introductory microeconomics.

Related Courses: 26:799:675 Marketing Models; 26:799:685 Supply Chain Inventory Models

Textbook: None. The course is based on lecture notes and academic journal papers.

Class Participation: Class participation is necessary. Students are required to discuss lecture materials in class.

Homework: Practical problems will be given throughout the semester. Even though students do not need to hand in their work, they are encouraged to try the problems first and then discuss solutions in-class.

Presentation: Each team (with at most 2 students) is required to give a presentation based on one journal paper (see samples listed on Page 2).

Exam: One in-class final exam. Exam questions are related to class materials and practical problems. Understanding lecture notes and papers and solving the practical problems are essential for passing the course.

Grades: 20% class participation, 20% presentation and 60% final exam.
**Presentation**

Depending on enrollment, each team (with at most 2 students) will select one paper and give a formal lecture based on the paper. In the lecture, you need to explain the research problem, the motivation, the model, and the solution to the problem. You also need to compare the paper to existing work and point out the contribution. Feel free to take you time to clearly explain the paper.

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

The presentation will be graded based on how well you motivate the research and how clearly you explain the model and results.

**Samples of journal papers:**


Topics covered (tentative)

Recommended textbooks:


PART I. PROBABILISTIC MODELS AND APPLICATIONS

0. Review of probability theory
  - Chapter 1 of SP
  - Applications in asset pricing theory

1. Demand theory and profit maximization from a failure rate perspective
  - Chapter 9 of SP
  - Part 1 of BM

2. Pricing, double marginalization and externality in a manufacturer-retailer distribution channel/ supply chain
3. Promotion, pass-through rates and revisit of failure rates


4. Strategic pricing leadership and game formats in distribution channels


PART II. STOCHASTIC MODELS AND APPLICATIONS

5. Poisson Processes

- Chapter 2 of SP
- Part 2 of BM

6. Dynamic Pricing with fixed capacity/inventory


7. Markov Chains

• Chapter 4 of SP
• Part 2 of BM
• Applications in customer relationship management

8. Stochastic Dynamic Programming: Introduction and Applications

• Applications in recursive macro-economics
• Applications in dynamic asset pricing theory

9. Markov Processes (if time permits)

• Chapter 5 of SP
• Part 2 of BM

10. Renewal theory (if time permits)

• Chapter 3 of SP