RUTGERS
Rutgers Business School
Newark and New Brunswick

Stochastic Models for SCM 26:799:661	**Michael N. Katehakis**
Spring 2018	1070 1 WP
Room: 502	[Home page](#)
Wednesdays 3:00-5:50 PM	Office Hours: after class, and by appointment

Course Description

This course covers economic models in supply chain management under uncertainty. The emphasis is on the foundations of dynamic optimization tools in stochastic inventory models and procurement auctions. We study key concepts such as Preservation and Attainment, Myopic Policies, optimality of (s,S) policies, capacitated inventory management, Bayesian Inventory Models, and Contracts in Supply Chains.

Course Materials:

◇ *Foundations of Stochastic Inventory Theory*, by Evan L. Porteus(2002) . Stanford Univ Press. [Book Site](#)

◇ *Other Resources:*

- Bertsekas, DP *Dynamic Programming and Optimal Control,* Athenea Scientific, Belmont, Massachusetts, 3rd Edition, 2005.

- *Foundations of Inventory Management,* by Zipkin, PH, McGraw Hill, 2000.

- I will provide additional at: [reading materials](#) during the course

◇ Start with: [Review of Probability](#).

Learning Goals and Objectives: The aim of the course is to provide students the theoretical foundations to perform analytical research in the area of inventory theory and Supply Chain management. Specifically, the course is designed to help students develop skills and knowledge in the following area(s):

1. Stochastic inventory models

2. Dynamic optimization tools

3. Optimization with simple classes of policies

4. Procurement auctions

5. Demand learning - Bayesian Models

6. Contracts in supply chains

Prerequisites

Basic knowledge of Probability, and Optimization.

Academic Integrity

Students are responsible for understanding the RU Academic Integrity Policy. Students must sign the RU Honor Pledge. See business.rutgers.edu/ai for more details.

Teaching Method: The course will be largely taught using computer presentation. Class-related material (lecture notes, messages, etc.) will be posted on Blackboard. Additional visual material and demos may be shown in some classes. *Most of your work will take place outside the classroom, as you study, and apply the material to which you are introduced in class.*

Grading: Your grade[1] will be based on a final exam, a quiz, case write-ups, homework assignments, and class participation, as follows:

◇ Final exam (3-hour exam) 40%, May 6.
◇ Homework assignments 20%
◇ Quiz (2-hour test held in class) 25% on 3/18 in class
◇ Class participation and conduct 15%

Class Participation and Conduct. Your class participation will be evaluated subjectively, but will rely upon measures of punctuality, attendance, familiarity with the required readings, relevance and insight reflected in class-room questions, and commentary. Your class participation will be judged by what you add to the class environment, regardless of your technical background. Although several lectures will be didactic, we will rely heavily upon interactive discussion within the class. Students will be expected to be familiar with the readings, even though they might not understand all of the material in advance. In general, questions and comments are encouraged. Comments should be limited to the important aspects of earlier points made, and reflect knowledge of the readings. You may called on to answer questions about the homework or classroom discussion. Your classroom participation evaluation is based on the extent to which you contribute to the learning environment. However, correcting a mistake of the professor and asking what appear to be "dumb questions" about what is being covered are positive contributions. In the case of so-called "dumb questions," very often half of the class will have the same questions in mind and are relieved to have them asked.

Other requirements are: On-time arrival to classes, with uninterrupted attendance for the duration.
Maintenance of a professional atmosphere - use respectful comments and humor.
Turning off electronic devices in class: silent wireless devices, no Web-browsing or emailing.
Refraining from distracting or disrespectful activities, e.g., avoiding side conversations.
Courtesy towards all participants in the classroom.

Homework Assignments are designed to help you learn the material discussed in class. In addition doing a thorough job on the homework assignments is the best preparation for the quiz and the final examination. There are three types of assignments: read, prepare, and hand in.

- **Read:** When the assignment is to read some material, this reading is an important introduction to the topics

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[1] Your final grade is not subject to negotiation. If you feel I have made an error, submit your written argument to me within one week of receiving your final grade. Clarify the precise error I made and provide all due supporting documentation. If I have made an error, I will gladly correct it. But I will adjust grades only if I have made an error. I cannot and will not adjust grades based on consequences, such as hurt pride, lost scholarships, lost tuition reimbursement, lost job opportunities, or dismissals. Do not ask me to do so. It is dishonest to attempt to influence faculty in an effort to obtain a grade that you did not earn, and it will not work

to be discussed in class. I will make the assumption that you have done the reading before class and have understood much (but not necessarily all) of it. When the assignment is to read a problem, that problem will often be used in class to introduce new concepts.

- **Prepare:** Fully analyze the problem. Be ready to discuss it in class, with the numbers computed, etc. I will call on people, so please be ready.

- **Hand In:** The same as prepare, but you must turn in your analysis. All written assignments must be handed in at the beginning of class on the day they are due, and so you will probably want to make a copy of your assignment for reference during class. All written assignments will be graded. These assignments should be submitted in typed form using a word processor. Please write your name, RUID and email on all homework submitted. Team work on this homework is not allowed. Unless a documented reason is produced for unusual circumstances, late submissions will not be accepted more than a week late.

Tentative Course Outline.

- The Newsvendor Inventory Model.

- Recursion and Finite Horizon Optimization Models.

- Dynamic Inventory Management - economic lot-sizing models.

- Myopic Policies.

- Optimality of (s,S) policies.

- Monotone Optimal Inventory Control Policies.

- Empirical Bayesian Inventory Models.

- Capacity Procurements under Unknown Demand.

- Continuous Time Models.

- Manufacturer?s Return Policies and Retail Competition.

- Supply Contracts with Quantity Commitment and Stochastic Demand.

- Option Contracts in Supply Chains.

- Vertical Restraints with Incomplete Information.

- Modeling the Impact of Information on Inventories.

- Procurement Auctions.

Suggested Readings

- Katehakis M.N., Melamed B. and J. Shi (2016). "Cash-Flow Based Dynamic Inventory Management", Production and Operations Management, Production and Operations Management Journal (POMS), DOI: 10.1111/poms.1257, pp. 18.

- Katehakis M.N and K.S. Puranam (2012). "On Optimal Bidding in Sequential Procurement Auctions", Operations Research Letters, 40(4): 223-306.

- Burnetas and Gilbert, "Future Capacity Procurements under Unknown Demand and Increasing Costs", Mgt Sci. 2001.

- Lariviere and Porteus, "Stalking Information: Bayesian Inventory Management with Unobserved Lost Sales", Mgt. Sci., 45 (1999), 346-363.

- Tsay, "The Quantity Flexibility Contract and Supplier-Customer Incentives", Mgt. Sci. 45, (1999), 1339-1358.

- Cachon and Zipkin, "Competitive and Cooperative Inventory Policies in a Two-Stage Supply Chain", Mgt. Sci., 45 (1999), 936-953.

- Van Mieghem and Dada "Price versus Production Postponement: Capacity and Competition", Mgt. Sci., 45 (1999), 1631-1649.

- Gal-Or (1991), "Vertical Restraints with Incomplete Information", Journal of Industrial Economics, 39, 503-516.

- Cachon-Lariviere, "Capacity Allocation with Past Sales: When to Turn and Earn", Mgt. Sci., 45, (1999), 685-703.

- Van Mieghem and Dada "Price versus Production Postponement: Capacity and Competition", Mgt. Sci., 45 (1999), 1631-1649.

- S.Tayur, R Ganeshan, M. J. Magazine (2000) . "Quantitative Models for Supply Chain Management", International Series in Operations Research & Management Science, 17.

- More papers will be posted on the class page.