Supply Chain Management
Course Number: 26:799:661
Course Title: Stochastic Methods in SCM

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

I do NOT *tolerate cheating*. Students are responsible for understanding the RU Academic Integrity Policy
http://academicintegrity.rutgers.edu/

I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." I will screen all written assignments through *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large database of past work. Don't let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

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 classroom 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 call 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

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 quizzes. 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 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.

TEACHING METHOD

The course will be largely taught using computer presentation. Class-related material (lecture notes, messages, etc.) will be posted on Canvas. 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 POLICY

Your grade[1] will be based on two, a quiz, homework assignments, and class participation, as follows:

 Final quiz (2 hour test) 45%, ().

Quiz 1 (2-hour test held in class) 35%

Class participation and conduct 20%

COURSE SCHEDULE

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.

- Capacity Procurements under Unknown Demand.

- Bayesian Inventory Models.

- Continuous Time Models.

- Manufacturer?s Return Policies and Retail Competition.

- Supply Contracts with Quantity Commitment and Stochastic Demand.

- Option Contracts in Supply Chains.

- 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, 503516.

- 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.

SUPPORT SERVICES

If you need accommodation for a ***disability***, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. More information can be found at ods.rutgers.edu.

[Rutgers University-New Brunswick ODS phone (848)445-6800 or email dsoffice@echo.rutgers.edu]

[Rutgers University-Newark ODS phone (973)353-5375 or email ods@newark.rutgers.edu]

If you are *pregnant*, the Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy.

[Rutgers University-New Brunswick Title IX Coordinator phone (848)932-8200 or email jackie.moran@rutgers.edu]

[Rutgers University-Newark Office of Title IX and ADA Compliance phone (973)353-1906 or email TitleIX@newark.rutgers.edu]

If you seek *religious accommodations*, the Office of the Dean of Students is available to verify absences for religious observance, as needed.

[Rutgers University-New Brunswick Dean of Students phone (848)932-2300 or email deanofstudents@echo.rutgers.edu]

[Rutgers University-Newark Dean of Students phone (973)353-5063 or email DeanofStudents@newark.rutgers.edu]

If you have experienced any form of *gender or sex-based discrimination or harassment*, including sexual assault, sexual harassment, relationship violence, or stalking, the Office for Violence Prevention and Victim Assistance provides help and support. More information can be found at http://vpva.rutgers.edu/.

[Rutgers University-New Brunswick incident report link: http://studentconduct.rutgers.edu/concern/. You may contact the Office for Violence Prevention and Victim Assistance at (848)932-1181]

[Rutgers University-Newark incident report link: https://cm.maxient.com/reportingform.php?RutgersUniv&layout_id=7 . You may also contact the Office of Title IX and ADA Compliance at (973)353-1906 or email at TitleIX@newark.rutgers.edu. If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or email run.vpva@rutgers.edu]

If students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate, you should submit a request via https://temporaryconditions.rutgers.edu .

If you are a military *veteran* or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. http://veterans.rutgers.edu/

If you are in need of *mental health* services, please use our readily available services.

[Rutgers University-Newark Counseling Center: http://counseling.newark.rutgers.edu/]

[Rutgers Counseling and Psychological Services–New Brunswick: http://rhscaps.rutgers.edu/]

If you are in need of *physical health* services, please use our readily available services.

[Rutgers Health Services – Newark: http://health.newark.rutgers.edu/]

[Rutgers Health Services – New Brunswick: http://health.rutgers.edu/]

If you are in need of *legal* services, please use our readily available services: http://rusls.rutgers.edu/

Students experiencing difficulty in courses due to *English as a second language (ESL)* should contact the Program in American Language Studies for supports.

[Rutgers–Newark: PALS@newark.rutgers.edu]

[Rutgers–New Brunswick: eslpals@english.rutgers.edu]

If you are in need of additional *academic assistance*, please use our readily available services.

[Rutgers University-Newark Learning Center: http://www.ncas.rutgers.edu/rlc

[Rutgers University-Newark Writing Center: http://www.ncas.rutgers.edu/writingcenter]

[Rutgers University-New Brunswick Learning Center: https://rlc.rutgers.edu/]

[Optional items that many faculty include:

 - Students must sign, date, and return a statement declaring that they understand the RU Academic Integrity Policy.

 - Students must sign, date, and return a statement declaring that they understand this syllabus.]