RICE | BUSINESS
Jones Graduate School of Business

BUSI 573: Stochastic Models in Operations Management

Spring 2027 Syllabus

Course Information

Instructor: Süleyman Kerimov, kerimov@rice.edu
Office Hours: By appointment, Virani Hall 389
Meeting Times: Mondays and Wednesdays, 1PM-2:15PM
Location: TBD
Course Website: Canvas

Course Description

This course introduces students to stochastic models of manufacturing and service enterprises, for which uncertainty is a key aspect of performance. It focuses on the workflow optimization for operational competitiveness, capacity and revenue management, as well as the operations of online platforms, which play an increasingly important role in delivering services to customers.

Course Materials

There is no required textbook. I will pass out lecture notes, hard copies of book chapters, and research papers when necessary. Some books that I will use throughout the semester are:

- Jyotiprasad Medhi. Stochastic Models in Queueing Theory. 2nd ed. Academic Press, 2003.
- Sean Meyn and Richard Tweedie. Markov Chains and Stochastic Stability. 2nd ed. Cambridge University Press, 2009.
- Sheldon M. Ross and Erol A. Peköz. A Second Course in Probability. Cambridge University Press, 2023.

Grading

- **Quizzes (30%):** There will be 6 in-class quizzes.
- **Final (50%):** The final will be held in class during the last week of classes, and it will be closed-book and closed-notes. The final will have two parts: theory (Apr 19) and modeling (Apr 21).
- **Presentations (20%):** You will give two presentations (one on your own research and one on an assigned paper).

Course Policies

- Students are expected to attend all classes and actively participate in class discussion. In case of absence, students must notify the instructor in advance. Students are also expected to read the assigned papers throughout the semester.
- Any regrading request must be made within three days after grades are posted. Your request must include a detailed note about the objection. You should be aware that the entire assessment will be regraded.

- All submitted work must include the signed Honor Code pledge (see Rice University Honor Code below).
- Please be courteous and be in class promptly. Use of electronic devices (call, text, etc.) is not allowed in class. If you are using an electronic device (e.g., a tablet) to take notes, please let me know.

Academic Accommodations for Disability

If you have a documented disability or other condition that may affect academic performance, you should:

- Make sure this documentation is on file with the Disability Resource Center (Allen Center, Room 111, adarice@rice.edu, x5841) to determine the accommodations you need.
- Notify the instructor at the beginning of the term so we can discuss your accommodation needs.

Mental Health Statement

The wellbeing and mental health of students is important; if you are having trouble completing your coursework, please reach out to the Wellbeing and Counseling Center. Rice University provides cost-free mental health services through the Wellbeing and Counseling Center (`https://wellbeing.rice.edu`) to help you manage personal challenges that threaten your personal or academic well-being. If you believe you are experiencing unusual amounts of stress, sadness, or anxiety, the Student Wellbeing Office or the Rice Counseling Center may be able to assist you. The Wellbeing and Counseling Center is located in the Gibbs Wellness Center and can be reached at 713-348-3311 (available 24/7).

Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. **All submitted work must include the signed Honor Code pledge**: "On my honor, I have neither given nor received any unauthorized aid on this (assignment, exam, etc.)."

Course Topics

The tentative course schedule is below.

- Week 1 (Jan 11 + Jan 13): Limit theorems
  Probability spaces, convergence theorems, law of large numbers.
- Week 2 (Jan 20): Stein's method
  Couplings, Poisson approximation, Stein's method for distributions. **Quiz 1 on Jan 20.**
- Week 3 (Jan 25 + Jan 27): Concentration inequalities
  Bounds on expectations and tail probabilities.
- Week 4 (Feb 1 + Feb 3): Queueing theory
  Markovian queueing systems, queueing networks. **Quiz 2 on Feb 3.**
- Week 5 (Feb 8 + Feb 10): Queueing theory cont.
  Non-Markovian queueing systems, heavy-traffic approximations.
- Week 6 (Feb 15 + Feb 17): Foster-Lyapunov techniques
  Lyapunov functions, bounding stationary expectations. **Quiz 3 on Feb 17.**

- Week 7 (Feb 22 + Feb 24): Dynamic matching
  Dynamic control of matching queues.
- Week 8 (Mar 1 + Mar 3): Dynamic matching cont.
  Design of max-weight and priority policies. **Quiz 4 on Mar 1. There will be no class on March 3. A makeup class will be scheduled later in the semester.**
- Week 9 (Mar 8 + Mar 10): Network revenue management
  Online packing, online combinatorial auctions.
- Week 10 (Mar 22 + Mar 24): Mean field theory
  Density dependent Markov chains, Kurtz's theorem, the supermarket model. **Quiz 5 on Mar 24.**
- Week 11 (Mar 29 + Mar 31): Mean field theory cont.
  Applications of power of d choices paradigm.
- Week 12 (Apr 5 + Apr 7): Online resource allocation
  Secretary problems, prophet inequalities, stochastic knapsack problems. **Quiz 6 on Apr 7.**
- Week 13 (Apr 12 + Apr 14): Online resource allocation cont.
  Dynamic revenue management.
- Week 14 (Apr 19 + Apr 21): Final Exam