



IE 313 Operations Research III

Course Syllabus Summer 2021-2022

Instructor

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Course Schedule

Lectures: Mondays 11:40 am - 2:30 pm (FASS- G052), Wednesdays 8:40 am - 11:30 am (FASS- G052)
Recitations: Fridays 12:40 pm - 2:30 pm (FASS- G052)

Course Content

Introduction to stochastic processes with examples based on the appropriate manufacturing and service systems; decision making under uncertainty; Markov chains; production/inventory models; queuing systems.

Recommend or Required Reading

Textbook

- Introduction to stochastic processes with R, 1st Edition by Robert P. Dobrow (Publisher: P John Wiley & Sons) **Available as E-Book at the IC**

Reading

- Stochastic Processes: An Introduction, Third Edition by Peter W. Jones and Peter Smith. (Publisher: Chapman and Hall/CRC),
- Introduction to Operations Research, 11th Edition by Frederick Hillier and Gerald Lieberman. (Publisher: McGraw-Hill)

Objectives

The mission of this course is to continue the study of modeling and solution of decision problems using operations research techniques with a particular emphasis on stochastic aspects.

Learning Outcomes

- Have a basic knowledge of discrete time Markov chains (DTMCs), formulate suitable applications as DTMCs and analyze their transient and steady-state behaviors.
- Have a basic knowledge of continuous time Markov chains (CTMCs), formulate suitable applications as CTMCs and analyze their transient and steady-state behaviors.
- Develop a deeper understanding of certain CTMC classes including Poisson processes, birth-and-death processes, and queueing models.
- Perform computation analysis of the stochastic processes of interest using a programming language.

Grading

Assignments	20%
Midterm Exam	30%
Final Exam	50%
Total	100%

- The instructor might adjust this grading scheme if necessary.
- The letter grade you achieve in this course will be determined according to the weights outlined above, not according to “what letter grade you might need” for graduation. If you need a high letter grade, perform accordingly. I will be happy to provide you with guidance and support during the semester. I do NOT discuss grading-related issues with students; please do not even bother to ask. Likewise, I do NOT grant any extra opportunity (such as an extra project, etc.) to increase a student’s letter grade, as this would be unfair to others.

Attendance

- We want students to explain their thoughts and recommendations clearly and engage in constructive discussions with others.
- This requires students to join the lecture hours fully prepared for the class session’s material.
- Each student’s class participation (i.e., comments, questions, answers, discussions with other students, etc.) will be graded.
- Hints for receiving a high participation grade:
 - talk often, show willingness
 - be a good listener, and be polite
 - explore new ideas as well, do not always play “safe.”
 - do not be shy
 - better quality comments receive better grades but do not always wait for the perfect comment
- Attendance to lectures is **optional** and will be tracked for bonuses.

Assignments

- We will have **two individual** assignments during the summer school.
- Assignments are due at the beginning of the class meeting to which they are assigned.
- Late deliveries will not be accepted.

Exams

- one Midterm Exam (at the end of week 4) and one **Comprehensive** Final Exam.

Make-up Exam Policy

- You have to have a valid reason for not taking an exam. If a proof such as a medical report is not brought to me before or within the first three days of the exams you will NOT be given a make-up exam and will be assumed to score 0 in the exam you have missed. The make-up exams may need be scheduled after the final exam and it may be comprehensive.

Computational Part

- Install Anaconda (<https://www.anaconda.com/products/distribution>). You can follow the guide uploaded to SU Course.

Tentative Course Outline

- Discrete time Markov chains
- Continuous time Markov chains
- Poisson Process
- Queueing models based on the birth-and-death process

The chapters refer to the Introduction to stochastic processes with R, 1st Edition by Robert P. Dobrow.

Week	Chapters	Title
1 (Week of July 18)	1 & 2	Ch 1: Introduction & Review Ch 2: Markov Chains: First Steps
2 (Week of July 25)	3	Ch 3: Markov Chains for the Long Term
3 (Week of Aug 01)	3	Ch 3: Markov Chains for the Long Term (continue)
4 (Week of Aug 08)	3	Ch 3: Markov Chains for the Long Term (continue)
5 (Week of Aug 15)	6	Ch 6: Poisson Process
6 (Week of Aug 22)	6 & 7	Ch 6: Poisson Process (Continue) Ch 7: Continuous-Time Markov Chains
7 (Week of Aug 29)	7	Ch 7: Queueing Theory