

IE 398: Stochastic Processes and Applications

1 Course description

This course is intended to be an introduction to stochastic processes with applications in decision-making under uncertainty. It covers newsvendor problem, discrete-time Markov chain (including classification of states, stationary distribution, absorbing states), Poisson processes (including time-homogeneous, time-nonhomogeneous, thinning Poisson), continuous-time Markov chain (including Markov property, generator matrix, stationary distribution), queuing theory (including M/M/k queue, open Jackson network), and Markov decision processes (including finite-horizon models, infinite-horizon models). **Note that students anticipating graduate training in stochastic processes should take IE 410.**

2 Learning outcomes

- Learn the basic stochastic processes models.
- Understand how to apply these in modeling and solving problems involving decision-making under uncertainty.
- Learn how to use software Python.

3 Basic information

Credit: 3 undergraduate hours

Instructor: Linwei Xin (lxin@illinois.edu); Office: Room 209A, Transportation Building; Office Hours: by appointment.

Lecture times: TR 5:00pm - 6:20pm.

Classroom: 112 Transportation Building.

TA #1: Arash Ghayoori(ghayoor2@illinois.edu); Office Hours: Wednesdays 5:00pm - 6:00pm, Room 20 Transportation Building.

TA #2: Xiaotian Xie(xx5@illinois.edu); Office Hours: Wednesdays 2:30pm - 3:30pm, Room 20 Transportation Building.

Prerequisites: IE 300, IE 310.

Required Textbook: No required textbook. Lecture notes will be provided.

Optional Textbook: *Applied Probability and Stochastic Processes*, by Richard Feldman & Ciriaco Valdez-Flores, 2010 (this book can be downloaded from UIUC library for free).

4 Course Mechanics

Homework: Homework will be assigned approximately every other week. **Late homework is not accepted.**

Test: There will be two in-class tests, tentatively scheduled on March 2 (Thursday) and April 27 (Thursday). Both tests are close notes and close textbook but one two-sided paper with formulas will be allowed. **No make-ups.**

Project: There will be two projects involving numerical computation using Python. More information will be available as class goes on.

Grading Policy: The grading will be based on homework (20%), two in-class tests (30% for each), and two projects (10%).

Letter	Grade Percent
A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

5 Tentative list of topics

1. Newsvendor problem
2. Queuing theory
3. Discrete-time Markov chain
4. Markov decision processes
5. Multi-period stochastic inventory control
6. Poisson process
7. Continuous-time Markov chain
8. Other topics

6 Course Policies

6.1 Academic Integrity

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: <http://studentcode.illinois.edu/>.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <http://studentcode.illinois.edu/>. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

6.2 Students with Disabilities

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible. To insure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should contact Disability Resources and Educational Services (DRES) and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me, or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail a message to disability@uiuc.edu. <http://www.disability.illinois.edu/>.

6.3 Emergency Response Recommendations

Emergency response recommendations can be found at the following website:

<http://police.illinois.edu/emergency/>. I encourage you to review this website and the campus building floor plans website within the first 10 days of class:

<http://police.illinois.edu/emergency/floorplans/>.

6.4 Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <http://registrar.illinois.edu/ferpa> for more information on FERPA.