

**IEE 470 Stochastic Operations Research  
Spring 2025**

**1. Contact Information**

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**2. Office Hours**

Instructor's office hour: 4:30-5:30pm Monday and Wednesday at BYENG 324, or by appointment.

**3. Course Description:**

The objectives of the course are to present fundamentals of probability and stochastic processes from a non-measure theoretic point-of-view to develop (i) basic modeling building and probabilistic reasoning skills, and (ii) an understanding of important qualitative characteristics of some basic stochastic processes used to model dynamical systems with noise. The emphasis is on problem formulation, modeling techniques, realistic applications, and an intuitive grasp of why the techniques work, rather than rigorous mathematical theory. The course is intended to help students develop the ability to "think probabilistically".

**4. Enrollment Requirements**

Fundamental knowledge in calculus, probability and statistics; graduate standing Industrial Engineering with no deficiencies.

**5. Course Objectives**

Introduction to probability theory (sample space and events, conditional probability); Random variables (discrete and continuous random variables, distributions, moments, etc.); Markov chains (modeling, classification of states, steady state probabilities, etc.); Continuous time Markov chains (birth-death process, poisson process, embedded markov chain, etc.); Queueing models (Little's law, markovian queues, networks of queues, etc.)

**6. Expected Learning Outcomes**

The students are expected to acquire knowledge related to the topic of stochastic operations research, including the following contents: (i) Basic Probability Theory, (ii) Discrete Time Markov Chain, (iii) Markov Chain Calculations, (iv) Continuous Time Markov Process, and (v) Queueing Models. Moreover, the students will learn how to use these techniques to solve real-world application problems.

**7. Grade Policies**

- a. Final grades will generally be determined according to the following:  $\geq 90\%$ : A;  $\geq 80\%$ : B;  $\geq 70\%$ : C;  $\geq 60\%$ : D;  $< 60\%$ : E
- b. Grading: Homework (25%), Quiz (5%), two midterm exams (20% each), final exam (30%).

**8. Absence policies and the conditions under which assigned work and/or tests can be made up, which should include**

Excused absences for classes will be given without penalty to the grade in the case of (1) a university-sanctioned event [ACD 304-02]; (2) religious holidays [ACD 304-04]; a list of religious holidays can be found here <https://eoss.asu.edu/cora/holidays> ; (3) work performed in the line-of-duty according [SSM 201-18]. Students who request an excused absences must follow the policy/procedure guidelines. Excused absences do not relieve students of responsibility for any part of the course work required during the period of absence.

**9. Lists of any required readings, assignments, examinations, special materials and extracurricular activities**

- a. Required textbooks: James J. Solberg, Modeling Random Processes for Engineers and Managers, John Wiley & Sons, Inc., Hoboken, NJ, 2008.  
Recommended reference: Ross, S.M., Introduction to Probability Models, Academic Press, 11th edition. Drake, A.W., Fundamentals of Applied Probability Theory, McGraw-Hill, 1967.
- b. Homework: The textbook provides answers to selected problems. Therefore, your final answers to these problems are not important, but the process to derive solutions will be carefully scrutinized. Giving only the final answer will result in zero (0) credit. Assignments should be done independently by each individual and turned in online by the due time. Homework turned in up to 24 hours late will be accepted with a 25% penalty. No Homework will be accepted more than 24 hours after the deadline.
- c. Exams: Two (2) midterm exams and one (1) final exam. All exams are close book. You are allowed to take one sheet of paper (A4 size, double sided) to write whatever you think may be helpful for the exam. Calculator is needed. No computer, tablet, cell phone or other smart devices are allowed.
- d. Tentative schedule:

Lecture	Day	Date	Topic	Reading
1	Mon	1/13	Introductions	
2	Wed	1/15	Overview of Basic Probability Theory	Ch 1
	Mon	1/20	Martin Luther King Jr. Holiday (no class)	
3	Wed	1/22		
4	Mon	1/27		
5	Wed	1/29		
6	Mon	2/3		
7	Wed	2/5		
8	Mon	2/10	Discrete Time Markov Chain	Ch 2
9	Wed	2/12		
10	Mon	2/17		
11	Wed	2/19		
	Mon	2/24	Midterm 1 (in class)	
12	Wed	2/26	Markov Chain Calculations	Ch 3
13	Mon	3/3		
14	Wed	3/5		
	Mon	3/10	Spring Break (no class)	
	Wed	3/12	Spring Break (no class)	
15	Mon	3/17		
16	Wed	3/19		
17	Mon	3/24		

18	Wed	3/26		
	Mon	3/31	Midterm 2 (in class)	
19	Wed	4/2	Continuous Time Markov Processes	Ch 5
20	Mon	4/7		
21	Wed	4/9		
22	Mon	4/14		
23	Wed	4/16		
24	Mon	4/21	Queueing Models	Ch 6&7
25	Wed	4/23		
26	Mon	4/28		
27	Wed	4/30		
		TBD	Final Exam Week: 5/5 – 5/10	

### 10. Policy regarding expected classroom behavior

Students in this class are expected to acknowledge and embrace the FSE student professionalism expectation located at: <https://engineering.asu.edu/professionalism/>

The use of recording devices is not permitted during class. Any violent or threatening conduct by an ASU student in this class will be reported to the ASU Policy Department and the Office of the Dean of Students.

### 11. Generative AI

Generative AI is a technology that can often be useful in helping students learn the theories and concepts in this course. However, unless explicitly allowed by your instructor, the use of generative AI tools to complete any portion of a course assignment or exam will be considered academic dishonesty and a violation of the [ASU Academic Integrity Policy](#). Students confirmed to be engaging in non-allowable use of generative AI will be sanctioned according to the academic integrity policy and FSE sanctioning guidelines.

### 12. Academic Integrity

All engineering students are expected to adhere to the ASU Student [Honor Code](#) and the ASU academic integrity policy, which can be found at <https://provost.asu.edu/academic-integrity/policy>). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. If you have taken this course before, you may not reuse or submit any part of your previous assignments without the express written permission from the instructor.

All student academic integrity violations are reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). Withdrawing from this course will not absolve you of responsibility for an academic integrity violation and any sanctions that are applied. The AIO maintains a record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

### 13. Student Copyright Responsibilities

You must refrain from uploading to this course shell, discussion board, website used by the course instructor or any other course forum, material that is not your own original work, unless you first comply with all applicable copyright laws. Course instructors reserve the right to delete materials from the course shell on the grounds of suspected copyright infringement.

The contents of this course, including lectures and other instructional materials, are copyrighted materials. Students may not share outside the class, including uploading, selling or distributing course content or notes taken during the conduct of the course. Any recording of class sessions by students is prohibited, except as part of an accommodation approved by the Disability Resource Center. (see [ACD 304-06](#), "Commercial Note Taking Services" and ABOR Policy [5-308 F.14](#) for more information).

#### **14. Policy against threatening behavior, per the Student Services Manual, [SSM 104-02](#)**

Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services (see [SSM 104-02](#)). Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

#### **15. Disability Accommodations**

Suitable accommodations are made for students having disabilities. Students needing accommodation must register with the ASU Student Accessibility and Inclusive Learning Services office and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in enough time for it to be properly arranged. See [ACD 304-08](#) Classroom and Testing Accommodations for Students with Disabilities.

#### **16. Harassment and Sexual Discrimination**

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling> is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, <https://goto.asuonline.asu.edu/success/online-resources.html>.

#### **17. Photo requirement**

Arizona State University requires each enrolled student and university employee to have on file with ASU a current photo that meets ASU's requirements (your "Photo"). ASU uses your Photo to identify you, as necessary, to provide you educational and related services as an enrolled student at ASU. If you do not have an acceptable Photo on file with ASU, or if you do not consent to the use of your photo, access to ASU resources, including access to course material or grades (online or in person) may be negatively affected, withheld or denied.

#### **18. Additional Items from ACD 304-10**

Syllabus changes: Any information in this syllabus (other than grading and absence policies) may be subject to change with reasonable advance notice.

How Long Students Should Wait for an Absent Instructor: In the event the instructor fails to indicate a time obligation, the time obligation will be 15 minutes for class sessions lasting 90 minutes or less, and 30 minutes for class sessions lasting more than 90 minutes. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly.