

**CE695: Stochastic Processes**  
**Department of Computer Engineering**  
**Sharif University of Technology**  
**Fall 2024: Sunday & Tuesday: 10:30-12:00**

**Instructor:**

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**Course Website:**

<https://stoch-sut.github.io/>

**Online Lectures:**

<https://vc.sharif.edu/rabiee>

**Prerequisites:**

Engineering Probability and Statistics (40-181)

**Course Objectives:**

To make the graduate students acquainted with the fundamental concepts of stochastic processes and their applications in Electrical & Computer Engineering.

**Course Textbooks & References:**

1. A. Papoulis and S. Pillai, Probability, Random Variables and Stochastic Processes, 4th Edition, McGraw Hill, 2002.
2. S. Ross, Introduction to Probability Models, Academic Press, 2009.

3. G. Casella and R. L. Berger, Statistical Inference, Wadsworth Press, 1990 (reference for Estimation Theory part of the course).
4. Bishop, Christopher M. Pattern recognition and machine learning. springer, 2006.
5. Instructor Handouts.

**Grading:**

Based on your performance on Homework, Quiz, Project, Mid-Term and Final Exam. The grade will be determined by:

- Homework: 20%
- Quiz: 20%
- Project: 20%
- Mid-Term Exam: 15%
- Final Exam: 25% (Comprehensive)
- Presentation: 5% (Extra Point)

**Course Description:**

The course includes fundamental concepts of Probability Theory, Stochastic Processes, Stochastic Linear Systems, Stationary and Ergodic Processes, Power Spectral Density, Estimation Theory, Spectral Estimation, Markov processes, Markov Chains, Sampling, and Selected Advanced Topics. For each topic instructor handout is the main reference.

### Course Regulations

**Homework Problems:**

Homework problems will be handed out on their designated dates and will be due about 10 days later. The problems will also cover the following week's materials so do not expect to cover the whole problem set right after its release. There might be some simple programming Homework and a Project using MATLAB or Python. If needed there will be learning materials and classes on how to use MATLAB or Python for problem solving. Course policy for late submission is 10% penalty for each day and no submission is accepted after 3 days.

**Homework Submission:**

Hand in your answers at the start of your class session and also submit your answers in .pdf file in course page on quera website, with the following format:

HW[HW#]-[std#] (For example HW3-400100111)

Week	Date	Topic	Readings	HW/Quiz	Deadline
1	07/01	Course overview, and Review of Probability Theory	Ch. 1-7		
	07/03	Introduction to Stochastic Processes	Ch. 9	Quiz0	
	07/08				
2	07/10	Stochastic Processes	Ch. 9	Quiz1, HW1	
	07/15	Stationary Stochastic Processes	Ch. 9		
3	07/17	Ergodic Stochastic Processes	Ch. 12, Ch. 9	Quiz2	
	07/22	Stochastic Analysis of Linear Systems	Ch. 9		
	07/24	Power Spectrum		HW2	HW1
4	07/29	Point Process	Handout	Quiz3	
	08/01	Poisson Process	Handout		
	08/06		Ch. 9		
5	08/08	Gaussian Process	Handout	Quiz4, HW3	HW2
	08/13		Handout		
6	08/15	Estimation Theory 01	Ch. 8, CB: Ch 6,7	Quiz5	
	08/20				
	08/22				HW3
7	<b>08/27</b>	<b>Midterm Exam</b>	<b>Comprehensive</b>		
8	08/29	Estimation Theory 02	Ch. 8, CB: Ch 6,7		
	09/04			Quiz6	
	09/06			HW4	
9	09/11	Hypothesis Testing	Handout	Quiz7	
	09/13				
	09/18				
10	09/20	Markov Chains	Handout	Quiz8, HW5	HW4
	09/25	HMM	Ross Ch. 4		
	09/27			Project	
	10/2				
11	10/04	Sampling of Stochastic Processes	Bishop Ch. 11	Quiz9,HW6	HW5
	10/09	Applications of Stochastic Processes	Handout		
	10/11			Quiz10	
11					HW6
	<b>10/24</b>	<b>Final Exam 9:00-11:00</b>	<b>Comprehensive</b>		
	<b>11/10</b>	<b>Paper Presentation</b>			
	<b>11/12</b>	<b>Project Deadline</b>			Project
	<b>11/13</b>	<b>Project Presentation</b>			

**Quizzes & Exams:**

There will be a quiz, at the end of the lectures. Each quiz will cover the facts discussed in the previous lecture.

**Problem Solving Classes:**

As a fundamental course, “Stochastic Processes” needs practice through problem solving; Therefore, Problem solving classes are mandatory. Do not be disappointed, as it is an obligatory help!

**Statement on Collaboration, Academic Honesty, and Plagiarism:**

We encourage working together whenever possible on homework, working problems in tutorials, and discussing and interpreting reading assignments. Talking about the course material is a great way to learn. Regarding homework, the following is a fruitful (and acceptable) form of collaboration; discuss with your classmates possible approaches to solving the problems, and then have each one fill in the details and write her/his own solution *independently*. An unacceptable form of dealing with homework is to copy a solution that someone else has written. We discourage, but do not forbid, use of materials from prior terms that students may have access to. Furthermore, at the time that you are actually writing up your solutions, these materials must be set aside; copy-editing from other’s work is not acceptable. At the top of each homework you turn in, we expect you to briefly list all sources of information you used, except known course materials like Text Book, Lectures, etc. A brief note such as “Did homework with ABC and ABD in study group” or “Looked at old solution for Problem 4” would be sufficient. Besides the morality issues, it will help TAs on grading your hand outs. There will be a zero tolerance policy for Cheating/Copying HW’s. The first time you are caught, you will receive a zero for the task at hand. If you are caught for a second time, you will fail the course. In general, we expect students to adhere to basic, common sense concepts of academic honesty. Presenting other’s work as if it was your own, or cheating in exams will not be tolerated.

**Enjoy the course & Good luck :)**