

CE695: Stochastic Processes
Department of Computer Engineering
Sharif University of Technology
Fall 2021: Sunday & Tuesday: 10:30-12:30
(Online Course)

Instructor:

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Course Website:

<http://ce.sharif.edu/courses/00-01/1/ce695-1/>

Online Lectures:

<https://vc.sharif.edu/ch/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%
- Practical Homework: 5% (Extra point)
- Quiz: 20%
- Project: 20%
- Mid-Term Exam: 15%
- Final Exam: 25% (Comprehensive)

Week	Topic	Readings	HW/Quiz
1 08/09, 08/11	Course overview, and Review of Probability Theory Introduction to Stochastic Processes	Ch. 1-7 Ch. 9	Quiz#0 (Take-Home, won't be graded), HW#1
2 08/16, 08/18 08/20	Stochastic Processes Stationary Stochastic Processes	Ch. 9 Ch. 9	Quiz#1 HW#1 Due, HW#2
3 08/23, 08/25	Ergodicity Stochastic Analysis of Linear Systems and Power Spectrum	Ch. 12, Ch. 9 Ch. 9	Quiz#2
4 08/30, 09/02 Extra Class	Poisson Process Point Process	Handout Handout	HW#2 Due, HW#3 Quiz#3
5 09/07, 09/09 09/11	Gaussian Process Estimation Theory - Motivation and Basic Concepts	Handout Ch. 8, CB: Ch 6,7	Quiz#4 HW#3Due, Practical-HW#1
6 09/14, 09/16 09/18	Estimation Theory I Estimation Theory II Midterm Exam	Ch. 8, CB: Ch 6,7 Ch. 8, CB: Ch 6,7 Comprehensive	Quiz#5 HW#4
7 09/21, 09/23 Extra Class	Estimation Theory III Estimation Theory IV Estimation Theory V	Ch. 8, CB: Ch 6,7 Ch. 8, CB: Ch 6,7 Ch. 8, CB: Ch 6,7	Quiz#6
8 09/28, 09/30 10/02	Hypothesis Testing I Hypothesis Testing II	Handout Handout	Quiz#7, HW#4 Due, HW#5 Practical-HW#1 Due, Practical- HW#2
9 10/05, 10/07	Markov Chains I Markov Chains II and Introduction to HMM	Ross Ch. 4 Ross Ch. 4	Quiz#8
10 10/12, 10/14	HMM Sampling of Stochastic Processes I	Ross Ch. 4 Bishop Ch. 11	Quiz#9, HW#5 Due
11 10/19	Sampling of Stochastic Processes II	Bishop Ch. 11	Practical-HW#2 Due
1400/11/03	Final Exam 9:00-12:00	Comprehensive	
1400/11/13	Course Project Due		

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)

Quizzes & Exams:

Each Tuesday there will be a quiz, at the beginning of the lectures. Each quiz will cover the facts discussed in the previous week, so use your Fridays to study!

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 others 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 HWs. 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 :)