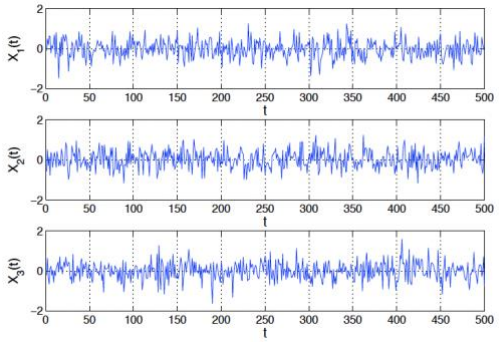
Rutgers University, Dept. of ECE
Fall 2025
16:332:541 Stochastic Signals and Systems

Instructor: Prof. Aggelos Bletsas (aggelos.bletsas@rutgers.edu)

Tuesday and Friday, 08.30-09.50, SEC 202
Office Hours: Tuesday 10.00-11.30, CORE 530 (pls RSVP via email)



Welcome to the Stochastic Signals and System course; this is an exciting and fundamental graduate-level course, at the heart of ECE, necessary in machine learning and data science, wired / wireless communications, signal / information processing and systems engineering.

It uncovers probability theory, including discrete and continuous random variables, functions and transformations of random variables, various convergence kinds of random sequences, random processes, including stationarity, ergodicity, correlation and spectral analysis, the Gaussian process, and the response of linear systems to random processes. Applications in filtering, estimation and inference.

Prerequisites: familiarity with undergraduate probability theory and linear algebra.

Lecture Topics (tentative)
1: Introduction to Probability Theory
2: Random Variables
3: Functions of Random Variables
4: Expectation and Moments
5: Random Vectors & Jointly Gaussian Random Variables
6-7: Estimation – MMSE & LMMSE
8-9: Convergence of Random Sequences
10: Random Processes Calculus: Strict-/Wide-Sense Stationarity, Ergodicity & Expansions
11-12: Markov Chains
13-14: Applications – POMDPs, Importance Sampling

Grading
~20% Psets/Participation
~40% Midterm 1 (Oct. 17, in class)
~40% Midterm 2 (Nov. 21, in class)
Grading by the curve is utilized; final lettergrade depends on class average (i.e., roughly, if grade is above class average, lettergrade will be A).

Collaboration Policy
Unless noted otherwise, collaboration in the problem sets (psets) is allowed in groups of 2-3, provided that each student offers her/his own deliverable and collaborators' names are listed on the deliverable.

Attendance Policy
This is a graduate-level course, and no classes should be missed, unless a (really) serious health, religious or personal issue arises; in that case, you need to inform the instructor.

Exams
Closed-book/notes - You can bring 4 pages ("cheat" sheet) with whatever material you want on them. No electronic devices allowed.

Problem Sets Delivery Format
You can hand-write and scan the answers – you do not have to typeset the solutions. Only pdf format is allowed for your deliverable, through canvas.

Books and notes
Notes will be given – the following books serve as references:

Bruce Hajek, Random Processes for Engineers, Edition: 15, ISBN 9781107100121
Preprint available: https://hajek.ece.illinois.edu/Papers/randomprocJuly14.pdf

Roy D. Yates, Probability and Stochastic Processes: Friendly Introduction for Electrical and Computer Engineers, Edition: 3, ISBN 978-1118324561

Robert. G. Gallager, Stochastic Processes: Theory for Applications, Edition: 1, ISBN 978-1107039759

H. Stark and J. W. Woods, Probability, Statistics, and Random Processes for Engineers, Edition: 4, ISBN 978-0132311236

Sheldon M. Ross, A First Course in Probability, Edition: 8, ISBN 978-0136033134

A. Papoulis, Probability, Random Variables, and Stochastic Processes, Edition: 3, ISBN 978-0070484686