

ADVANCED PROBABILITY FOR ENGINEERS EECE 6932 - 101

Spring-2024
TuTh
3:30PM-4:45PM

Why do we need to learn advanced probability?

To build new analytical and simulation capabilities and confidence to analyze challenging engineering and data-science problems that involve uncertainty.

To be able to truly grasp research articles and textbooks that are probabilistic in nature in various engineering topics such as digital communications, signal detection and estimation, wireless communication, stochastic control, noise in semiconductor devices, signal processing, statistical/machine learning, Monte-Carlo simulation, computer networks, computing, complex systems, optimization, operation research, finance, and reliability analysis.

To have the rigorous mathematical foundation for learning further specialized and advanced topics in probability and stochastic processes that are encountered in engineering.

Recommended preparation: EECE 6020 or equivalent, EECE 6010 or equivalent (preferred), MATLAB

Instructor: Dr. Majeed Hayat, EECE, Marquette University

WHAT YOU WILL LEARN IN THIS COURSE

- ✓ Measure theoretic foundation of probability
- ✓ Deep understanding of the concept of conditional expectation and its power in solving engineering problems
- ✓ Deep understanding of the concept of projections in a Hilbert space, and their use in prediction and signal estimation
- ✓ The concept of convergence of stochastic sequences and the connection among various modes of convergence
- ✓ Laws of large numbers and central limit theorems
- ✓ Markov chains with applications
- ✓ Rare event modeling and analysis
- ✓ Examples of key stochastic processes and their use in modeling engineering problems
- ✓ Martingales and their applications in optimization
- ✓ Modeling and solving a challenging application problem and validating the solution using Monte-Carlo simulation