



**OPUS**  
College of Engineering

**MARQUETTE UNIVERSITY**

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## Advanced Probability for Engineers

TTh 5:00 pm - 6:15 pm

**EECE  
6932**

**Fall-2021**

### Why do we need to learn advanced probability?

To be able to truly grasp research papers that are probabilistic in nature in various engineering topics such as digital communications, 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 build new analytical and simulation capabilities and confidence to analyze challenging engineering problems.

To have the mathematical foundation for learning further specialized and advanced topics in probability 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
- ✓ Markov chains and their use in applications
- ✓ Rare event modeling and analysis
- ✓ Markov chains and their use in applications
- ✓ Examples of key stochastic processes and their use in modeling engineering problems
- ✓ Modeling and solving a challenging application problem and validating the solution using Monte-Carlo simulation