
CSE 209: PROBABILITY METHODS IN ENGINEERING

Credit Hours: 3

Contact Hours: 3

Grading: As per UET rules

1. COURSE OUTLINE:

Probability Methods in Engineering (PME) course provides an introduction to Probability theory and underlying concepts. Axioms of probability and counting methods are taught with illustrations. Probability concepts like conditional probability, total probability, Bayes' rule are covered with examples of practical importance.

The main focus of this course is the notion of Random Variables and its relevance in state-of-the-art research. Related concepts like expected value, standard deviation, functions, transforms and entropy of Random Variables are also part of this course. Students are also trained to generate Random Variable based values using software tools like MATLAB or Python codes.

1. WEEKLY COURSE OUTLINE:

Week	Contents
Week 1	Statistics, Descriptive Statistics and Inferential Statistics, Applications of Statistics, Sample and Population
Week 2	Introduction to Mathematical Models, Deterministic Models, Probabilistic Models Basic Concepts of Probability, Axioms of Probability
Week 3	Computing Probabilities using Counting Methods, Conditional Probability
Week 4	Law on Total Probability, Bayes' Rule
Week 5	Independence of Events, Sequential Experiments
Week 6	Binomial Probability Law, Geometric Probability Law
Week 7	Sequences of Dependent Experiments, Random Variables, Notation of a Random Variable
Week 8	Types of Random Variable, Probability Mass Function
Midterm Examination	
Week 9	Discrete Random Variables
Week 10	Expected Value, Variance, Standard Deviation
Week 11	Functions of a Random Variable, Expected Value of Function of Random

	Variables
Week 12	Entropy, Continuous Random Variables
Week 13	CDF, PDF, Memoryless Property
Week 14	Multiple Random Variables, Joint CDF and PDF, Conditional CDF and PDF, CCDF
Week 15	MATLAB or Python codes for Generation of Pseudo Random Variables
Week 16	Course Revision
Final Term Examination	

2. MAPPING OF CLOS WITH PLOS:

After completing this course, students will be able to

CLO #	Course Learning Outcomes (CLOs)	Level of Learning (Bloom's Taxonomy)	Program Learning Outcomes (PLOs)
1	Use essential concepts of probability and apply analytical methods for solving engineering problems.	Cog-3 (Application)	PLO1 (Engineering Knowledge)
2	Use the concepts of random variables and solve mathematical problems related to stochastic systems.	Cog-3 (Application)	PLO3 (Design/Development of Solutions)
3	Apply mathematical skills and demonstrate the use of software tools for implementation of probabilistic models.	Cog-3 (Application)	PLO5 (Modern Tool Usage)

3. MAPPING OF CLOs WITH COURSE ASSESSMENT TOOLS:

Course Assessment Tools	CLO1	CLO2	CLO3
Assignment	✓	✓	✓
Quiz	✓	✓	✓
Mid Term	✓		
Final Term		✓	✓

4. RESOURCES:

- **TEXT BOOK**

- Alberto Leon-Garcia, “Probability and Random Processes for Electrical Engineering”, 3rd Edition, Pearson Prentice Hall, 2008

- **REFERENCE BOOKS**

- Dimitri Bertsekas and John N. Tsitsiklis, “Introduction to Probability”, 2nd Edition, Athena Scientific, 2008
- Hossein Pishro-Nik, “Introduction to Probability, Statistics, and Random Processes”, Kappa Research, 2014