[ELEC2600] [Probability and Random Process in Engineering] [Fall 2023] [Credits: 4]

Course Description

An introduction to statistical inference and random processes in electrical engineering, including the necessary probabilistic background. Random variables, distribution and density functions, characteristic functions, conditional statistics, expectation, moments, stochastic processes.

Exclusion(s): ELEC2600H, MATH2421
Prerequisite(s): MATH 1003 or MATH 1014 or MATH 1020 or MATH 1024
Corequisite(s): MATH2011 or MATH2023

List of Topics

Lecture Outline

Week 1	Course Introduction	Build a Probability Model
Week 2	Conditional Probability & Independence	Sequential Experiments
Week 3	Discrete Random Variables	Expected Value and Moments
Week 4	Important Discrete Random Variables	Continuous Random Variables
Week 5	Expectation of Continuous Random Variables	Conditional PMF/CDF/PDF
Week 6	Function of a Random Variable	Pairs of Discrete Random Variable
Week 7	Midterm	Pairs of Continuous Random Variable
Week 8	Conditional Probability and Independence	Joint Moments and Conditional Expectation
Week 9	Sum of Two Random Variables	Pairs of Jointly Gaussian Random Variables
Week 10	More than Two Random Variables	Laws of Large Numbers
Week 11	Central Limit Theorem	Definition of a Random Process
Week 12	Sum Processes and Independent Stationary Increment Processes	Mean and Autocorrelation of Random
Week 13	Stationary Random Process	

Laboratory Outline

Lab 1	Week 3	Relative frequency
Lab 2	Week 4	Conditional Probability
Lab 3	Week 8	Different Distributions of One Random Variable
Lab 4	Week 10	Two Random Variables
Lab 5	Week 12	Classifier

Intended Learning Outcomes

On successful completion of this course, students will be able to:

CO1 - Understand the mathematic basis of probability models and their application to engineering

CO2 - Manipulate probability models to solve engineering problem

CO3 - Recognize probabilistic experiments and develop relevant probability models for representing such experiments

CO4 - Use Python as a software tool to manipulate, process, analyze and plot quantities relating to engineering probability models

Textbook(s)

Probability, Statistics and Random Processes for Electrical Engineering, 3rd ed., Alberto Leon-Garcia, Addison Wesley, 2009.

Reference Books

Introduction to Random Signals and Applied Kalman Filtering, 4th ed., G. Brown and P. Y. C. Hwang, New York: John Wiley & Sons, 2012.

Probability and Random Processes, 3rd ed., G. Grimmet and D. Strizaker, Oxford University Press, 2001.

Probability, Random Variables and Stochastic Processes, 4th ed., A. Papouils and S. U. Pillai, Mc-Graw Hill, 2002.

Probability, Random Processes and Estimation Theory for Engineers, 4th ed., H. Stark and J. W. Woods, Prentice Hall, 2012.

Relationship of Course to Program Outcomes

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme

Homework	8%
Laboratory exercises	12%
Mid-term Examination	35%
Final Examination	45%