**[ELEC2600] [Probability and Random Process in Engineering] [Spring 2024] [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

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|---|---|---|
| Week 1 | | Course Introduction |
| Week 2 | Build a Probability Model | Conditional Probability & Independence |
| Week 3 | Lunar New Year | Sequential Experiments |
| Week 4 | Discrete Random Variables | Expected Value and Moments |
| Week 5 | Important Discrete Random Variables | Continuous Random Variables |
| Week 6 | Expectation of Continuous Random Variables | Conditional PMF/CDF/PDF |
| Week 7 | Function of a Random Variable | Pairs of Discrete Random Variable |
| Week 8 | Midterm | Pairs of Continuous Random Variable |
| Week 9 | Conditional Probability and Independence | Break |
| Week 10 | Joint Moments and Conditional Expectation | Sum of Two Random Variables |
| Week 11 | Pairs of Jointly Gaussian Random Variables | More than Two Random Variables |
| Week 12 | Laws of Large Numbers | Central Limit Theorem |
| Week 13 | Definition of a Random Process | Sum Processes and Independent Stationary Increment Processes |
| Week 14 | Mean and Autocorrelation of Random | Stationary Random Process |

### Laboratory Outline

Lab 1 Relative frequency
Lab 2 Conditional Probability
Lab 3 Different Distributions of One Random Variable
Lab 4 Two Random Variables
Lab 5 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

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