PURDUE UNIVERSITY

Electrical and Computer Engineering

ECE 30200 - Probabilistic Methods in Electrical and Computer Engineering

Lecture Hours: 3 Credits: 3
Professional Attributes
CMPE Core
EE Core

Normally Offered: Each Fall, Spring, Summer

Requisites:
(MA 26200 or MA 26600 or MA 36600) and ECE 30100 [may be taken concurrently].

Catalog Description:
An introductory treatment of probability theory including distribution and density functions, moments and random variables. Applications of normal and exponential distributions. Estimation of means, variances. Correlation and spectral density functions. Random processes and response of linear systems to random inputs.

Course Objectives:
This course is intended to introduce the concepts of probability and random processes and to discuss their application to engineering problems. Particular emphasis is given to application of these methods to systems analysis. It is also intended that this course should be a suitable prerequisite for EE 60000.

Required Text(s):
1. *Probability, Statistics, and Random Processes for Electrical Engineering*, 3rd Edition, Alberto Leon-Garcia, Prentice-Hall, 2008, ISBN No. 9780131471221.

Recommended Text(s):
1. *MatLab: Student Version*, Current Edition, The MathWorks, Inc..

Learning Outcomes:

A student who successfully fulfills the course requirements will have demonstrated:

i. an ability to solve simple probability problems in electrical and computer engineering applications. [1,6]

ii. an ability to model complex families of signals by means of random processes. [1,6]

Lecture Outline:

Week	Topic
1	Introduction, Definitions; Set Operations; Probability Introduced
2	Probability Axioms; Math Model; Joint & Conditional Probability
3	Independence, Bernoulli Trials; Random Variables and Distribution Functions; Density Functions
4	Gaussian Random Variables; Other Density Functions; Conditional Probability
5	Expectation; Moments; Transformations of a Random Variables
6	Review; Test; Vector Random Variables
7	Joint Distribution & Density; Conditional Distributions, Independence; Sums of Random Variables
8	Random Processes; Correlation Functions
9	Process Measurements; Gaussian, Poisson Processes

10	Review; Test; Spectral Density
11	Relationship to Correlation Function; Some Noise Definitions; Linear System Fundamentals
12	Random Signals & Linear Systems; System Evaluation Using Random Noise; Spectral Character of System Response
13	Noise Bandwidth; Modeling Noise Sources; Matched Filters
14	Wiener Filters; Review; Test
15	Noise is AM; Noise is FM; Noise Feedback Systems
	Final Exam