



Course Code ECE-332	Course Title Probability and Random Signals	ECTS Credits 6
Department Engineering	Semester Spring	Prerequisites ECE-330
Type of Course Required	Field Engineering	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 3 rd	Lecturer(s) Dr George Gregoriou
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are to:

- Study random variables and random processes as they apply in the electrical and computer engineering disciplines.
- Understand a set theory approach to probability.
- Develop an understanding of discrete and continuous random variables and how they can be used to model and analyze systems.
- Introduce probability density functions and cumulative distribution functions, and how they can be used to characterize engineering systems.
- Introduce sets of random variables and how they relate to electrical engineering applications.
- Provide students with the basics of stochastic processes and their application to signal processing and communications systems.

Learning Outcomes:

After completion of the course students are expected to:

- Demonstrate knowledge and understanding of probability theory and statistics as they apply in the electrical and computer engineering disciplines.
- Differentiate the elements of the random experiment model.
- Explain non-deterministic phenomena using the random experiment model.
- Apply the concept of random variable and to use the probability distribution and density function associated with the random variable in calculating probabilities of events.
- Be able to extend the concept of a random variable to that of a random process as an indexed set of random variables.

Course Contents:

- Probability: set definitions, set operations, probability introduced through sets, joint and conditional probability, independent events, combined experiments,

Bernoulli trials.

- Random variable: the random variable concept, distribution function, density function, the Gaussian random variable, other distribution and density functions, conditional distribution and density functions.
- Operations on one random variable: expectation, moments, functions that give moments, transformations of a random variable.
- Multiple random variables: vector random variables, joint distribution and its properties, joint density and its properties, conditional distribution and density, statistical independence, distribution and density of a sum of random variables.
- Operations on multiple random variables: expected value of a function of random variables, joint moments about the origin and joint central moments, jointly Gaussian random variables.
- Random processes: the random process concept, classification of random processes, stationarity and independence, correlation functions.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises

Assessment Methods:

Homework, mid-term exam, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
P. Z. Peebles	Probability, Random Variables and Random Signal Principles	McGraw Hill	2001	0073660078

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
S. Ross	A First Course in Probability	Pearson Prentice Hall	2005	0131856626
A. Papoulis, S. Pillai	Probability, Random Variables and Stochastic Processes	McGraw Hill	2001	0073660116