EE3331: PROBABILITY MODELS IN INFORMATION ENGINEERING

Effective Term
Semester B 2022/23

Part I Course Overview

Course Title
Probability Models in Information Engineering

Subject Code
EE - Electrical Engineering
Course Number
3331

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
MA2001 Multi-variable Calculus and Linear Algebra

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course introduces probability models and their applications to major areas of information engineering, including digital communications, signal processing and computer networks. The aims are to elucidate the fundamental concepts of probability theory through examples, to explain the importance of random variables and unconditional/conditional distributions, and to develop the student ability in solving problems with randomness and uncertainty. This course is project-based, which provides hands-on experience to students and conveys the relevance and usefulness of probability modelling to practical engineering problems that undergraduate students can appreciate.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain basic concepts in probability, and apply them to solve real-life problems.		x	x	
2	Explain random variables and their distributions		x	x	
3	Apply random variables and probability distributions to formulate and solve engineering problems.		x	x	
4	Apply computer simulations for probability modelling with analysis and verification.		x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Key concepts are described and illustrated. Key concepts are worked out based on examples or problems.	1, 2, 3, 4	3 hrs/wk
2	Project	Key concepts are worked out by experiments and/or simulations.	2, 4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min: 2) and quizzes	1, 2, 3	30	
2	#Assignments and Lab Assignments (min.: 3)	1, 2, 3, 4	20	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

Remark:
To pass the course, students are required to achieve at least 30% in coursework and 30% in the examination.

may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)

Assessment Task

Examination

Criterion

Achievements inCILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reachingmarginal levels

Assessment Task

Coursework

Criterion

Achievements inCILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reachingmarginal levels

Part III Other Information

Keyword Syllabus

Probability
Definitions, rules and axioms, independent and dependent events, conditional probability, Bayes' rule, combinatorics

Random Variables
Discrete and continuous random variables, distribution functions, multiple random variables, expected values, conditional distribution functions and expectation

Random Processes
Stationarity, correlation, ergodicity, Poisson processes

Applications of Probability Modelling
Detection, estimation, queueing theory, data compression

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Sheldon M. Ross, Introduction to Probability Models, 11th ed., Academic Press, 2014.
2	Roy D. Yates and D. J. Goodman, Probability and Stochastic Processes: a Friendly Introduction for Electrical and Computer Engineers, 3rd ed., Wiley, 2014.
3	S. Kay, Intuitive Probability and Random Processes using MATLAB, Springer, 2006
4	H. Pishro-Nik, Introduction to Probability, Statistics, and Random Processes, Kappa Research LLC, 2014