MA3160: PROBABILITY AND STOCHASTIC PROCESSES

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Probability and Stochastic Processes

Subject Code
MA - Mathematics
Course Number
3160

Academic Unit
Mathematics (MA)

College/School
College of Science (SI)

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 or equivalent

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
MA4535 Applied Probability

Part II Course Details

Abstract

This course introduces probability models, stochastic processes and their applications. The primary aim is to elucidate the fundamental principles of probability theory through examples and to develop the ability of students in applying what they learned from this course to widely divergent concrete science and engineering problems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	explain clearly concepts from probability and describe basic stochastic processes.	10	x		
2	evaluate various quantities for probability distributions and random variables.	20		x	
3	formulate and solve problems about stochastic processes.	20		x	
4	develop mathematical models for a range of empirical phenomena and analyze models of queueing system on the basis of stochastic processes.	20	x	x	x
5	the combination of CILOs 1-4	30	x	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	Lectures	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5	39 hours in total
2	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	2	2 hours
3	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	3	2 hours

4	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	1	1 hour
5	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	4	2 hours
6	Take-home assignments	Learning through take-home assignments helps students understand probability theory, solve problems on probability distributions and stochastic processes, as well as apply the knowledge of which and queueing theory to build mathematical models in sciences and engineering.	1, 2, 3, 4	after-class
7	Online applications	Learning through online examples for applications helps students apply concepts of probability and theories of stochastic processes and/or queueing system to model problems in engineering sciences.	4	after-class
8	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	1, 2, 3, 4	after-class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test	1, 2, 3	15	Questions are designed for the first part of the course to see how well the students have learned theory and techniques of probability and stochastic processes.

2	Hand-in assignments	1, 2, 3, 4	15	These are skills based assessment to see whether the students are familiar with theory, techniques of probability and stochastic processes and related applications in queueing systems and scientific modelling.
3	Formative take-home assignments	1, 2, 3, 4	0	The assignments provide students chances to demonstrate their achievements on probability and stochastic processes as well as their applications learned in this course.

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Additional Information for ATs

30% Coursework
70% Examination (Duration: 2 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

1. Test

Criterion

Ability to apply the theories and techniques of probability and stochastic processes

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task
2. Hand-in assignments

Criterion
Ability to apply the learned theory and techniques of probability and stochastic processes

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
3. Examination

Criterion
Ability to apply the learned theory and techniques of probability and stochastic processes

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
4. Formative take-home assignments

Criterion
Ability to apply the learned theory and techniques of probability and stochastic processes

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
Probability.. Distributions. Stochastic processes. Queuing theory. Markov chains. Poisson processes

Reading List

Compulsory Readings

	Title
1	Introduction to probability models, Sheldon M. Ross, 10th ed., San Diego, Calif. : London : Academic, c2007.
2	Probability and stochastic processes: a friendly introduction for electrical and computer engineers Roy D. Yates, David J. Goodman, New York : John Wiley, c1999.

Additional Readings

	Title
1	Nil