SYE8106: SPECIAL TOPICS IN STOCHASTIC MODELING

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Special Topics in Stochastic Modeling

Subject Code
SYE - Systems Engineering
Course Number
8106

Academic Unit
Systems Engineering (SYE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
1

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
SEEM8106 Special Topics in Stochastic Modeling (offered until 2021/22)
ADSE8106 Special Topics in Stochastic Modeling (offered until 2023/24)

Exclusive Courses
Nil

Part II Course Details

Abstract

This course will introduce some basic methodologies in stochastic models, with an emphasis on engineering applications. Topics covered include probability and statistics basics, discrete-time Markov chains and processes; exponential distribution and the Poisson process; other Point processes; Renewal processes, Renewal reward theorem; continuous-time Markov chains; introduction to martingales and applications; introduction to Brownian motion.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles, methodologies and tools in stochastic modelling	20		x	
2	Select appropriate stochastic models and methodologies for analyzing engineering problems	30			x
3	Apply theoretical analysis and quantitative methods for the stochastic models	30			x
4	Demonstrate reflective practice in an engineering context	20	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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Large class Activities	Delivery of the course will be achieved through a series of formal lectures supported by practical case studies. A series of lectures will introduce basic elements and importance of stochastic models	1, 2, 3, 4	13 hours/semester

2	Mini-project	A typical stochastic modelling task will be given to students to solve. The students are expected to work in teams to tackle the given problem. This learning activity will be mainly student-led but with some structural guidance from the teacher.	1, 2, 3, 4	4 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mini-Project	1, 2, 3, 4	100	-	No

Continuous Assessment (%)

100

Examination (%)

0

Minimum Continuous Assessment Passing Requirement (%)

30

Assessment Rubrics (AR)

Assessment Task

Mini-Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Project is completed in groups and is graded by the course leader.

Pass (P)

(P) Pass

Failure (F)

(F) Fail

Assessment Task

Mini-Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Project is completed in groups and is graded by the course leader.

Pass (P)

(P) Pass

Failure (F)

(F) Fail

Additional Information for AR

The grading is assigned based on students' performance in assessment tasks/activities.

This is a Pass/Fail course.

Part III Other Information

Keyword Syllabus

- Probability theory
- Poisson processes
- Renewal theory
- Markov chains and processes
- Queueing models

Reading List

Compulsory Readings

	Title
1	Sheldon Ross. Introduction to Probability models

Additional Readings

	Title
1	C. L. Chiang. An Introduction to Stochastic Processes and Their Applications.
2	P. Guttorp. Stochastic Modeling in Scientific Applications.
3	S. Ross. Stochastic Processes.