

Module code

SPM-3409

Type of module

Undergraduate: Mathematical Sciences – Elective

Stochastic Processes



Modular credits

4

Total student
engagement

56 hours

Prerequisite

**SPM-2203 Probability
and Statistics**

Anti-requisite

None

Aims

To develop students' ability to analyse and apply advanced stochastic processes, including Markov chains, renewal theory, queueing models, reliability theory, and stationary processes, to model and solve problems in science and engineering.

Module learning outcomes (MLO)

On successful completion of this module, a student will be expected to be able to:

MLO 1

Formulate and analyse discrete- and continuous-time Markov chains, Poisson processes, and renewal processes.

MLO 2

Apply and evaluate stochastic models in queueing and reliability theory to solve real-world problems.

MLO 3

Analyse and interpret the properties of Brownian motion and stationary processes in probabilistic modelling.

MLO 4

Apply probabilistic techniques to derive long-term behaviours, such as steady-state distributions and limiting probabilities.

MLO 5

Synthesise stochastic modelling approaches to design and justify solutions in applied contexts across science and engineering.

Module contents

Markov Chains: Discrete- and continuous-time chains, exponential distribution, and Poisson process

Renewal Theory: Renewal processes and applications

Queueing Theory: Models of queues, waiting times, and performance measures

Reliability Theory: Modelling system reliability and failure times

Brownian Motion and Stationary Processes: Properties, applications, and connections to stochastic modelling

Assessment

60%

Examination

40%

Coursework

Examination
60%

Class tests
30%

10%

■ Examination — 60% ■ Class tests — 30% ■ Assignments — 10%

Formative assessment

Weekly discussion and feedback

Summative assessment

COMPONENT		WEIGHTING
Examination		60%
Coursework		40%
Individual		40%
Class tests		30%
Assignments		10%

Graduate attributes and skills

Programme learning objectives (PLO) addressed

- 1 PLO 1 (Core Mathematical Knowledge)
- 3 PLO 3 (Computational and Digital Tools)

- 2 PLO 2 (Analytical Problem-Solving)
- 4 PLO 4 (Mathematical Communication)

Sustainability concept addressed

- 4 SDG 4 Quality Education
- 9 SDG 9 Industry, Innovation and Infrastructure

Digital skills/software used (not limited to)

- Mathematical and computational software (Python, MATLAB, Mathematica)

Micro-credentialling option

No

Stackable towards GenBESTARI Undergraduate Degree Programme or other relevant Lifelong Learning Programmes

No

Document details

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