

Module code

SPM-3418

Type of module

Undergraduate: Mathematical Sciences – Elective

Operations Research II



Modular credits

4

Total student
engagement

56 hours

Prerequisite

SPM-2203
(Probability and
Statistics) **SPM-3301**
(Operations Research)

Anti-requisite

None

Aims

To develop students' ability to evaluate, select, and apply decision-making models, optimisation techniques, and simulation methods to solve complex real-world problems and support evidence-based decision-making under uncertainty.

Module learning outcomes (MLO)

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

MLO 1

Evaluate and justify the selection of decision-making, optimisation, and simulation techniques based on problem characteristics, uncertainty, and operational constraints.

MLO 2

Analyse and apply network models, inventory systems, queueing models, and Markov chains to solve operational and logistical problems.

MLO 3

Evaluate the assumptions, reliability, and limitations of optimisation, stochastic, and simulation models in supporting evidence-based decisions.

MLO 4

Generate and justify strategic recommendations by applying game theory, nonlinear programming, dynamic programming, and simulation techniques to complex real-world scenarios.

Module contents

Decision analysis and utility theory	Decision trees and risk analysis	Utility functions and risk attitudes
Bayesian decision making	Network models and project management	Shortest path and minimum spanning tree
Maximum flow and CPM/PERT scheduling	Inventory control and EOQ models	Reorder points and quantity discounts
Markov chains and steady-state analysis	Absorbing chains and fundamental matrix	Queueing theory and waiting line models
Single and multi-server queues	Simulation and Monte Carlo methods	Random variate generation and applications
Game theory and strategic models	Pure and mixed strategy solutions	Non-linear programming and optimisation
Lagrangian and KKT conditions	Dynamic programming principles and applications	

Assessment

60% **40%**
Examination Coursework



■ Examination — 60% ■ Class tests — 30% ■ Tutorials participation — 10%

Formative assessment

Weekly discussion and feedback

Summative assessment

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

Graduate attributes and skills

Programme learning objectives (PLO) addressed

1	PLO 1 (Core Mathematical Knowledge)	2	PLO 2 (Analytical Problem-Solving)
3	PLO 3 (Computational and Digital Tools)	4	PLO 4 (Mathematical Communication)
6	PLO 6 (Adaptability and Lifelong Learning)		

Sustainability concept addressed

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

Digital skills/software used (not limited to)

- Learning management and collaboration platforms (e.g. Canvas, Microsoft Teams)
- Spreadsheet and numerical analysis software (e.g. Microsoft Excel)
- Statistical computing and programming software (e.g. RStudio)
- Presentation software (e.g. Microsoft PowerPoint)
- General productivity tool (e.g. Microsoft Words)

Micro-credentialling option No	Stackable towards GenBESTARI Undergraduate Degree Programme or other relevant Lifelong Learning Programmes No
--	---

Document details

Office **ODVCE** Document date **27 June 2026** Status **New** Approval **GBF (12/02/2026)**