

Module code

SPM-3411

Type of module

Undergraduate: Mathematical Sciences – Elective

Mathematical Modelling



Modular credits

4

Total student
engagement

56 hours

Prerequisite

**SPM-1203 Software for
Mathematicians SPM-
2205 Ordinary
Differential Equations**

Anti-requisite

None

Aims

To develop students' ability to formulate, analyse, validate, and solve real-world problems using mathematical modelling techniques and appropriate computational tools across scientific, engineering, and social contexts.

Module learning outcomes (MLO)

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

MLO 1

Formulate mathematical models for real-world problems, apply suitable mathematical and computational techniques to solve them, and analyse their behaviour and sensitivity under varying assumptions and parameters.

MLO 2

Evaluate the validity, limitations, and reliability of mathematical models.

MLO 3

Utilise computational and digital tools effectively to implement, simulate, and visualise mathematical models, enhancing problem-solving, analysis, and interpretation of results.

MLO 4

Interpret and communicate the results of mathematical models effectively in written and oral forms.

Module contents

Fundamentals of Mathematical Modelling (Optimisation Models):	Problem identification and formulation of models	Solution techniques: analytical and numerical
Sensitivity analysis and model validation	Modelling using Ordinary Differential Equations (ODEs):	Formulation and solution of ODE models
Applications across science, engineering, medicine, and social sciences	Modelling using Partial Differential Equations (PDEs):	Formulation and solution of PDE models

Applications in natural,
engineering, and social systems

Computational Modelling:

Simulation and visualization of
ODE and PDE models using
computational tools

Assessment

60%

Examination

40%

Coursework

Examination
60%

Class tests
30%

10%

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

Formative assessment

Weekly discussion
and feedback

Summative assessment

COMPONENT	WEIGHTING
Examination	60%
Coursework	40%
Individual	40%
Class tests	30%
Assignment	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)

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)

■ Mathematical and Computational Software

Micro-credentialling option

No

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

No

Document details

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