

Module code

SPM-2205

Type of module

Undergraduate: Mathematical Sciences – Major Core

Ordinary Differential Equations



Modular credits

4

Total student
engagement

56 hours

Prerequisite

SPM-1201
Mathematical Methods
for the Sciences

Anti-requisite

None

Aims

To develop students' ability to formulate, analyse, and solve ordinary differential equations using analytical and computational techniques, and to apply these methods to mathematical models arising in the physical, biological, medical, social, and engineering sciences.

Module learning outcomes (MLO)

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

MLO 1

Analyse and classify ordinary differential equations, including first-order equations, higher-order linear equations, and systems of ODEs, to determine their qualitative behaviour and appropriate solution strategies.

MLO 2

Apply appropriate analytical techniques—including separation of variables, integrating factors, characteristic equations, and Laplace transforms—to solve initial value problems arising in scientific and engineering contexts.

MLO 3

Evaluate the stability and long-term behaviour of solutions to systems of ordinary differential equations using analytical and graphical methods.

MLO 4

Construct, implement, and visualize ordinary differential equation models using appropriate computational tools to support analytical solutions and interpret system behaviour.

MLO 5

Evaluate mathematical models by stating assumptions, justifying solution methods, and communicating results using appropriate mathematical and computational conventions.

Module contents

Classification and qualitative behaviour of differential equations	First-order ODEs: solution methods and applications in sciences and engineering	Higher-order linear ODEs: solution techniques and applications
Systems of ODEs and stability analysis	Laplace transform methods for solving initial value problems	Introduction to computational tools for solving and visualizing ODEs

Assessment

60% **40%**
Examination Coursework

Examination 60%	Class tests 40%
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■ Examination — 60% ■ Class tests — 40%

Formative assessment

Weekly discussion and feedback

Summative assessment

COMPONENT	WEIGHTING
Examination	60%
Coursework	40%
Individual	40%
Class tests	40%

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

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
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Document details

Office **ODVCE** Document date **26 June 2026** Status **New** Approval **GBF (12/02/2026)**