

Module code

SPM-2206

Type of module

Undergraduate: Mathematical Sciences – Major Core

Multivariate Calculus



Modular credits

4

Total student
engagement

56 hours

Prerequisite

**SPM-2201 Advanced
Mathematical Methods
for the Sciences**

Anti-requisite

None

Aims

To develop students' ability to analyse functions of several variables and apply multivariable and vector calculus techniques to solve mathematical, physical, and engineering problems.

Module learning outcomes (MLO)

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

MLO 1

Compute and apply partial derivatives, tangent planes, and optimization methods (including Lagrange multipliers) to multivariable problems.

MLO 2

Evaluate and interpret double and triple integrals, including changes of variables, with applications to geometry and physical quantities.

MLO 3

Formulate and analyse vector fields, computing line and surface integrals, and applying Green's theorem.

MLO 4

Justify and assess appropriate mathematical approaches in solving complex multivariate problems.

MLO 5

Independently select, justify, and implement appropriate multivariable calculus techniques to solve complex problems.

Module contents

Partial Differentiation: functions of several variables, partial derivatives, tangent/normal planes, error estimation, optimization, and Lagrange multipliers

Multiple Integrals: double and triple integrals, change of order and variables (Jacobian), applications to area, volume, surface area, mass, and moments

Vector Calculus: gradient, divergence, curl, line and surface integrals, conservative fields, and Green's theorem in the plane

Assessment

60%

Examination

40%

Coursework

Examination
60%

Class tests
30%

10%

■ Examination — 60% ■ Class tests — 30% ■ Online quizzes — 10%

Formative assessment

Weekly discussion
and feedback

Summative assessment

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

Graduate attributes and skills

Programme learning objectives (PLO) addressed

1

PLO 1 (Core Mathematical Knowledge)

2

PLO 2 (Analytical Problem-Solving)

4

PLO 4 (Mathematical Communication)

6

PLO 6 (Adaptability and Lifelong Learning)

Sustainability concept addressed

4

SDG 4 Quality Education

Digital skills/software used (not limited to)

■ Computer algebra and mathematical visualisation software (e.g. Mathematica, Desmos)

■ Learning management and collaboration platforms (e.g. Canvas)

■ Communication Software

Micro-credentialling option

No

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

No

Document details

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