Advanced Calculus and Partial Differential Equations

Module Information

2022.01, Approved

Summary Information

Module Code	6113MATHS
Formal Module Title	Advanced Calculus and Partial Differential Equations
Owning School	Computer Science and Mathematics
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 6
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
Computer Science and Mathematics

Learning Methods

Learning Method Type	Hours
Lecture	33
Practical	22

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	Extend students' mastery of calculus in application areas such as vectors, complex numbers transforms and series. To use functions of a complex variable to evaluate real integrals. To extend theory introduced in 5105MATHS: Differential Equations at Level 5 and provide an introductory course on solving Partial Differential Equations (PDEs).

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Apply the theorems of Gauss, Green and Stokes to solve a range of real-world problems drawn from subjects such as engineering and physics.
MLO2	2	Synthesise techniques from complex analysis to solve problems in calculus.
MLO3	3	Construct Fourier Series approximations to piecewise continuous functions and be able to graph out periodic extensions of these series.
MLO4	4	Classify PDEs as hyperbolic, parabolic or elliptic and construct the solution of a selection of simple PDEs on finite, semi-infinite and infinite domains.

Module Content

Outline Syllabus	1) Complex Analysis • Continuity and analytic functions. • Complex integration. • Cauchy's Theorem. 2) Vector Calculus • The del operator.• Calculating the gradient of a scalar function and the divergence and curl of vector-valued functions.• The theorems of Green, Gauss and Stokes.3) Partial Differential Equations • Representing piecewise continuous functions using full and half-range Fourier Series.• Classification of PDEs.• Solution of simple two-dimensional PDEs on finite domains using separation of variables.• Using Full Fourier Transforms to solve PDEs on infinite domains, and Fourier Sine and Cosine Transforms to solve PDEs on semi-infinite domains.
Module Overview	
Additional Information	This module gives students the opportunity to apply mathematics to scientific problems.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Portfolio	Portfolio	40	0	MLO1, MLO2, MLO3
Centralised Exam	Examination	60	2	MLO1, MLO2, MLO3, MLO4

Module Contacts