

Differential Equations

Module Information

2022.01, Approved

Summary Information

Module Code	5105MATHS
Formal Module Title	Differential Equations
Owning School	Computer Science and Mathematics
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
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	To build on differential equation theory that was introduced in Mathematical Methods (4101MATHS) and provide a comprehensive coverage of initial value problems in one independent variable and an introduction to boundary value problems. To introduce students to systems of ordinary differential equations (ODEs) and determine how to solve linear autonomous systems of ODEs. To introduce the concepts of asymptotic theory as a tool for analytically approximating the solution of differential equations.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Apply appropriate theorems to determine the existence and uniqueness of solutions of first and second order ODEs
MLO2	2	Analyse the salient properties of both first and second order ODEs and select appropriate methods to solve them
MLO3	3	Construct asymptotic series to approximate the solution of ODEs and evaluate their accuracy
MLO4	4	Solve a range of differential equations that model real phenomena and interpret solutions in a real-world context

Module Content

Outline Syllabus	1) First order ODEs• Separation of variables and integrating factor method to solve initial value problems (IVPs)• Existence and uniqueness of both linear and non-linear IVPs2) Second order ODEs• Existence and uniqueness of solutions of linear ODEs• Solution of homogeneous ODEs – constant coefficients, Euler equations and series solutions• Solution of inhomogeneous ODEs – method of undetermined coefficients, variation of parameters3) Systems of ODEs• Solution of simple systems, including autonomous systems of ODEs4) Asymptotic Expansions• Approximating the roots of equations• Applications to the solution of differential equations5) Boundary Value Problems• Introduction and solution of simple examples
Module Overview	This module will build on differential equation theory that was introduced in Mathematical Methods. You will be introduced to systems of ordinary differential equations (ODEs) and determine how to solve linear autonomous systems of ODEs and to introduce the concepts of asymptotic theory as a tool for analytically approximating the solution of differential equations.
Additional Information	This module is designed to give students experience and confidence in solving differential equations that depend on only one variable. The theory covered in this module will complement material delivered at level 6.

Assessments

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

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Stewart Chidlow	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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