Liverpool John Moores University

Title:	Differential Equations
Status:	Definitive
Code:	**5105MATHS** (126751)
Version Start Date:	01-08-2021
Owning School/Faculty:	Computer Science and Mathematics
Teaching School/Faculty:	Computer Science and Mathematics

Team	Leader
Stewart Chidlow	Y

Academic Level:	FHEQ5	**Credit Value:**	20	**Total Delivered Hours:**	57
Total Learning Hours:	200	**Private Study:**	143		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	33
Practical	22

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Portfolio	AS1	A selection of online tests and problems	40	
Exam	AS2	Examination	60	2

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.

Learning Outcomes

After completing the module the student should be able to:

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

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Online tests and problems	1	2	4
Examination	1	2	3

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 IVPs

2) 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 parameters

3) Systems of ODEs
• Solution of simple systems, including autonomous systems of ODEs

4) Asymptotic Expansions
• Approximating the roots of equations
• Applications to the solution of differential equations

5) Boundary Value Problems
• Introduction and solution of simple examples

Learning Activities

A combination of lectures, tutorials and directed reading.

Notes

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.