



Ollscoil Chathair
Bhaile Átha Cliath
Dublin City University

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Module Specifications.

Current Academic Year 2024 - 2025

All Module information is indicative, and this portal is an interim interface pending the full upgrade of Coursebuilder and subsequent integration to the new DCU Student Information System (DCU Key).

As such, this is a point in time view of data which will be refreshed periodically. Some fields/data may not yet be available pending the completion of the full Coursebuilder upgrade and integration project. We will post status updates as they become available. Thank you for your patience and understanding.

Date posted: September 2024



Module Title	Introduction to Differential Equations		
Module Code	MS211 (ITS) / MTH1036 (Banner)		
Faculty	Science & Health	School	Mathematical Sciences
Module Co-ordinator	-		
Module Teachers	Paul Razafimandimby		
NFQ level	8	Credit Rating	5
Pre-requisite	Not Available		
Co-requisite	Not Available		
Compatibles	Not Available		
Incompatibles	Not Available		

None
Array

Description

The purpose of this module is to equip students with the knowledge and skills relevant to elementary ordinary differential equations. This will involve dealing with the theory of such equations, as well as learning methods of solution for the most important classes of these equations. The importance of using rigorous mathematical arguments in this analysis will be emphasised. Students will attend workshop style lectures in which they reconstruct the main results and methods of the topic through guided enquiry. They will also attend review lectures and tutorials that recap on previously encountered material. They will undertake exercises and problems to be presented for assessment.

Learning Outcomes

1. Classify ordinary differential equations;
2. Synthesise different mathematical techniques to determine quantitative and qualitative information about those equations and their solutions;
3. Construct mathematical models using differential equations and study those models



and their applications;

4. Apply rigorous mathematical analysis to the study of the theory of ordinary differential equations.

Workload		Full-time hours per semester	
<i>Type</i>	<i>Hours</i>	<i>Description</i>	
Lecture	24	No Description	
Tutorial	12	No Description	
Independent Study	89	No Description	
		Total Workload: 125	

All module information is indicative and subject to change. For further information, students are advised to refer to the University's Marks and Standards and Programme Specific Regulations at:

<http://www.dcu.ie/registry/examinations/index.shtml>

Indicative Content and Learning Activities

Introduction

Definitions and classification. Solutions of differential equations. Applications of ordinary differential equations.

First Order Equations

Initial value problems. Geometric interpretation and direction fields. The existence and uniqueness theorem. Linear, separable, homogeneous and exact equations.

Modelling with First Order Equations

Radioactive decay. Newton's law of cooling. Modelling populations: exponential and logistic growth; logistic growth with harvesting. Mixing problems.

Second Order Linear Equations

Homogeneous equations with constant coefficients. Non-homogeneous equations; method of undetermined coefficients, variation of parameters. Fundamental solutions and



Wronskians; Abel's theorem.

Linear Systems

Homogeneous linear systems solved by finding eigenvalues and eigenvectors (or generalised eigenvectors), simple inhomogeneous systems

Assessment Breakdown

Continuous Assessment 20% Examination Weight 80%

Course Work Breakdown

Type	Description	% of total	Assessment Date
In Class Test	This is on methods of solving elementary differential equations	20%	Week 28

Indicative Reading List

- **W.E. Boyce and R.C. Di Prima:** 1996, Elementary Differential Equations and Boundary Value Problems, John Wiley,
- **W. Kohler and L. Johnson:** 2006, Elementary Differential Equations with Boundary Value Problems, Pearson/Addison-Wesley,

Other Resources

None

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