

MA3001: DIFFERENTIAL EQUATIONS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Differential Equations

Subject Code

MA - Mathematics

Course Number

3001

Academic Unit

Mathematics (MA)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

MA2001 Multi-variable Calculus and Linear Algebra or equivalent

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to investigate both the occurrence of differential equations in science and engineering, and the methods available for their solutions. It is intended for students to learn methods and techniques of ordinary and partial differential equations. It will help students develop skills and the ability to think quantitatively and analyse problems critically.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	explain at high-level concepts from differential equations and transforms.		x	x	
2	implement basic operations in Fourier series and Laplace transforms.		x	x	
3	solve first and second order ordinary differential equations and systems of linear differential equations.			x	
4	solve linear partial differential equations: diffusion, wave and Laplace equations.			x	
5	develop advanced mathematical models through differential equations, and appropriately apply advanced mathematical and computational methods to a range of problems in engineering involving differential equations.			x	x

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5	39 hours in total
2	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	2	3 hours
3	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	3	5 hours

4	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	4	3 hour
5	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	1, 5	2 hours
6	Take-home assignments	Learning through take-home assignments helps students understand basic concepts and techniques of differential equations, transforms and some applications in engineering.	1, 2, 3, 4, 5	after-class
7	Online applications	Learning through online examples for applications helps students apply mathematical and computational methods to some problems in engineering applications.	5	after-class

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Test	2, 3, 4	20	Questions are designed for the first part of the course to see how well the students have learned concepts and techniques of differential equations.	No
2	Hand-in assignments	1, 2, 3, 4, 5	10	These are skills based assessment to see whether the students are familiar with advanced concepts and techniques of ordinary and partial differential equations, and some applications in engineering.	Yes

3	Formative take-home assignments	1, 2, 3, 4, 5	0	The assignments provide students' chances to demonstrate their achievements on ordinary and partial differential equations, and their applications in engineering learned in this course.	Yes
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Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

30% Coursework 70% Examination (Duration: 2 hours, at the end of the semester) For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)**Assessment Task**

1. Test

Criterion

ABILITY to SOLVE in DETAIL and with ACCURACY the posed QUESTIONS

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

2. Hand-in assignments

Criterion

ABILITY to SOLVE in DETAIL and with ACCURACY the posed QUESTIONS

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

3. Examination

Criterion

ABILITY to SOLVE in DETAIL and with ACCURACY the posed QUESTIONS

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

4. Formative take-home assignments

Criterion

ABILITY to SOLVE in DETAIL and with ACCURACY the posed QUESTIONS

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Ordinary differential equations (7 weeks): First order differential equations, Second and higher order linear differential equations; Laplace transform; System of linear differential equations.

Partial differential equations (6 weeks): Diffusion, wave and Laplace equations; Initial value problems; Fourier series; Boundary value problems.

Reading List

Compulsory Readings

Title	
1	Mathematics for Engineering and Science, Department of Mathematics, City University of Hong Kong, Prentice Hall, Pearson Education South Asia, 2008

Additional Readings

Title	
1	Nil