

MA3512: PARTIAL DIFFERENTIAL EQUATIONS

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

Partial Differential Equations

Subject Code

MA - Mathematics

Course Number

3512

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

MA3511 Ordinary Differential Equations

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to provide an introduction to the theory and applications of partial differential equations. It trains students to formulate physical problems mathematically and develops a systematic approach of solving elementary partial differential equations.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	explain clearly concepts and theory of basic methods for solving partial differential equations.		x	x
2	recognize the types of second-order partial differential equations as typified by classical equations of mathematical physics, such as the wave equation, heat-diffusion equation and Laplace equation.		x	x
3	apply eigenfunction expansion methods to solve non-homogeneous versions of heat-diffusion and wave equations.		x	x
4	recognize the concept of a Green function and its applications in solving non-homogeneous problems and elementary boundary value problems (with the use of Dirac delta).		x	
5	create and formulate mathematical models for a range of scientific and engineering problems involving partial differential equations.		x	
6	the combination of CILOs 1--5			

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.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5, 6 39 hours in total

2	Take-home assignments	Learning through take-home assignments helps students understand basic mathematical concepts and methods of solving elementary partial differential equations as well as their applications to scientific problems.	1, 2, 3, 4, 5	after-class
3	Online applications	Learning through online examples for applications helps students create and formulate mathematical models and apply to a range of problems in science and engineering.	5	after-class
4	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	1, 2, 3, 4, 5	after-class

Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)	
1	Test (Midterm Exam)	1, 2, 3	21	Questions are designed for the first part of the course to see how well the students have learned the basic methods and techniques of solving partial differential equations as typified by the wave equation, Laplace equation, etc.
2	Hand-in assignments	1, 2, 3, 4, 5	9	These are skills based assessment to enable students to demonstrate the basic concepts and theory of solving elementary partial differential equations and their applications to physical sciences.
3	Formative take-home assignments	1, 2, 3, 4, 5	0	The assignments provide students chances to demonstrate their achievements on solving partial differential equations learned in this course.

Continuous Assessment (%)

Examination (%)

70

Examination Duration (Hours)

3

Additional Information for ATs

30% Coursework

70% Examination (Duration: 3 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

Capacity to APPLY and EXPLAIN the basic concepts and methodology of partial differential equations

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

Capacity to UNDERSTAND basic concepts and tools for solving partial differential equations

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 APPLY different approaches in the theory of partial differential equations to concrete problems.

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 for SELF-DIRECTED LEARNING to understand and apply different approaches in the theory of partial differential equations

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

Basic Concepts of Partial Differential Equation. Heat-diffusion Equation. Eigenvalue Problems. Wave Equations. Elliptic Equations. Green's Function.

Reading List

Compulsory Readings

	Title
1	Parital Differential Equations. An Introduction. By Walter A. Strauss, 2nd Edition, 2008.

Additional Readings

	Title
1	Nil