MA2158: LINEAR ALGEBRA AND CALCULUS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Linear Algebra and Calculus

Subject Code
MA - Mathematics
Course Number
2158

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
MA1201 Calculus and Basic Linear Algebra II / MA1301 Enhanced Calculus and Linear Algebra II; or equivalent

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
MA2001 Multi-variable Calculus and Linear Algebra

Part II Course Details

Abstract

This course aims to develop mathematical concepts and techniques in advanced linear algebra, multi-variable calculus and Fourier series as well as their applications in science and engineering. It provides students 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 levels concepts from advanced linear algebra and multi-variable calculus.	10			x
2	compute eigenvalues and eigenvectors of matrices, and solve first and second order ordinary differential equations.	20		x	
3	Compute partial derivatives and multiple integrals of multivariate functions.	20		x	
4	implement basic operations in vector calculus and evaluate line and surface integrals of vector fields.	20		x	
5	apply mathematical and computational methods to a range of application problems involving advanced linear algebra, ordinary differential equations and multi-variable calculus.	20	x	x	x
6	the combination of CILOs 1-5	10	x	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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5, 6	39 hours in total
2	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	2	4 hours

3	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	3	4 hours
4	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	1, 5	3 hours
5	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	4	2 hours
6	Assignments	Learning through take-home assignments helps students understand basic concepts and techniques of advanced linear algebra, ordinary differential equations and multi-variable calculus, and some applications in science and 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 applications.	5	after-class
8	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	2, 3, 4	after-class

Assessment Tasks / Activities (ATs)

	ATs	**CILO No.**	**Weighting (%)**	**Remarks (e.g. Parameter for GenAI use)**
1	Test	2, 3, 4, 6	30	Questions are designed for the first part of the course to see how well the students have learned concepts and techniques of advanced linear algebra and ordinary differential equations.

2	Hand-in assignments	1, 2, 3, 4, 5, 6	0	These are skills based assessment to see whether the students are familiar with advanced concepts and techniques of linear algebra, ordinary differential equations, multi-variable calculus and Fourier series and some applications in science and engineering.
3	Formative take-home assignments	1, 2, 3, 4, 5, 6	0	The assignments provide students chances to demonstrate their achievements on linear algebra, ordinary differential equations and multi-variable calculus learned in this course.

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

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 apply and explain the concepts, methodology and procedure

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 apply and explain the concepts, methodology and procedure

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. Formative take-home assignments

Criterion
Ability to apply the methodology and procedure for analysing real life 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. Examination

Criterion
Ability to apply and explain the concepts, methodology and procedure

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

Eigenvalues and eigenvectors. Applications in elasticity. First-and second-order ordinary differential equations and applications. Vector calculus. Partial differentiation. Multiple integration. Gradient, divergence and curl. Theorems of Gauss, Stokes and Green. Applications in energy methods, stress and strain transformations, etc. Fourier series.

Reading List

Compulsory Readings

	Title
1	For further detailed information, please refer to https://www.cityu.edu.hk/ma/programmes/undergraduate/non-BSCM-students/topics-recommended-readings-servicing-courses#heading9

Additional Readings

	Title
1	Nil