MA1200: CALCULUS AND BASIC LINEAR ALGEBRA I

Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Calculus and Basic Linear Algebra I

Subject Code
MA - Mathematics
Course Number
1200

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
(i) HKDSE Mathematics Compulsory Part, or
(ii) HKDSE Mathematics Compulsory Part and Extended Part Module 1, or
(iii) HKDSE Mathematics Compulsory Part and Extended Part Module 2 (Levels 1 – 3); or equivalent

Notes to Students:
Students with HKDSE Mathematics Extended Part Module 2 (Levels 4 –5) are required to take MA1300 instead.

Precursors
Nil

Equivalent Courses
MA1300 Enhanced Calculus and Linear Algebra I

Exclusive Courses

MA1006 Calculus and Linear Algebra for Business
MA1508 Calculus

Part II Course Details

Abstract

This is the first of two required courses designed for students pursuing studies in engineering or science. It aims to equip students with mathematical skills and methods essential for study of calculus and linear algebra, develop fluency in concepts and techniques from differential calculus, and provide students with mathematical training for all further study in science/engineering and its applications.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	implement basic mathematical techniques of algebra, trigonometry and coordinate geometry.	20	x	x	
2	describe properties of functions and manipulate expressions involving standard functions and their inverses.	15	x		
3	explain concepts of limit, continuity and differentiability of functions.	15	x		
4	perform techniques of differentiation to obtain derivatives and Taylor series expansions of functions.	25	x	x	
5	apply methods of differential calculus to dynamical and optimization problems as well as applications in science and engineering.	25		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 (A/B);46 hours in total (C/D)
2	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	1	3 hours in total (A/B);4 hours in total (C/D)

3	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	2	2 hours in total (A/B);3 hours in total (C/D)
4	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	3	2 hours in total (A/B);3 hours in total (C/D)
5	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	4	3 hours in total (A/B);5 hours in total (C/D)
6	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	5	3 hours in total (A/B);4 hours in total (C/D)
7	Assignments	Learning through take-home assignments helps students implement basic concepts of functions and techniques of differential calculus, as well as apply knowledge of which to problems in science and engineering.	1, 2, 3, 4, 5	after class
8	Online applications	Learning through online examples for applications helps students apply methods of differential calculus to practical problems in science and engineering.	5	after class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test 1	1, 2	15	Questions are designed to see how well students have learned basic mathematical methods, concepts of functions, limits and continuity, as well as techniques and applications of differential calculus. These assessment tasks monitor students' progress and reveal gaps in knowledge.

2	Test 2	3, 4, 5	15	Questions are designed to see how well students have learned basic mathematical methods, concepts of functions, limits and continuity, as well as techniques and applications of differential calculus. These assessment tasks monitor students' progress and reveal gaps in knowledge.
3	Hand-in assignment(s)	1, 2, 3, 4, 5	0	These are skills based assessment to see whether students are familiar with essential mathematical methods, properties of functions, techniques and applications of differential calculus.

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

3

Additional Information for ATs

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. Quizzes/Test(s)

Criterion

The test consists of two 1-hour test papers. In each test paper, there are six short questions. All questions must be attempted. Since it is important for students to reach an understanding of all the basic mathematical concepts and acquire manipulating skills on all mathematical techniques of the course, a minimum standard of 50% must be achieved in each test.

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 assignment(s)

Criterion
For students with test score <50 marks, they are required to complete remedial work to the satisfaction of the Lecturer.

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
The examination will consist of one 3-hour paper. It will contain two sections. Section A (70%) consists of 7 short questions while Section B (30%) consists of 2 long questions. All questions must be attempted. The examination is designed to find out the proficiency and the degree of understanding of the students in mastering the course materials. Thus, it is more demanding than the two tests.

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

A) Polynomials; Mathematical induction; Binomial theorem
B) Coordinate geometry and conic sections; Basic trigonometry
C) Functions and inverses; Limits, continuity and differentiability
D) Techniques of differentiation, implicit, logarithmic and parametric differentiation; Successive differentiation
E) Applications of differentiation: rate of change, local extrema, optimization problems, Taylor series, l'Hôpital rule

Reading List

Compulsory Readings

	Title
1	For further detailed information, please access the course materials via https://www.cityu.edu.hk/ma/programmes/undergraduate/non-BSCM-students/topics-recommended-readings-servicing-courses#heading2

Additional Readings

	Title
1	Frank Ayres, Jr. and Elliott Mendelson, Calculus (Schaum's Outlines), 6th ed., McGraw Hill, 2013
2	Fred Safier, Precalculus (Schaum's Outlines), 3rd ed., McGraw Hill, 2013
3	Basic Calculus and Linear Algebra (Compiled by Department of Mathematics, City University of Hong Kong), Pearson Custom Publishing, 2007
4	Ron Larson and Bruce Edwards, Calculus I with Precalculus: A One-Year Course, 3rd ed., Brooks/Cole, 2012
5	C. Henry Edwards and David E. Penney, Calculus: Early Transcendentals, 7th ed., Pearson Prentice Hall, 2008
6	Robert A. Adams, Calculus: A Complete Course, 6th ed., Pearson Addison Wesley, 2006
7	Glyn James, Modern Engineering Mathematics, 4th ed., Pearson Prentice Hall, 2008