City University of Hong Kong
Course Syllabus

offered by College/School/Department of _Mathematics_____
with effect from Semester __A____ 20_18_ / _19_

Part I Course Overview

Course Title:	**Enhanced Calculus and Linear Algebra II**
Course Code:	**MA1301**
Course Duration:	**1 semester**
Credit Units:	**3 CUs**
Level:	**B1**
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**(i) MA1300 Enhanced Calculus and Linear Algebra I, or** **(ii) Grade B or above in MA1200 Calculus and Basic Linear Algebra I (approval from MA must be obtained)**
Precursors: *(Course Code and Title)*	**Nil**
Equivalent Courses: *(Course Code and Title)*	**MA1201 Calculus and Basic Linear Algebra II** **MA1006 Calculus and Linear Algebra for Business** **MA1101 Foundation Mathematics II,**
Exclusive Courses: *(Course Code and Title)*	**MA1001 Higher Mathematics I(A)** **MA1002 Higher Mathematics I(B)** **MA1003 Higher Mathematics II(A)** **MA1004 Higher Mathematics II(B)**

Part II Course Details

1. Abstract

(A 150-word description about the course)

This is the second of two required courses designed for students pursuing studies in **mathematics**, or **engineering/science** students requiring solid background in mathematics. It aims to

- develop fluency in concepts and techniques from **integral calculus**, **linear algebra** and **complex numbers**,
- introduce elementary theory of differential and integral calculus, and
- foster skills in implementing methods of calculus and linear algebra to mathematical and physical applications.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	explain elementary theory of differential and integral calculus.	15%	✓		
2.	perform techniques of integration to evaluate integrals of functions.	30%		✓	
3.	explain at high level concepts from vector and matrix algebra.	10%	✓		
4.	manipulate expressions and solve geometric problems with vector arithmetic.	10%		✓	
5.	implement techniques of matrix arithmetic and of solving linear systems.	15%		✓	
6.	perform operations and solve equations involving complex numbers.	10%		✓	
7.	develop mathematical models through calculus and linear algebra, and appropriately apply to problems in science and engineering.	10%	✓	✓	✓
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.							Hours/week (if applicable)
		1	2	3	4	5	**6**	**7**	
Lectures	Learning through **teaching** is primarily based on lectures.	✓	✓	✓	✓	✓	✓	✓	39 hours in total (A); 46 hours in total (B)
Tutorials	Learning through **tutorials** is primarily based on interactive problem solving allowing instant feedback.	✓							3 hours in total (A); 4 hours in total (B)
			✓						2 hours in total (A); 3 hours in total (B)
				✓	✓				2 hours in total (A); 3 hours in total (B)
				✓		✓			2 hours in total (A); 3 hours in total (B)
							✓		2 hours in total (A); 3 hours in total (B)
								✓	2 hours in total (A); 3 hours in total (B)
Take-home assignments	Learning through **take-home assignments** helps students implement theory of calculus, methods of integral calculus, linear algebra and complex numbers, as well as apply knowledge of which to mathematical and physical problems.	✓	✓	✓	✓	✓	✓	✓	after class
Online applications	Learning through **online examples for applications** helps students apply methods of calculus, linear algebra and complex numbers to problems in science and engineering.							✓	after class
Math Help	Learning activities in	✓	✓	✓	✓	✓	✓	✓	after-class,

Centre	**Math Help Centre** provides students extra assistance in study.								depending on need

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

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 Tasks/Activities	CILO No. 1	2	3	4	5	6	7	Weighting*	Remarks
Continuous Assessment: _30___%									
Quizzes/Test(s)	✓	✓	✓	✓	✓	✓	✓	15 – 30%	Questions are designed to see how well students have learned theory of calculus, techniques of integral calculus, as well as concepts and methods of linear algebra and complex numbers. These assessment tasks monitor students' progress and reveal gaps in knowledge.
Hand-in assignment(s)	✓	✓	✓	✓	✓	✓	✓	0 – 15%	These are skills based assessment to see whether students are familiar with elementary theory of calculus as well as essential methods and applications of

									integral calculus, linear algebra and complex numbers.
Examination: _70___% (duration: 3 hrs, if applicable)									Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills based to assess the extent to which students have mastered methods of the course and synthesized mathematical knowledge in practical applications.
** The weightings should add up to 100%.*								100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Quizzes/Test(s)	ABILITY to APPLY and EXPLAIN the methodology of integral calculus and linear algebra	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignment(s)	CAPACITY for SELF-DIRECTED LEARNING to understand the principles of integral calculus and linear algebra	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	ABILITY to DEVELOP mathematical models through calculus and linear algebra and SOLVE problems with different methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
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Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

A) Basic theorems of differentiation
B) Applications of differentiation: rate of change, local extrema, optimization problems, power and Taylor series, l'Hôpital rule
C) Definite and indefinite integrals; Techniques of integration, integration by substitution, integration by parts; Improper integrals
D) Physical and geometric applications of integration
E) Vectors in R^2 and R^3; Scalar products, cross products, triple scalar products; Linear (in)dependence; Applications to equations of lines and planes
F) Matrices; Determinants, cofactor expansion; Systems of linear equations, Gaussian elimination, Cramer's rule; Matrix inverses, Gauss-Jordan elimination method
G) Arithmetic of complex numbers; Polar and Euler forms; De Moivre's theorem and its applications

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	*Basic Calculus and Linear Algebra* (Compiled by Department of Mathematics, City University of Hong Kong), Pearson Custom Publishing, 2007	
2.	C. Henry Edwards and David E. Penney, *Calculus: Early Transcendentals*, 7th ed., Pearson Prentice Hall, 2008	
3.	Robert A. Adams, *Calculus: A Complete Course*, 6th ed., Pearson Addison Wesley, 2006	
…		

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Glyn James et al., *Modern engineering mathematics*, Harlow : Pearson Prentice Hall, 2008.
2.	
3.	
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