City University of Hong Kong
Course Syllabus

offered by Department of <u>Mathematics</u>
with effect from Semester __A____ 20_15_ / _16__

Part I   **Course Overview**

Course Title:	**Linear Algebra and Calculus**
Course Code:	**MA2158**
Course Duration:	**One Semester**
Credit Units:	**3**
Level:	**B2**
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)*	**MA1200/MA1300 and MA1201/MA1301 or MA2176or equivalent**
Precursors: *(Course Code and Title)*	**Nil**
Equivalent Courses: *(Course Code and Title)*	**MA3158 Linear Algebra and Calculus**
Exclusive Courses: *(Course Code and Title)*	**MA2001 Elementary Calculus** **MA2149 Mathematical Analysis** **MA2170 Linear Algebra and Multi-variable Calculus**

Part II   Course Details

1. **Abstract**
    (A 150-word description about the course)

    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.

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 at high levels concepts from advanced linear algebra and multi-variable calculus.	10%			✓
2.	compute eigenvalues and eigenvectors of matrices, and solve first and second order ordinary differential equations.	20%		✓	
3.	Compute partial derivatives and multiple integrals of multivariate functions.	20%		✓	
4.	implement basic operations in vector calculus and evaluate line and surface integrals of vector fields.	20%		✓	
5.	apply mathematical and computational methods to a range of application problems involving advanced linear algebra, ordinary differential equations and multi-variable calculus.	20%	✓	✓	✓
6.	the combination of CILOs 1-5	10%	✓	✓	✓

* If weighting is assigned to CILOs, they should add up to 100%.   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**	
Lectures	Learning through **teaching** is primarily based on lectures.	✓	✓	✓	✓	✓	✓	39 hours in total
Tutorials	Learning through **tutorials** is primarily based on interactive		✓					4 hours
				✓				4 hours
		✓				✓		3 hours

		1	2	3	4	5	6	
	problem solving allowing instant feedback.				✓			2 hours
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.	✓	✓	✓	✓	✓		after-class
Online applications	Learning through **online examples for applications** helps students apply mathematical and computational methods to some problems in applications.					✓		after-class
Math Help Centre	Learning activities in **Math Help Centre** provides students extra help.		✓	✓	✓			after-class

4. **Assessment Tasks/Activities (ATs)**
   (ATs are designed to assess how well the students achieve the CILOs.)

   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 Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5	6		
Continuous Assessment: <u>30%</u>								
Test		✓	✓	✓		✓	15-30%	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.
Hand-in assignments	✓	✓	✓	✓	✓	✓	0-15%	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.
Formative take-home assignments	✓	✓	✓	✓	✓	✓	0-15%	The assignments provide students chances to demonstrate their achievements on linear algebra, ordinary differential equations and multi-variable calculus learned in this course.
Examination: <u>70%</u> (duration: 2 hours, if applicable)								Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills and understanding based to assess the student's versatility in advanced linear algebra, ordinary differential equations and multi-variable calculus.

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-)	Adequate (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	Ability to apply and explain the concepts, methodology and procedure	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	Ability to apply and explain the concepts, methodology and procedure	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Formative take-home assignments	Ability to apply the methodology and procedure for analysing real life problems	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Ability to apply and explain the concepts, methodology and procedure	High	Significant	Moderate	Basic	Not even reaching marginal levels

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.)

    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.

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.	For further detailed information, please refer to http://www6.cityu.edu.hk/ma/ug/serv/ma2158.htm
2.	
3.	

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

1.	Nil
2.	
3.	