

Course Syllabus

offered by Department of Mathematics
with effect from Semester B 2021/22

Part I Course Overview

Course Title: Algebra

Course Code: GE1359

Course Duration: One semester

Credit Units: 3

Level: B1

Arts and Humanities

Study of Societies, Social and Business Organisations

Proposed Area:
(for GE courses only)

Science and Technology

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) Nil

Precursors:
(Course Code and Title) Nil

Equivalent Courses:
(Course Code and Title) MA1502 Algebra

Exclusive Courses:
(Course Code and Title) MA2508 Multi-variable Calculus

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims at strengthening students' background knowledge in the various topics of algebra. The content includes an introduction to functions, the theory of equations, trigonometric series, binomial theorem, set theory and combinatorics. It emphasizes on understanding the concepts of functions and the manipulation of algebraic problem-solving techniques. Students learn how to apply the concepts and mathematical techniques to solve real-life problems.

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 the concept of functions and sets.	-	√	√	
2.	Solve a system of equations and inequalities and apply the techniques to problems related to real-world situations.	-	√	√	
3.	Apply trigonometric functions to solve geometrical problems.	-	√	√	
4.	Apply binomial theorem to prove algebraic identities.	-	√	√	
5.	Prove rigorously mathematical statements using mathematical induction.	-	√	√	
6.	Apply basic counting techniques to solve combinatorics problems.	-	√	√	
		n/a			

* 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	
Lecture	Learning through teaching is primarily based on lectures.	√	√	√	√	√	√	39 hours in total
Take-home assignments	Learning through take-home assignments helps students understand basic concepts and mathematical techniques.	√	√	√	√	√	√	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> %								
Tests	√	√	√				15%	Questions are designed for the first part of the course to see how well the students have learned the basic concepts and fundamental theory of algebra, and to apply mathematical techniques to solve real-life problems.
Hand-in assignments	√	√	√	√	√	√	15%	These are skills based assessment to enable students to demonstrate the basic concepts and fundamental theory of algebra and identify their applications.
Formative take-home assignments	√	√	√	√	√	√	0%	The assignments provide students chances to demonstrate their achievements on algebra learned in this course.
Examination: (duration: 2 hours)	√	√	√	√	√	√	70%	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 algebra.
							100%	

* The weightings should add up to 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 the concept of functions and set, and various techniques in algebra to solve a range of mathematical problems	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	Demonstration of the understanding of the basic materials	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Formative take-home assignments	Demonstration of the understanding of the basic materials	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Demonstration of skills and versatility in algebra	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.)

- Set theory
- Functions: Domain, range, one-one, onto, and inverse
- Trigonometric functions: Trigonometric identities, trigonometric series
- Theory of equations: Quadratic equations, roots of polynomial equations
- Inequalities: Elementary inequalities, triangle inequality, arithmetic and geometric means.
- Combinatorics: Counting techniques, binomial theorem
- Mathematical induction

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.	A course in Pure Mathematics, by Margaret M. Gow (Elsevier Ltd, 2004)
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2.2 Additional Readings

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

1.	Algebra to Calculus: Unlocking Math's Amazing Power, by Mike Goldsmith (Shelter Harbor Press, 2018)
2.	The Joy of x : A Guided Tour of Math, from One to Infinity, by Steven Strogatz (Eamon Dolan/Houghton Mifflin Harcourt, 2012)
3.	The Math Behind the Magic: Fascinating Card and Number Tricks and How They Work, by Ehrhard Behrends (American Mathematical Society, 2019)
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A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

GE PILO	Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)
PILO 1: Demonstrate the capacity for self-directed learning	1,2,3,4,5,6
PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology	1,2,3,4,5,6
PILO 3: Demonstrate critical thinking skills	1,2,3,4,5,6
PILO 4: Interpret information and numerical data	1,2,3,4,5,6
PILO 5: Produce structured, well-organised and fluent text	1,2,3,4,5,6
PILO 6: Demonstrate effective oral communication skills	1,2,3,4,5,6
PILO 7: Demonstrate an ability to work effectively in a team	1,2,3,4,5,6
PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues	
PILO 9: Value ethical and socially responsible actions	
PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation	

GE course leaders should cover the mandatory PILOs for the GE area (Area 1: Arts and Humanities; Area 2: Study of Societies, Social and Business Organisations; Area 3: Science and Technology) for which they have classified their course; for quality assurance purposes, they are advised to carefully consider if it is beneficial to claim any coverage of additional PILOs. General advice would be to restrict PILOs to only the essential ones. (Please refer to the curricular mapping of GE programme: http://www.cityu.edu.hk/edge/ge/faculty/curricular_mapping.htm.)

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task
Examination Papers