GE1359: ALGEBRA

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Algebra

Subject Code
GE - Gateway Education
Course Number
1359

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

GE Area (Primary)
Area 3 - Science and Technology

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
MA1502 Algebra

Exclusive Courses
MA2508 Multi-variable Calculus

Part II Course Details

Abstract

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.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the concept of functions and sets.		x	x	
2	Solve a system of equations and inequalities and apply the techniques to problems related to real-world situations.		x	x	
3	Apply trigonometric functions to solve geometrical problems.		x	x	
4	Prove rigorously mathematical statements using mathematical induction.		x	x	
5	Apply basic counting techniques to solve combinatorics problems.		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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures to gain knowledge of topics in algebra	1, 2, 3, 4, 5	39 hours in total
2	Practice exercises	Students will engage with a series of practice exercises posted on the course website in advance to deepen their knowledge and skills	1, 2, 3, 4, 5	After-class
3	Math Help Centre	Students will receive extra help through learning activities in Math Help Centre	1, 2, 3, 4, 5	After-class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Quizzes/Test/Midterm	1, 2, 3	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.
2	Formative take-home assignments	1, 2, 3, 4, 5	15	These are skills-based assessment to enable students to demonstrate the basic concepts and fundamental theory of algebra and identify their applications.

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

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/Midterm

Criterion

Ability to apply the concepts of functions and sets, and various techniques in algebra to solve a range of mathematical problems related to functions and theory of equations.

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts and techniques in algebra and can always apply this understanding to solve a range of mathematical problems.

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts and techniques in algebra and can usually apply this understanding to solve some mathematical problems.

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts and techniques in algebra and can sometimes apply this understanding to solve some mathematical problems.

Marginal (D)

Demonstrate a partial understanding of the concepts and techniques in algebra and can rarely apply this understanding.

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts and techniques in algebra and can rarely or almost never apply this understanding.

Assessment Task

2. Formative take-home assignments

Criterion

Ability to demonstrate the basic concepts and fundamental theory of algebra and identify their applications.

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts, theories and techniques in algebra and can always apply this understanding to solve a range of mathematical problems.

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts, theories and techniques in algebra and can usually apply this understanding to solve some mathematical problems.

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts, theories and techniques in algebra and can sometimes apply this understanding to solve some mathematical problems.

Marginal (D)

Demonstrate a partial understanding of the concepts, theories and techniques in algebra and can rarely apply this understanding.

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts, theories and techniques in algebra and can rarely or almost never apply this understanding.

Assessment Task

3. Examination

Criterion

Ability to demonstrate their skills and understanding in algebra to solve a range of mathematical problems.

Excellent (A+, A, A-)

Demonstrates a thorough understanding of the concepts, theories and techniques in algebra and can always apply this understanding to solve a range of mathematical problems.

Good (B+, B, B-)

Demonstrate a substantial understanding of the concepts, theories and techniques in algebra and can usually apply this understanding to solve some mathematical problems.

Fair (C+, C, C-)

Demonstrate a general understanding of the concepts, theories and techniques in algebra and can sometimes apply this understanding to solve some mathematical problems.

Marginal (D)

Demonstrate a partial understanding of the concepts, theories and techniques in algebra and can rarely apply this understanding.

Failure (F)

Demonstrate a little understanding or some misunderstanding of the concepts, theories and techniques in algebra and can rarely or almost never apply this understanding.

Part III Other Information

Keyword Syllabus

- 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, AM-GM inequality
- Combinatorics: Counting techniques, binomial theorem
- Mathematical induction

Reading List

Compulsory Readings

	Title
1	A course in Pure Mathematics, by Margaret M. Gow (Elsevier Ltd, 2004)

Additional Readings

	Title
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)

Annex (for GE courses only)

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:

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

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

PILO 3: Demonstrate critical thinking skills

1, 2, 3, 4, 5

PILO 4: Interpret information and numerical data

1, 2, 3, 4, 5

PILO 5: Produce structured, well-organised and fluent text

1, 2, 3, 4, 5

PILO 6: Demonstrate effective oral communication skills

1, 2, 3, 4, 5

PILO 7: Demonstrate an ability to work effectively in a team

1, 2, 3, 4, 5

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