

GE1359: ALGEBRA

Effective Term

Semester A 2023/24

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	Apply binomial theorem to prove algebraic identities.	x	x	
5	Prove rigorously mathematical statements using mathematical induction.	x	x	
6	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.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5, 6	39 hours in total
2	Take-home assignments	Learning through take-home assignments helps students understand basic concepts and mathematical techniques.	1, 2, 3, 4, 5, 6	After-class

3	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	1, 2, 3, 4, 5, 6	After-class
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Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)	
1	Tests	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	Take-home assignments	1, 2, 3, 4, 5, 6	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. Test

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. 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, 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

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