MA1502: ALGEBRA

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Algebra

Subject Code
MA - Mathematics
Course Number
1502

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
GE1359 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 real-world situations.		x	x	x
3	Apply trigonometric functions to solve geometrical problems.		x	x	x
4	Apply binomial theorem to prove algebraic identities.		x	x	
5	Prove rigorously mathematical statements using mathematical induction.		x	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

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests	1, 2, 3, 4, 5, 6	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	Hand-in 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.
3	Formative take-home assignments	1, 2, 3, 4, 5, 6	0	The assignments provide students chances to demonstrate their achievements on algebra learned in this course.

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Additional Information for ATs

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 Rubrics (AR)

Assessment Task

1. Test

Criterion

Ability to apply the concept of functions and set, and various techniques in algebra to solve a range of mathematical problems

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
2. Hand-in assignments

Criterion
Demonstration of the understanding of the basic materials

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
3. Formative take-home assignments

Criterion
Demonstration of the understanding of the basic materials

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
4. Examination

Criterion
Demonstration of skills and versatility in algebra

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

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, arithmetic and geometric means.
- 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)