

# MA3523: INTRODUCTION TO ABSTRACT ALGEBRA

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## Effective Term

Semester A 2022/23

## Part I Course Overview

### Course Title

Introduction to Abstract Algebra

### Subject Code

MA - Mathematics

### Course Number

3523

### 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

MA2503 Linear Algebra

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

The purpose of this course is to teach undergraduate student the fundamental concepts in abstract algebra, which are matrix operations, groups, vector spaces and linear transformations. The connection between matrix and group will be illustrated and practiced.

### Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Fluent in matrix operations.	10	x	x	
2	Explain the concept of group, subgroup and homomorphism between groups.	30	x	x	x
3	Explain vector spaces in abstract field.	15	x	x	
4	Solve linear transformations in terms of matrix operations.	15	x	x	
5	Explain deeper theories of group, for example, the Sylow Theorem, generators and relations, and apply to matrix operations.	30	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	39 hours in total
2	Take-home assignments	Learning through take-home assignments helps students understand basic concepts and theories of group, vector space with abstract field, and linear transformations.	1, 2, 3, 4, 5	after-class

**Assessment Tasks / Activities (ATs)**

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test (Mid Term Exam)	1, 2, 3	30	Questions are designed for the first part of the course to see how well students have learned the concepts and theories of matrix operations and group.
2	Formative take-home assignments	1, 2, 3, 4, 5	20	The assignments provide students chances to demonstrate their achievements on abstract algebra learned in this course.

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**Additional Information for ATs**

50% Continuous Assessment(s)

50% 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 and EXPLAIN the basic concepts and methodology of abstract 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

### Assessment Task

#### 2. Examination

#### Criterion

ABILITY to DERIVE mathematical proofs in abstract 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

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### Assessment Task

#### 3. Formative take-home assignments

#### Criterion

CAPACITY for LEARNING to understand the principles of abstract 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

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## Part III Other Information

### Keyword Syllabus

Permutation matrix, group, subgroup, homomorphism, quotient group, abstract field, the characteristic polynomial, rotation, operations on subsets, the Sylow Theorem, generators and relations.

### Reading List

**Compulsory Readings**

Title	
1	"Algebra" by Michael Artin, Pearson (2rd edition), 2010.

**Additional Readings**

Title	
1	Nil