

## Abstract Algebra I

### Programme(s) in which it is offered: B.Sc.B.Ed. Mathematics

<b>Course Category:</b> Core	<b>Schedule of Offering:</b> Odd
<b>Course Credit Structure:</b> 4	<b>Course Code:</b> EG418
<b>Total Number of Hours:</b> 5	<b>Contact Hours Per Week:</b> 5
<b>Lecture:</b> 3, 3	<b>Tutorial:</b> 1, 2
<b>Practical:</b> 0, 0	<b>Medium of Instruction:</b> English
<b>Date of Revision:</b>	<b>Skill Focus:</b> Other
<b>Short Name of the Course:</b> Abstract Algebra I	<b>Course Stream</b>
<b>Grading Method:</b> Regular	<b>Repeatable:</b> Credit
<b>Course Level:</b> Beginner	

### Course Description

This course is a core course for B.Sc. B.Ed. Mathematics students. This course discusses the fundamental theory of groups.

### Course Introduction

This course is an introductory course in group theory – a study of algebraic structure called groups. The course discusses fundamentals of groups, its types, their homomorphisms and their applications. The course exposes the students to the tools of modern abstract algebra, and provides essential foundation for other advanced algebra related courses.

### Course Objective

The objectives of the course are:

1. To discuss the fundamental concepts of group theory
2. To study cyclic groups and their properties
3. To discuss group homomorphisms, their properties and applications
4. To study various classes of groups and their applications

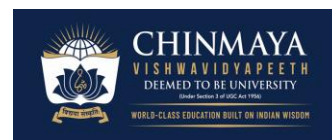
### Course Outcome

At the end of the course students will be able to

1. List various examples of groups and their properties

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2. Apply the properties of cyclic groups in solving problems related to general groups
3. Prove and apply the properties of group homomorphisms
4. Analyse and apply the properties of dihedral and symmetric groups
5. Appreciate the theory and applications of groups

### PO-CO Mapping

<This should explain how the Course Outcomes (CO) are mapped with the Programme Outcomes (PO). All programmes to have two generic POs which can map to all minors/proficiency courses and foundation/self-immersion courses. Please tick the respective cells only; leave the other cells blank.>

**PO-CO Mapping Matrix**

CO/PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2						
CO3						
CO4						
CO5						

### Prerequisites and other constraints

This course is offered to all students of B.Sc.B.Ed. Mathematics. There is no prerequisite course.

### Pedagogy

The teaching-learning of the course is organized through lectures, problem-solving sessions and student presentations

### Suggested Reading:

1. Herstein (2006). Topics in Algebra. Wiley.
2. Artin (1994). Algebra. Prentice Hall of India. New Delhi.
3. Fraleigh (2013). First course in Algebra, Seventh Edition. Pearson Education India
4. Gallian (2008). Contemporary abstract algebra. Narosa.
5. Bhattacharya, Jain and Nagpaul (1994). Basic Abstract Algebra. Cambridge University Press.
6. Santhanam (2017). Algebra. Alpha Science International Ltd.

## Evaluation Pattern

**Evaluation Matrix**

	Component Type	Weightage Percentage	Total Marks	Tentative Dates	Course Outcome Mapping
Continuous Internal Assessment (CIA) Components*	Mid-semester exam	50% of CIA	30	Around 9 <sup>th</sup> week	1, 2
	Assignment	25% of CIA	15	End of each module	1, 2, 3, 4, 5
	Quizzes	17% of CIA	10	Every two weeks	1, 2, 3, 4
	Presentations	8% of CIA	5	End of two modules	1, 2, 3, 4, 5
	CIA Marks	100% of CIA	60		
	ESE		40%	80	End of the semester

## Module Sessions

### Module 1: Introduction to Groups

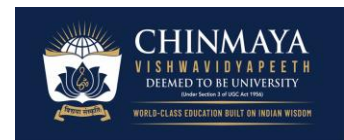
**(20 Hours)**

Semigroups, Groups - examples, properties and types; Sub-groups, Order of a group, order of an element, Cosets, Lagrange's theorem and its Consequences. Cyclic groups and properties; Infinite cyclic group; Fundamental theorem of cyclic groups.

#### Reading:

1. Gallian
2. Santhanam
3. Fraleigh

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**Activities:**

- a. Quiz
- b. Assignment

**Module 2: Normal Groups and Quotient Groups (18 Hours)**

Normal subgroups, Quotient groups. Applications of Quotient groups. External Direct Product, its properties and applications. Internal Direct Product and applications.

**Reading:**

1. Gallian
2. Fraleigh

**Activities:**

- a. Quiz
- b. Assignment
- c. Presentation

**Module 3: Group Homomorphisms (17 Hours)**

Homomorphism and Isomorphism of groups, Kernel of a homomorphism, Fundamental theorem of group homomorphism and consequences. Automorphisms. Cauchy's theorem for abelian groups.

**Reading:**

1. Gallian
2. Santhanam
3. Herstein

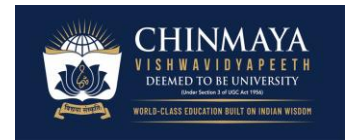
**Activities:**

- a. Quiz
- b. Assignment

**Module 4: Symmetric groups and Group Action (20 Hours)**

Dihedral groups; Permutation group, Alternating group, Cayley's theorem. Group action, G-Sets, Conjugacy Classes and applications.

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**Reading:**

1. Gallian
2. Fraleigh
3. Santhanam

**Activities:**

- a. Quiz
- b. Assignment
- c. Presentation