Version No:
Approval Date:

Abstract Algebra I

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

Course Category: Core	**Schedule of Offering**: Odd
Course Credit Structure: 4	**Course Code:** MTH1213
Total Number of Hours: 5	**Contact Hours Per Week:** 5
Lecture: 3, 3	**Tutorial:** 1, 2
Practical: 0, 0	**Medium of Instruction:** English
Date of Revision:	**Skill Focus:** Other
Short Name of the Course: Abstract Algebra I	**Course Stream**
Grading Method: Regular	**Repeatable:** Credit
Course Level: 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

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	33% of CIA	50	Around 9th week	1, 2,
	Assignment	67% of CIA	30	End of each module	1, 2, 3, 4, 5
	Quizzes/ Problem Solving		10	Every two weeks	1, 2, 3, 4
	Presentations		10	End of two modules	1, 2, 3, 4, 5
	CIA Marks	30%	**100**		
ESE		70%	**100**	End of the semester	1, 2, 3, 4, 5

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

Activities:

a. Quiz
b. Assignment

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

Normal subgroups, Quotient groups. Applications of Quotient groups. Isomorphic groups, External Direct Product - properties and applications. Internal Direct Product and their properties.

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 groups, Alternating groups, Cayley's theorem. Group action, G-Sets, Conjugacy classes and applications.

Reading:

1. Bhattacharya
2. Gallian
3. Santhanam

Activities:

a. Quiz
b. Assignment
c. Presentation