Version No:
Approval Date:

Abstract Algebra II

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:** EG419
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 II	**Course Stream**
Grading Method: Regular	**Repeatable:** Credit
Course Level: Intermediate	

Course Description

This course is a core course for B.Sc. B.Ed. Mathematics students. This course discusses the theory of rings and fields.

Course Introduction

This course is an introductory course in ring theory – study of algebraic structure called rings. The course discusses fundamentals of rings, 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 ring theory
2. To study integral domains and their properties
3. To discuss ring homomorphisms, their properties and applications
4. To study polynomial rings, irreducibility of polynomials and their applications

Course Outcome

At the end of the course students will be able to

1. List various examples of rings and their properties

2. Apply the properties of ideals in solving problems
3. Prove and apply the properties of ring homomorphisms
4. Apply various criteria of irreducibility to determine irreducibility of polynomials
5. Analyse ring theory as generalisation of elementary number theory
6. Appreciate the theory and applications of rings

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.
7. Dummit and Foote (2011). Abstract Algebra. Wiley.

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 9th week	1, 2
	Assignment	25% of CIA	15	End of each module	1, 2, 3, 4, 5, 6
	Quizzes	17% of CIA	10	Every two weeks	1, 2, 3, 4, 5
	Presentations	8% of CIA	5	End of two modules	1, 2, 3, 4, 5, 6
	CIA Marks	**100% of CIA**	**60**		
ESE		40%	**80**	End of the semester	1, 2, 3, 4, 5, 6

Module Sessions

Module 1: Introduction to Rings (20 Hours)

Rings, Integral Domains, Division Rings, Fields, Skew-fields - Examples. Subrings. Characteristic of a ring; Ideals, Maximal Ideals, Prime Ideals, Principal Ideals and Quotient rings.

Reading:

1. Gallian
2. Herstein
3. Fraleigh

Activities:

a. Quiz
b. Assignment

Module 2: Divisibility in Integral Domains (18 Hours)

Divisibility in an Integral domain, Prime elements and irreducible elements; Units and Associates. Principal Ideal Domain, Euclidean Domain and Unique Factorization Domain.

Reading:

1. Gallian
2. Fraleigh

Activities:

a. Quiz
b. Assignment
c. Presentation

Module 3: Ring Homomorphisms (17 Hours)

Homomorphism of a ring, Kernel of a ring homomorphism, Fundamental theorem of homomorphism and consequences. Correspondence theorem and consequences. Field of quotients, embedding of an integral domain.

Reading:

1. Gallian
2. Herstein
3. Artin

Activities:

a. Quiz
b. Assignment

Module 4: Polynomial Rings (20 Hours)

Polynomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm. Polynomial rings over UFD,

Criteria for irreducibility, and Eisenstein criterion.

Reading:

1. Gallian
2. Fraleigh
3. Herstein

Activities:

a. Quiz
b. Assignment
c. Presentation