

<b>B.A/ B.Sc</b>	<b>Semester-III</b>	<b>Credits:4</b>
<b>Course:3</b>	<b>ABSTRACT ALGEBRA</b>	<b>Hrs/Weak:5</b>

### **Course Outcomes:**

After successful completion of this course, the student will be able to;

- acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
- get the significance of the notation of a normal subgroups.
- get the behavior of permutations and operations on them.
- study the homomorphisms and isomorphisms with applications.
- Understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
- Understand the applications of ring theory in various fields.

### **UNIT I:(12 Hours)**

**GROUPS :** Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

### **UNIT II:(12 Hours)**

**SUBGROUP:**Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition- examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups. **Co-sets and Lagrange's Theorem:** Cosets Definition

– properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

### **UNIT III:(12 Hours)**

**NORMAL SUBGROUPS:** Definition of normal subgroup – proper and improper normal subgroup– Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

### **UNIT IV:(12 Hours)**

**HOMOMORPHISM :**Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

**PERMUTATIONS:** Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

### **UNIT V:(12 Hours)**

**RINGS** Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings.

### **Co-Curricular Activities(15 Hours)**

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

**TEXT BOOK :**

1. A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.

**REFERENCE BOOKS :**

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna.
3. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan.