



- **CO8:** Advance their ability to apply the necessary and sufficient conditions studied, to solve the problems in Normal Subgroups and learn the concept of Quotient group
- **CO9:** Be able to deduce other homomorphism theorems from fundamental theorem of Homomorphism and also illustrate the concept of automorphisms and related theorems
- **CO10:** Be able to understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
- **CO11:** Be able to understand the applications of ring theory in various fields

## **COURSE SYLLABUS**

### **UNIT – I**

#### **GROUPS :**

Applications 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**

#### **SUBGROUPS :**

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**

#### **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.

#### **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.

## UNIT – IV

### PERMUTATIONS AND CYCLIC GROUPS :

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

**Cyclic Groups :-** Definition of cyclic group – elementary properties – classification of cyclic groups.

## UNIT – V

### 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, Ideals

### Co-Curricular Activities(15 Hours)

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

### Text Book :

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. (2006)
2. 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. (2003)
3. Modern Algebra by M.L. Khanna.(1998)
4. Theory of Numbers – Prakash Om (1982) – Lakshmi Publications
5. Introduction to Analytic Number Theory – Tom M. Apostol – Narosa Publishing House, New Delhi. (2001)
6. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan