## Course Objectives:

**To enable the students to**

- ➢ To introduce the basic concepts of group theory and study the structure of groups.
- ➢ To introduce the concepts of conjugacy and G sets and prove cayley theorem. To introduce explicitly the properties of permutation groups
- ➢ To determine structure of any abelian groups. To determine structure of finite nonabelian groups through Sylow theorems.
- ➢ To introduce concepts of ring theory. To introduce different types of ideals. To apply Zorn's lemma on the set of ideals.
- ➢ To introduce prime elements and irreducible elements in a commutative integral domain. To study the domains UFD, PID and ED

### Course Outcomes

**After successful completion of the course, students will be able to**

- ➢ Apply theoretical / analytical / statistical knowledge gained in various courses of B.Sc to solve numerical problems based on real life situations during practicals and draw meaningful solutions to day to day problems
- ➢ Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study
- ➢ Enhancing students' overall development and to equip them with mathematical abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- ➢ understand the direct product of groups and application of  Sylow's theorems
- ➢ understand the homomorphic relation between the groups, sum and direct sum of ideals
- ➢ know factorizing the domains, factorization of polynomials and describe some other forms ofpolynomial rings
- ➢ know about submodules and direct sums
- ➢ know about Free modules  and Representation of linear mappings

## UNIT-I
## Structure theorems of groups

Direct products-Finitely generated abelian groups-Invariants of a finite abelian group-Sylow theorems. (Sections 8.1 to 8.4 of the Chapter 8 in the Prescribed Text Book.)

## UNIT-II
## Ideals and Homomorphisms

Ideals-Homomorphisms-Sums and direct sums of ideals- Maximal and prime ideals-Nilpotentand nil ideals-Zorn's lemma. (Sections 10.1 to10.6 of the Chapter 10 in the Prescribed Text Book.)

## UNIT-III
## Unique factorization domains and Euclidean domains

Unique factorization domains-Principal ideal domains-Euclidean domains-Polynomial rings over UFD  (Sections 11.1 to 11.4 of the Chapter 11 in the Prescribed Text Book.)

## UNIT IV
## Modules and Vector Spaces

Definition and examples – Submodules and direct sums – R-homomorphisms and quotient modules (Sections 1,2 & 3 of Chapter - 14)

## UNIT V
## Free Modules

Completely reducible modules – Free modules – Representation of linear mappings – Rankof linear mapping (Sections 4 to 7 of Chapter - 14)

**Activities:**
1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

**Text Book :**
Basic Abstract Algebra by P.B.Battacharya, S.K.jain, S.R.Nagpaul, Cambridge UniversityPress,1995.

**Reference Books:**

1. Topics in Algebra : I. N. Herstein, 2nd Edition, John Wiley &Sons
2. Algebra : Thomas W. Hungerford, Springer
3. Algebra : Serge Lang, Revised Third Edition, Springer