

**Course Name: ABSTRACT ALGEBRA**

**Course Code: MT(N)-202**

## **SYLLABUS**

### **Sets, Groups and Subgroups**

Sets, some basic concept of sets: cartesian product; binary operation; relations; partitions, definition and examples of groups including dihedral, permutation and quaternion groups, elementary properties of groups. Subgroups and examples of subgroups, Cyclic groups, Properties of cyclic groups, Lagrange's theorem, Euler phi function, Euler's theorem, Fermat's little theorem.

### **Normal Subgroups, Permutation Group and Group Homomorphism**

Properties of cosets, Normal subgroups, Simple groups, Factor groups, Cauchy's theorem for finite abelian groups; Centralizer, Normalizer, Center of a group, Product of two subgroups; Classification of subgroups of cyclic groups.

Cycle notation for permutations, Properties of permutations, Even and odd permutations, alternating groups, Cayley's theorem and its applications, Group homomorphisms, Properties of homomorphisms, Group isomorphisms, Properties of isomorphisms; First, second and third isomorphism theorems for groups.

### **Rings and Fields**

ring, elementary properties of a ring, ring with or without zero divisor, isomorphism of ring, subring, characteristic of ring, imbedding of ring into another field, ring of endomorphism of an abelian group, ideal, principle ideal, unit, associate, prime elements, greatest common divisor, polynomial ring, homomorphism of ring, kernel of ring homomorphism, maximal ideal, prime ideal, Euclidean ring, integral domains and fields.

## REFERENCES

1. John B. Fraleigh,(2002),*A First Course in Abstract Algebra* (7<sup>th</sup> Edition), Pearson, 2002.
2. Joseph A Gallian, (1999), *Contemporary Abstract Algebra* (4<sup>th</sup> Edition), Narosa, 1999.
3. I. N. Herstein,(1975),*Topics in Algebra*, Wiley Eastern Ltd., New Delhi.
4. V. K. Khanna and S. K. Bhambri (2021 ), *A Course in Abstract Algebra* (5<sup>th</sup> Edition), Vikas Publication House.
5. RamjiLal, *Algebra 1: Groups, Rings, Fields and Arithmetic*, Springer, 2017.

## SUGGESTED READINGS

1. P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul: *Basic Abstract Algebra*, Cambridge Press, 1994.
2. David S. Dummit and Richard M. Foote: *Abstract Algebra* (3<sup>rd</sup> Edition), Wiley, 2011.
3. Michael Artin: *Algebra* (2<sup>nd</sup> edition), Pearson, 2014.