20HS012 ALGEBRA

Hours Per Week :

L	T	P	C
4	2	-	6

COURSE DESCRIPTION AND OBJECTIVES:

Learn the elementary concepts and basic ideas involved in homomorphism and isomorphism. Develop the ability to form and evaluate group theory and its actions. Understand the fundamental concepts of abstract algebra

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Demonstrate ability to think group actions critically by Cayley's theorem.
2	Use the logical connectives on abstract algebra to decide whether an argument is a tautology or contradiction.
3	Effectively write abstract mathematical proofs in a clear and logical manner.
4	Understand the notion of planarity and coloring of a graph.
5	Explain the notion and use the notion of ring theory.

SKILLS:

✓   *Be able to grasp features, properties of special graphs.*

✓   *Demonstrate understanding of algebraic extensions and algebraic closures.*

✓   *Describe the structure of certain finite groups.*

UNIT-I: GROUPS AND ITS ELEMENTARY PROPERTIES

Symmetries of a square, Definition and examples of groups including dihedral, permutation and quaternion groups, Elementary properties of groups.

UNIT-II: SUBGROUPS AND CYCLIC 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.

UNIT-III: NORMAL SUBGROUPS

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.

UNIT-IV: PERMUTATION GROUPS

Cycle notation for permutations, Properties of permutations, Even and odd permutations, alternating groups, Cayley's theorem and its applications.

UNIT-V: GROUP HOMOMORPHISMS, RINGS AND FIELDS

Group homomorphisms, Properties of homomorphisms, Group isomorphisms, Properties of isomorphisms; First, second and third isomorphism theorems for groups; Definitions and elementary properties of rings and fields.

TEXTBOOKS:

1. I. N. Herstein (2006). *Topics in Algebra* (2nd edition). Wiley India.

2. John B. Fraleigh (2007). *A First Course in Abstract Algebra* (7th edition). Pearson.

REFERENCES:

1. Michael Artin (2014). *Algebra* (2nd edition). Pearson.

2. Joseph A. Gallian (2017). *Contemporary Abstract Algebra* (9th edition). Cengage.

3. Nathan Jacobson (2009). *Basic Algebra* I (2nd edition). Dover Publications. **24**

4. Ramji Lal (2017). *Algebra 1: Groups, Rings, Fields and Arithmetic*. Springer.

5. I.S. Luthar and I.B.S. Passi (2013). *Algebra: Volume 1: Groups.* Narosa.