17HS024 GROUP THEORY

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:

1. Be able to grasp features, properties of special graphs.
2. Demonstrate understanding of algebraic extensions and algebraic closures.
3. Describe the structure of certain finite groups.

UNIT – 1 : (10 Hrs) 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 – 2 : (14 Hrs) 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 –3 : (12 Hrs) 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 – simple group – quotient group – criteria for the existence of a quotient group.

UNIT – 4 : (10 Hrs) HOMOMORPHISM : -

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – aultomorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

UNIT – 5 : (14 Hrs) 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.

Reference Books:

1. Abstract Algebra, by J.B. Fraleigh,   Narosa Publishing house, New Delhi

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

3. Modern Algebra by M.L. Khanna.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Group theory and its applications in Graphics and Medical image Analysis