

PROGRAMME NAME: B.Sc. (Hons.) Mathematics
COURSE NAME : Group Theory-I
SEMESTER DURATION : July to December

WEEKS	TOPIC(S)	Teaching Methodology Adopted /Continuous Internal Evaluation
1	Symmetries of a square, Dihedral groups, Definition and examples of groups including permutation groups and quaternion groups (illustration through matrices).	LECTURES
2	Definition and examples of groups, Elementary properties of groups.	DISCUSSION
3	Subgroups and examples of subgroups, Centralizer, Normalizer, Center of a Group, Product of two subgroups.	SELF-INSTRUCTIONS
4	Properties of cyclic groups.	ASSIGNMENTS
5	Classification of subgroups of cyclic groups.	TUTORIALS
6	Cycle notation for permutations, Properties of permutations.	PRESENTATIONS
7	Even and odd permutations, Alternating group.	DEMONSTRATIONS
8	Properties of cosets.	CASE STUDY
9	Lagrange's theorem and consequences including Fermat's Little theorem.	CASE STUDY
10	Normal subgroups, Factor groups, Cauchy's theorem for finite abelian groups.	PRESENTATIONS
11	Group homomorphisms, Properties of homomorphisms.	ASSIGNMENTS
12	Group isomorphisms, Cayley's theorem.	DISCUSSION
13	Properties of isomorphisms.	TUTORIALS
14	First, Second and Third isomorphism theorems.	ASSIGNMENTS

Course Objectives: The objective of the course is to introduce the fundamental theory of groups and their homomorphisms. Symmetric groups and group of symmetries are also studied in detail. Fermat's Little theorem as a consequence of the Lagrange's theorem on finite groups.

Course Learning Outcomes: The course will enable the students to:

- i) Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.
- ii) Link the fundamental concepts of groups and symmetrical figures
- iii) Analyze the subgroups of cyclic groups and classify subgroups of cyclic groups.
- iv) Explain the significance of the notion of cosets, normal subgroups and factor groups.
- v) Learn about Lagrange's theorem and Fermat's Little theorem.
- vi) Know about group homomorphisms and group isomorphisms.