Course Code: **MATH-324**
Course Title: **Group Theory**
Credit Hours: **(3 0 3)**
Pre-requisite(s): **None**

Course Objectives:

a) To learn group structures
b) To learn some fundamental results and techniques of group theory
c) To classify groups (not all) up to isomorphism

Reading List:

1) P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, "Basic Abstract Algebra", 2nd ed., Cambridge University Press, 1995.
2) D.S. Dummit and R.M. Foote, "Abstract Algebra", 3rd ed., Addison-Wesely, 2004.
3) J.B. Fraleigh, "A First Course in Abstract Algebra", 7th ed., Pearson, 2002.
4) J.A. Gallian, "Contemporary Abstract Algebra", 7th ed., Brooks/Cole, 2010.
5) J.F. Humphreys, "A course in Group Theory", Oxford University Press, 1996.
6) A. Majeed, "Theory of Groups", Ilmi Kitab Khana, 2012.

Lecture-wise distribution of the course contents

Lecture #	Topics
L1	Introduction to the course
L2-L3	Operations, binary operations, usual and unusual operations (Including modular arithmetic), semigroup, monoid
L4-L6	Group, Caley's table for finite groups, elementary properties of groups, order of a group, order of an element
L7-L9	Group of symmetries (e.g., equilateral triangle, square, rectangle etc)
L10-L12	Subgroup with examples, subgroup test, finite subgroup test
L13-L15	Subgroup lattice, product of subgroups, direct product of groups
L16-L18	Generators and defining relations, cyclic groups, and their properties
L19-L21	Cosets, index of subgroup, Lagrange's Theorem, its converse, and consequences
L22-L23	normalizer and centralizer of a subset of a group, center of a group
L24	**MID EXAM**
L25-L27	Normal subgroups, factor groups
L28-L30	Group homomorphism, kernel, and image
L31-L33	Properties elements/subgroups under homomrphism
L34-L36	Injective and surjective homomorphism, endomorphism, isomorphism,
L37-L39	The Fundamental Theorem of homomorphism and its applications
L40-L42	2nd and 3rd isomorphism theorems
L43-L45	Permutations, Cycles in group of permutations and their properties, even and odd permutations
L46-L48	Symmetric and alternating subgroups, Caley's Theorem