

## V.1:Algebra-II (Group Theory -I)

**Total marks:** 100(Theory: 75, Internal Assessment: 25)

**5 Periods** (4 lectures +1 students' presentation),

**1 Tutorial** (per week per student)

### (1<sup>st</sup>& 2<sup>nd</sup> Weeks)

Symmetries of a square, Dihedral groups, definition and examples of groups including permutation groups and quaternion groups (illustration through matrices), elementary properties of groups.

### (3<sup>rd</sup> Week)

Subgroups and examples of subgroups, centralizer, normalizer, center of a group, product of two subgroups.

### (4<sup>th</sup>& 5<sup>th</sup>Weeks)

Properties of cyclic groups, classification of subgroups of cyclic groups.

[1]: Chapters 1, Chapter 2, Chapter 3 (including Exercise 20 on page 66 and Exercise 2 on page 86), Chapter 4.

### (6<sup>th</sup>, 7<sup>th</sup>& 8<sup>th</sup> Weeks)

Cycle notation for permutations, properties of permutations, even and odd permutations, alternating group, properties of cosets, Lagrange's theorem and consequences including Fermat's Little theorem.

### (9<sup>th</sup>& 10<sup>th</sup> Weeks)

External direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite abelian groups.

[1]: Chapter 5 (till end of Theorem 5.7), Chapter 7 (till end of Theorem 7.2, including Exercises 6 and 7 on page 168), Chapter 8 (till the end of Example 2), Chapter 9 (till end of Example 10, Theorem 9.3 and 9.5).

### (11<sup>th</sup>& 12<sup>th</sup> Weeks)

Group homomorphisms, properties of homomorphisms, Cayley's theorem, properties of isomorphisms, First, Second and Third isomorphism theorems.

[1]: Chapter 6 (till end of Theorem 6.2), Chapter 10.

**REFERENCES:**

1. Joseph A. Gallian, *Contemporary Abstract Algebra* (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010)

**SUGGESTED READING:**

1. Joseph J. Rotman, *An Introduction to the Theory of Groups* ( 4<sup>th</sup> Edition), Springer Verlag, 1995.