



**Indraprastha College for Women  
University of Delhi**

Course Name:	B.Sc.(H) Mathematics
Paper Title:	Group Theory
Unique Paper Code:	2352012301
Semester:	III
Faculty(s):	Dr. Gunjan Khurana
Year:	2024-25

<b>Work Plan</b>			
Period	Unit No.	Learning Objective	Topics to be Covered
1 <sup>st</sup> Aug -3 <sup>rd</sup> Aug	1	Symmetric groups, normal subgroups, factor groups, and direct products of groups.	Permutation Groups, Lagrange's Theorem and Normal Subgroups Permutation groups and group of symmetries,
5 <sup>th</sup> Aug-10 <sup>th</sup> Aug	1	Same as above	Cycle notation for permutations and properties, Even and odd permutations, Alternating groups
12 <sup>th</sup> Aug-17 <sup>th</sup> Aug	1	Same as above	Cosets and its properties, Lagrange's theorem and consequences including Fermat's Little theorem
19 <sup>th</sup> Aug-24 <sup>th</sup> Aug	1	Same as above	Number of elements in product of two finite subgroups; Normal subgroups, Factor groups, Cauchy's theorem for finite Abelian groups.
26 <sup>th</sup> Aug-31 <sup>st</sup> Aug	2	The notions of group homomorphism to study the isomorphism theorems with applications.	Group Homomorphisms and Automorphisms
2 <sup>nd</sup> Sep-7 <sup>th</sup> Sep	2	Same as above	Isomorphisms and properties, Cayleys theorem
9 <sup>th</sup> Sep-14 <sup>th</sup> Sep	2	Same as above	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> isomorphism theorems for groups
16 <sup>th</sup> Sep-21 <sup>st</sup> Sep	2	Same as above	Automorphism, Inner automorphism, Automorphism groups

23 <sup>rd</sup> Sep-28 <sup>th</sup> Sep	2	Same as above	Automorphism groups of cyclic groups, Applications of factor groups to automorphism
30 <sup>th</sup> Sep-5 <sup>th</sup> Oct	3	Classification of groups with small order according to isomorphisms.	External direct products of groups and its properties,
7 <sup>th</sup> Oct-12 <sup>th</sup> Oct	3	Same as above	The group of units modulo $nn$ as an external direct product,
14 <sup>th</sup> Oct-19 <sup>th</sup> Oct	3	Same as above	Applications to data security and electric circuits;
21 <sup>st</sup> Oct-26 <sup>th</sup> Oct	3	Same as above	Internal direct products;
28 <sup>th</sup> Oct-2 <sup>nd</sup> Nov			MID SEMESTER BREAK
4 <sup>th</sup> Nov-9 <sup>th</sup> Nov	3	Same as above	Fundamental theorem of finite abelian groups and its isomorphism classes
11 <sup>th</sup> Nov-16 <sup>th</sup> Nov	3	Same as above	Fundamental theorem of finite abelian groups and its isomorphism classes
18 <sup>th</sup> Nov-23 <sup>rd</sup> Nov		To revise entire course	Revision
25 <sup>th</sup> Nov-27 <sup>th</sup> Nov		To revise entire course	Revision
28 <sup>th</sup> Nov			DISBERSAL OF CLASSES

Unit	TOPICS
I	Permutation groups and group of symmetries, Cycle notation for permutations and properties, Even and odd permutations, Alternating groups; Cosets and its properties, Lagrange's theorem and consequences including Fermat's Little theorem, Number of elements in product of two finite subgroups; Normal subgroups, Factor groups, Cauchy's theorem for finite Abelian groups.
II	Group Homomorphisms and Automorphisms Group homomorphisms, isomorphisms and properties, Cayley's theorem; First, Second and Third isomorphism theorems for groups; Automorphism, Inner automorphism, Automorphism groups, Automorphism groups of cyclic groups, Applications of factor groups to automorphism groups.
III	Direct Products of Groups and Fundamental Theorem of Finite Abelian Groups External direct products of groups and its properties, The group of units modulo $nn$ as an external direct product, Applications to data security and electric circuits; Internal direct products, fundamental theorem of finite abelian groups and isomorphism classes
S. No.	Name of Authors/Books/Publishers

1.	Gallian, Joseph. A. (2017). Contemporary Abstract Algebra (9th ed.). Cengage Learning India Private Limited, Delhi. Indian Reprint 2021.
2.	Artin, Michael. (1991). Algebra (2nd ed.). Pearson Education. Indian Reprint 2015.
3.	Dummit, David S., & Foote, Richard M. (2016). Abstract Algebra (3rd ed.). Student Edition. Wiley India.
4.	Herstein, I. N. (1975). Topics in Algebra (2nd ed.). Wiley India, Reprint 2022.
5.	Rotman, Joseph J. (1995). An Introduction to The Theory of Groups (4th ed.). Springer-Verlag, New York.