

SRI GURU TEG BAHADUR KHALSA COLLEGE

University of Delhi-110007

Academic Calendar July-Dec 2016

Week	Dates	Day s	Lecture Schedule	List of Holidays
1 st	20 th July - 23 rd July	4	Total Days: 100	Sem. Break: 11 th Oct.-16 th Oct
2 nd	25 th July - 30 th July	6	Holidays : 08	
3 rd	01 st Aug - 06 th Aug	6	Total Teaching Days: 92	Aug.15: Independence day
4 th	08 th Aug - 13 th Aug	6		Aug.25: Janmashtami
5 th	16 th Aug - 20 th Aug	5		Sep.12: Id-ul-Zuha
6 th	22 nd Aug - 27 th Aug	5		Oct. 02: Gandhi Jayanti
7 th	29 th Aug - 03 rd Sep	6		Oct. 11: Dussehra
8 th	05 th Sep - 10 th Sep	6		Oct. 12: Muharram
9 th	13 th Sep - 17 th Sep	5		Oct. 14: Guru Nanak
10 th	19 th Sep - 24 th Sep	6		B'Day
11 th	26 th Sep - 01 st Oct	6		Oct. 30: Diwali
12 th	03 rd Oct - 08 th Oct	6		
13 th	10 th Oct - 15 th Oct	1		
14 th	17 th Oct - 22 nd Oct	6		
15 th	24 th Oct - 29 th Oct	6		
16 th	31 st Oct - 05 th Nov	6		
17 th	07 th Nov - 12 th Nov	6		

Teacher's Name: Dr. RUCHI ARORA

Department: Mathematics

Course: B.Sc. (H) Mathematics

Semester: III

Paper: MACT-302, Group Theory

Book Recommended: Contemporary Abstract Algebra by Joseph A. Gallian,
Fourth Edition, Narosa Publishing House

NOTE: Students are welcome for Interactions to clear doubts & queries and for Discussions of Innovative Project Works in the following time slots available besides regular lectures and tutes:

Day	Time Slot
Tuesday	10:30 a.m.-11:30 a.m.
Wednesday	12:45 p.m.-1:45 p.m.
Thursday	10:30 a.m.- 12:30 p.m.

Teaching Plan

W	Week Topic	Specific Topics for Lecture	Hours	Task for Tutorials	Test/Prsn
1 st	Basic understanding of groups and its illustrations	<ul style="list-style-type: none"> ➤ Introduction to Group theory ➤ Definitions: Groupoid, Semigroup, Monoid, Group, AbelianGroup. ➤ Common Examples: Z, Q, R, C, Q^*, R^*, $M_2(F)$, $GL(2,F)$, $SL(2,F)$, n complex roots of unity, R^n, $T(R^2)$ 	03	Doubts	
2 nd	Standard groups & Introduction to subgroups	<ul style="list-style-type: none"> ➤ Special Groups: Z_n, $U(n)$, $M_2(Z_p)$, $\{\pm 1, \pm i\}$, Klein's group, Quaternion group, Dihedral group (Symmetries of a square) ➤ Basic properties: Uniqueness of identity and inverses in a group. ➤ Definitions: Order of an element, order of a group, Subgroups and its examples 	05	Ch-2 Q.5, 8, 10, 11, 12, 13 Ch-2 14-20,26-32, 35,37	Prsn : Dihedral group D_4 through symmetries of square
3 rd	Subgroup tests and standard subgroups	<ul style="list-style-type: none"> ➤ Tests for subgroups: one step, two step and finite subgroup test ➤ Standard subgroups: Centre of a group, Centralizer of an element, Normalizer and Conjugate of a subgroup (as subgroups) 	05	Ch-1 2,3,13 Ch-3: 4,9,11-16, 20- 24 ,28 ,29, 32,35, 41,42	Test 1 : Ch-1,2
4 th	Cyclic groups : Introduction & Analysis	<ul style="list-style-type: none"> ➤ Cyclic groups: Definition & examples ➤ Generators: Definition & existence ➤ Counting Theorems for subgroups & elements of specific order in cyclic groups: Fundamental theorem of cyclic groups 	05	Ch-3: 43-46 Ch-4: 8-11, 13,21,23, 31	Prsn: Subgroup lattice
5 th	Permutation groups	<ul style="list-style-type: none"> ➤ Permutation: definition, types, order and properties ➤ Symmetric group of degree n ➤ Alternating group of degree n 	04	Ch-4: 35,38,39, 50,52 SuppExs-I 2,5,6,10,16	Prsn: Center, centralizer, normalizer

6 th	Cosets & Lagranges Theorem	<ul style="list-style-type: none"> ➤ Cosets: Definitions and examples ➤ Properties of Cosets ➤ Verification of properties for known examples ➤ Lagranges Theorem & its corollaries 	05	Ch-5: 11,13,19, 21,28,32, 38-40, 45,46, 52,52,53	Test 2: Cyclic groups
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Week	Topic	Specific Topics for Lecture	Teaching hours	Task for Tutorials	Test/ Prestrn
7 th	Cosets in permutation groups & External direct product	<ul style="list-style-type: none"> ➤ Stabilizer of a point: Definition and examples ➤ Orbit of a point: Definition and examples ➤ Orbit-Stabilizer theorem ➤ External direct product of groups: Definitions and examples 	05	Ch-7: 12,14,15, 18-22	Prsn: Permutation groups
8 th	Normal subgroups & Factor groups	<ul style="list-style-type: none"> ➤ Normal subgroups: Definition and examples ➤ Results: <ul style="list-style-type: none"> • Center of a group is a normal subgroup. • Alternating group A_n is a subgroup of S_n ➤ Factor groups: Definitions and common examples ➤ Specific examples: D_4, A_4 	05	Ch-7: 27,28,31 Ch-8: 2,5	Test 3: Permutation groups
9 th	Applications of factor groups	<ul style="list-style-type: none"> ➤ A_4 has no subgroup of order 6 ➤ G/Z theorem ➤ $G/Z(G) \cong \text{Inn}(G)$ ➤ Existence of elements of prime order for finite abelian groups 	04	Ch-9: 3,5,7,12,19, 42-44	Prsn: Normal subgroups
10 th	Group Homomorphism	<ul style="list-style-type: none"> ➤ Group Homomorphism: Definition and examples ➤ Kernel of a homomorphism: Definition and examples ➤ Properties of homomorphisms 	05	Ch-9: 46-48,50- 55,62,63,65	Prsn: Factor groups

11 th	Group Isomorphism	<ul style="list-style-type: none"> ➤ Group Isomorphism: Definition and examples ➤ Cayley's theorem ➤ Properties of isomorphisms 	05	Ch-6: 2-5,11,14,20, 21,25,27	Prsn: Homomorphisms
12 th & 13 th	Automorphisms	<ul style="list-style-type: none"> ➤ Automorphism $\text{Aut}(G)$: Definitions and examples ➤ Inner automorphism induced by an element $\text{Inn}(G)$: Definitions and examples ➤ $\text{Aut}(Z_n) \cong U(n)$ 	06	Ch-6: 30,32,35-37	Prsn: Isomorphisms

Week	Topic	Specific Topics for Lecture	Teaching hours	Task for Tutorials	Test/ Prestrn
14 th	Isomorphism theorems	<ul style="list-style-type: none"> ➤ Kernels are normal subgroups ➤ Verification of the result for homomorphisms ➤ First Isomorphism theorem ➤ Verification of the theorem for homomorphisms ➤ $Z/\langle n \rangle \cong Z_n$ 	05	Ch-10: 6,8,10,14, 15, 18, 23	Prsn: Applications of group theory-I
15 th	Isomorphism theorems....ctd	<ul style="list-style-type: none"> ➤ Normal subgroups are kernels ➤ Second Isomorphism theorem and its verifications on examples ➤ Third Isomorphism theorem and its verifications on examples 	05	Ch-10: 27,33,35,36 , 40,45	Applications of group theory-II
16 th	Revision	<ul style="list-style-type: none"> ➤ Center, centralizer, normalizer ➤ Permutation Groups ➤ Normal Subgroups ➤ Factor Groups 	05	Doubts	Test(optional) Isomorphism theorems
17 th	Revision	<ul style="list-style-type: none"> ➤ Homomorphism ➤ Isomorphisms ➤ Automorphisms& Inner Automorphism ➤ Isomorphism Theorems 	05	Doubts	

