

# Advanced Instructional School in Group Theory

## Syllabus & Time Table

Day	Date	Time	Time	Time	Time
		9.00-10.30	11.00-12.30	2.00 – 4.00	4.30-5.30
Mon	10	BS	AN	BS+AKS+SMG	
Tue	11	BS	AN	AN+AJS+SNG	
Wed	12	BS	AN	BS+AKS+SMG	
Thu	13	BS	AN	AN+AKS+SMG	
Fri	14	BS	AN	BS+AKS+SMG	
Sat	15	BS	AN	AN+AKS+SMG	
Sun	16				
Mon	17	UKA	PS	UKA+AK+IBSP	
Tue	18	UKA	PS	PS+AK+ARS	SG
Wed	19	UKA	PS	UKA +AK+IBSP	MSR
Thu	20	UKA	PS	PS+AK+ARS	SKR
Fri	21	UKA	PS	UKA +AK+IBSP	TNV
Sat	22	UKA	PS	PS+AK+ARS	ARS
Sun	23				
Mon	24	RM	IBSP	RM+RPS+AK	NSN
Tue	25	RM	IBSP	IBSP+RPS+AK	NSN
Wed	26	RM	IBSP	RM+RPS+AK	NSN
Thu	27	RM	IBSP	IBSP+RPS+AK	NSN
Fri	28	RM	IBSP	RM+RPS+AK	NSN
Sat	29	RM	IBSP	IBSP+RPS+AK	NSN

Course Instructor	Lectures	Brief Syllabus
B. Sury (BS)	6	Free groups, Factor groups and subgroups.
U.K. Anandavardhanan	6	Nielson transformations, Free products. Free products with amalgamations. HNN extensions. Bass-Serre theory.
R. Mikhailov (RM)	6	Commutator calculus
A. Naolekar (AN)	6	Cayley graphs of finitely generated groups. Hyperbolic metric spaces. Area and isoperimetric inequalities. The Gromov boundary of a hyperbolic space.
P. Sankaran	6	Definitions and characterizations of CAT-spaces. Isometries of CAT-spaces. The flat torus theorem. The boundary at infinity of a CAT-space.
I.B.S.Passi (IBS)	6	Growth of groups, Hyperbolic groups
N.S.N. Sastry (NSN)	6	Reflection groups (Unity of Mathematics Lectures)

Course Associates	
Shripad Garge (SG)	IIT Bombay
Amit Kulshreshtha (AK)	IISER Mohali
Ravindra Shukla (RS)	Allahabad University
Anupam Kumar Singh (AKS)	IISER Pune

Guest Speakers	
S. Gadgil	IISc., Bangalore
M.S. Raghunathan	TIFR Mumbai
A.R. Shastri	IIT Bombay
S.K. Roushon	TIFR Mumbai
T.N. Venkataramana	TIFR Mumbai

## **A brief Description of the School**

The theory of groups is a subject of primary interest for all researchers in mathematics. The subject originated in the works of Cauchy, Lagrange and others, and mainly with the fundamental work of Galois on the solution of polynomial equations by radicals during early nineteenth century. The proposed Advanced Instructional School on Theory of groups will focus on two areas, namely, combinatorial group theory (CGT) and geometric group theory (GGT). While the former (CGT) is the study of groups given by presentations and has its roots in the applications of the theory of groups to topology and geometry during early twentieth century, the latter (GGT) is a relatively recent development. During 1980s M. Gromov suggested ways of applying geometric notions to the study of groups. This view point has led to a new surge of activity in the subject. The AIS will be directed towards making young researchers in India familiar with the developments in CGT and GGT. The programme will consist of two instructional courses aimed at providing participants, at the second year Ph.D. level and above, an introduction to the basic results in the above mentioned areas in the theory of groups, leading up to some of the problems of current research.

### **Literature:**

W. Magnus, A. Karrass and D. Solitar: Combinatorial Group Theory

R. C. Lyndon and P.E. Schupp: Combinatorial Group Theory

G. Baumslag: Topics in Combinatorial Group Theory

C.F. Miller III : Combinatorial Group Theory

M. R. Bridson and A. Haefliger: Metric Spaces of Non-Positive Curvature

M. Kapovich: Lectures on Geometric Group Theory

Pierre de la Harpe: Topics in Geometric Group Theory. Chicago Lectures in Mathematics

S. Gersten: Introduction to Hyperbolic and Automatic Groups. Summer School in Combinatorial Group Theory, 1996

J.-P. Serre: Trees. Springer, 1980