PROF. ABHIJIT PAL
Department of Mathematics & Statistics
IIT Kanpur

PRE-REQUISITES :   Topology, Algebra (Group Theory), Complex Analysis

INTENDED AUDIENCE : PG & PhD Students but an UG student with background in topology, algebra and complex analysis can take this course.

COURSE OUTLINE :

Hyperbolic geometry is a non-Euclidean Geometry which has wide applications in mathematics and is a central object to study group theory from a geometrical view point. Many surfaces and three manifolds exhibit hyperbolic geometry. In this course, we will learn basic hyperbolic geometry and then move on to its applications in geometric group theory.

ABOUT INSTRUCTOR :

Prof. Abhijit Pal is a faculty member in the Department of Mathematics & Statistics of IIT-Kanpur. He has done PhD from ISI-Kolkata in 2011 under the supervision of Prof. Mahan Mj. His research interest lies in Hyperbolic Geometry, Geometric Group Theory, specially in hyperbolic groups and relatively hyperbolic groups.

COURSE PLAN :

Week 1-5 : Hyperbolic Geometry : Models of Hyperbolic space: Upper half plane and Unit Disc with Poincaré metric, Hyperbolic Inner Product, Geodesics, Isometry Groups, Classification of Isometries, Area of Triangles, Trignometric Identities.

Week 6-8 : Properly discontinous action, Cocompact action, Fuchsian Group, Covering Space, Fundamental Region, Tesellation, Algebraic properties of Fuchsian Group, Hyperbolic surfaces, Poincaré's Theorem
(Statement Only) Closed curves and geodesics on Hyperbolic Surfaces .

Week 9-12 : Slim and Thin triangles, Hyperbolic metric space, Exponential Divergence, Stability of Quasi-geodesics. Hyperbolic groups and its properties.