

Math 8800: Introduction to Geometric Group Theory

January 10, 2016

Course webpage:

<https://people.math.osu.edu/davis.12/courses/8800/8800.html>

List of topics

Week 1

- Cayley graphs, word metrics, geodesic proper metric spaces, free groups
- Quasi-isometries, Fundamental Lemma of Geometric Group Theory
- Review of the fundamental group and covering space theory, the presentation 2-complex, aspherical spaces, graphs, $\pi_1(\text{surface})$, the classifying space of a group

Week 2

- growth of a group, Milnor's theorem on negative curvature and exponential growth, statement of Gromov's Theorem on groups of polynomial growth
- other q.i invariants: $\#$ (ends of a group), Hopf's Theorem, Stallings's Theorem on groups with infinitely many ends, the (co)homology at infinity

Weeks 3, 4

- manifolds, orbifolds
- Hyperbolic space, hyperbolic manifolds and orbifolds, negative curvature and nonpositive curvature, the ideal boundary
- hyperbolic groups

Week 5

- Groups acting on trees, amalgamated products, HNN construction, trees of spaces

Week 6, 7

- Coxeter groups and Artin groups
- CAT(0) spaces and groups
- hyperbolization

Week 8

- Complexes of groups

References

- [1] M. Bridson and A. Haefliger, *Metric Spaces of Non-positive Curvature*, Springer, New York, 1999.
- [2] M.W. Davis, *The Geometry and Topology of Coxeter Groups*, London Math. Soc. Monograph Series, vol. 32, Princeton Univ. Press, 2008.
- [3] A. Haefliger, *Extensions of complexes of groups*, Ann. Inst. Fourier (Grenoble) **42** (1992), 275–311.
- [4] P. Scott and C.T.C. Wall, *Topological methods in group theory* in Homological Group Theory, London Math. Soc. Lec. Notes **36** pp. 137–204, Cambridge Univ. Press, 1979.

[5] J.-P. Serre, Trees, Springer-Verlag, Berlin and new york, 1980.