MATH 810-A
Special topics in Group Theory
Fall 2012

Reading for 2012/2013:

- Introduction to Group Theory:

  (1) On combinatorial group theory: D.L. Johnson "Presentations of groups" LMS, Students Texts, 15, Cambridge.

  (2) O. Bogopolski " Introduction to Group Theory", EMS, Textbooks in Mathematics, 2008.

  (3) On van Kampen diagrams: H. Short "Diagrams and groups" in "The Geometry of the Word Problem for Finitely Generated Groups" Advanced Courses in Mathematics - CRM Barcelona.
  (http://www.cmi.univ-mrs.fr/ hamish/Papers/crmshort.pdf)

  (4) On hyperbolic groups: J.M. Alonso, T. Brady, D. Cooper, V. Ferlini, M. Lustig, M. Mihalik, M. Shapiro, H. Short, H. Short, ed., Notes on word hyperbolic groups, in Group Theory from a Geometric Viewpoint, E. Ghys, A. Haeiger, A. Verjovsky eds., World Scientic, (1991) 2-63.

- On free constructions:

  – On free products with amalgamation: W. Magnus, A. Karrass and D. Solitar, Combinatorial Group Theory, 3rd edition, Dover 1976 , Chapter 4 (exposition is very combinatorial and detailed, a lot of exercises)

  – On HNN-extensions: R. Lyndon, P. Schupp "Combinatorial group theory", Classics in Math., Springer, Chapter IV (the classical book, exposition is combinatorial and detailed, with various applications).

  – On HNN extensions via van Kampen diagrams: C. Miller, P. Schupp, "The geometry of Higman-Newmann-Newmann extensions" Communications in pure and applied mathematics, v. XXVI, 1973, 787-802.

- Bass-Serre theory:

  – The book (2) from above, Chapter 2. (A good introduction to the subject).

  – J.-P. Serre "Trees", Springer, 1980. (classic)

  – Bass-Serre theory from topological view-point: P. Scott and T. Wall "Topological methods in group theory", In the book Homological Group Theory, LMS, Lecture Notes, 36, Cambridge Un. Press, 1979, p. 137-203.

  – See also: G. Baumslag. Topics in combinatorial group theory. Lectures in Mathematics ETH Zrich. Birkhuser Verlag, Basel, 1993.

  - See also: D. Cohen, "Combinatorial Group Theory: A Topological Approach", London Mathematical Society, Student Texts 14.

- JSJ-decompositions:
  - E. Rips and Z. Sela, Cyclic splittings of finitely presented groups and the canonical JSJ decomposition, Ann. of Math. 146 (1997), 53179.
  - Vincent Guirardel, Gilbert Levitt, "A general construction of JSJ decompositions"
  - Vincent Guirardel, Gilbert Levitt, "Deformation spaces of trees", Groups, Geometry, and Dynamics, Volume 1, Issue 2, 2007, pp. 135171.

- Makanin-Razborov processes for solving equations in free groups:
  - O.Kharlampovich, A. Myasnikov, "Equations over fully residually free groups", Bogopolski O., Bumagin I., Kharlampovich O., Ventura E., (eds.), Combinatorial and Geometric Group Theory. Dortmund and Carleton conferences (2007), New Trends in Mathematics, Birkhauser, 2010, 203-243.
  - O.Kharlampovich, A.Myasnikov. *Irreducible affine varieties over a free group. II: Systems in triangular quasi-quadratic form and description of residually free groups.* J. of Algebra, 1998,v. 200, n. 2, p. 517-570. (old way to do it, but detailed).

- Actions on $\mathbb{R}$-trees. Rips-Betsvina-Feighn machines:
  - The original paper: M. Bestvina and M. Feighn, Stable actions of groups on real trees, Invent. Math. 121 (1995), 287-321
  - How to apply the machine: M.Bestvina, R-trees in topology, geometry and group theory, 1999. (online).
  - Introductory notes: Henry Wilton "Rips Theory" (online).
  - A different approach: D. Gaboriau, G. Levitt, and F. Paulin, "Pseudogroups of isometries of $\mathbb{R}$ and Rips' Theorem on free actions on $\mathbb{R}$-trees", Israel. J. Math., 87, 1994, 403-428.