Math 277: Topology and Geometry of 3-manifolds

Those of you needing grades (that is, people officially registered for the course who are not grad students who have passed their quals), will need to write a 7-10 page paper about some topic in 3-manifolds not covered in this course. The topic of the paper will be chosen in consultation with me. Below are a list of possible topics, together with a couple references for you to look at to see what that topic is about. Of course, other topics are possible, these are just things that occurred to me when writing this. Please meet with me soon to discuss choosing a topic. In addition to office hours, you're free to stop by anytime.

The paper will be due on Friday, January 14th.

Possible topics

- Normal surface theory and algorithms for 3-manifolds.

  Thompson, Abigail Algorithmic recognition of 3-manifolds. Bull. Amer. Math. Soc. (N.S.) 35 (1998), no. 1, 57–66.

- Foliations of 3-manifolds and the Thurston norm.

  Thurston, William P. A norm for the homology of 3-manifolds. Mem. Amer. Math. Soc. 59 (1986), no. 339, i–vi and 99–130.

  Candel, Alberto; Conlon, Lawrence Foliations. I. Graduate Studies in Mathematics, 23. American Mathematical Society, Providence, RI, 2000.

- Number theory and hyperbolic 3-manifolds, scissors congruence.

  Neumann, Walter D.; Reid, Alan W. Arithmetic of hyperbolic manifolds. Topology '90 (Columbus, OH, 1990), 273–310, Ohio State Univ. Math. Res. Inst. Publ., 1, de Gruyter, Berlin, 1992.

  Neumann, Walter D. Hilbert's 3rd problem and invariants of 3-manifolds. The Epstein birthday schrift, 383–411 (electronic), Geom. Topol. Monogr., 1, Geom. Topol., Coventry, 1998.

- Thurston's Hyperbolic Dehn Surgery Theorem: If M is a hyperbolic 3-manifold with one cusp, then all put finitely many Dehn fillings are hyperbolic 3-manifolds.

  Thurston's notes, http://www.msri.org/publications/books/gt3m/ , Chapter 4.

  (there are other more detailed sources, such as Chapter 10 of Ratcliffe, Foundations of Hyperbolic Manifolds.).

- 3-manifolds and cosmology.

  Cornish, Neil and Weeks, Jeffrey. Measuring the shape of the universe, Notices of the American Math Society, December 1998, pg. 1463.

- Surface automorphisms and 3-manifolds which fiber over the circle.

  Casson, Andrew J.; Bleiler, Steven A. Automorphisms of surfaces after Nielsen and Thurston. London Mathematical Society Student Texts, 9. Cambridge University Press, Cambridge-New York, 1988.

  Bestvina and Feighn, "A combination theorem for neg. curved groups", Jour. Diff. Geom 35(1992), 85-101.

- The Virtual Haken Conjecture.

  See the slides for my talk with that title on my web page.

  Cooper, D.; Long, D. D. Virtually Haken Dehn-filling. J. Differential Geom. 52 (1999), no. 1, 173–187.