University of Utah
Math 5520, Spring 2009

Topics and bibliography

Possible topics covered:

- Surfaces (I)

- The Euler characteristic

- Groups, free groups, generators and relations

- Fundamental groups, examples and applications (surfaces, graphs and trees, knot complements)

- Covering spaces, universal covers

- Introduction to plane hyperbolic geometry

- Surfaces (II): geometric structures, gluing polygons, hyperbolic surfaces

We will certainly cover the first four topics; others will be according to time and affinity.

Main references

- L.C. Kinsey; Topology of surfaces, Undergraduate Texts in Mathematics, Springer (1993). We will cover chapters 4 and 5 in class, and bits and pieces from other sections.

- W.S. Massey; Algebraic Topology: An Introduction, Graduate Texts in Mathematics, Springer (1967). This will be our main reference for fundamental groups, covering spaces, as well as selected topics in group theory (free groups, presentations and possibly more), included in chapters 2,3,5,6 and possibly 4. This book is a little more advanced than the level of this class.

- A. Hatcher; Algebraic Topology, (chapters 0 and 1), Cambridge University Press (2002). Available at `http://www.math.cornell.edu/~hatcher/AT/ATchapters.html`. This is also more advanced, but with a very geometric presentation. An excellent reference for those of you who wish to learn more algebraic topology.

Other references

- C.C. Adams; The Knot Book, W.H. Freeman and Company (1994).

- J.W. Anderson; Hyperbolic Geometry, Springer Undergraduate Mathematics Series (1999).

- A.F. Beardon; The Geometry of Discrete Groups, Graduate Texts in Mathematics, Springer (1983).

- R. Benedetti and C. Petronio; Lectures on Hyperbolic Geometry, Universitext, Springer-Verlag (1992).

- J. Conway, P. Doyle, J. Gilman, and W.P. Thurston; Geometry and the Imagination. http://geom.math.uiuc.edu/docs/education/institute91/

- H.S.M. Coxeter; Introduction to geometry, Wiley (1961).

- H.S.M. Coxeter; Non-Euclidean geometry, University of Toronto Press (1957).

- D.W. Farmer; Groups and Symmetry: A Guide to Discovering Mathematics, American Mathematical Society, Mathematical World vol. 5 (1996).

- D.W. Farmer & T.B. Stanford; Knots and Surfaces: A Guide to Discovering Mathematics, American Mathematical Society, Mathematical World vol. 6 (1996).

- I.N. Herstein; Abstract Algebra (3d ed.), John Wiley & Sons (1999). For background information on groups (chapters 2 and 3), usually covered in Math 5310 or an equivalent class.

- C. Livingston; Knot Theory, Mathematical Association of America (1993).

- D. Mumford, C. Series and D. Wright (with cartoons by Larry Gonick); Indra's pearls : the vision of Felix Klein, Cambridge University Press (2002).

- J.R. Munkres; Topology (2d ed.), Prentice Hall (2000).

- V.V. Prasolov; Intuitive Topology, American Mathematical Society, Mathematical World vol. 4 (1995).

- D. Rolfsen; Knots and Links, Publish or Perish (1976).

- W.P. Thurston; Three-Dimensional Geometry and Topology, Princeton University Press (1997). Mostly for chapter 1 and part of chapter 2; the rest is much more advanced.

- J.R. Weeks; The Shape of Space (2d ed.), Marcel Dekker (2002).