Math 2420: Algebraic Topology, Spring 2012 Syllabus

Instructor: Chris Kottke

Office: #303 Kassar-Gould House

Email: ckottke@math.brown.edu

Course website: http://math.brown.edu/~ckottke/2420_sp12/

Office hours: WF 2-3pm, or by appointment.

Text:

- *Algebraic Topology*, by Allen Hatcher. ISBN: 0-521-79540-0. Also freely available from the author's website: http://www.math.cornell.edu/ hatcher/AT/ATpage.html

Other useful texts (not required):

- *Topology and Geometry*, by Glen Bredon.

- *A Concise Course in Algebraic Topology*, by J.P. May.
  Freely available online at http://www.math.uchicago.edu/~may/CONCISE/ConciseRevised.pdf.

- *Characteristic Classes*, by John Milnor and James Stasheff.

- *Fibre Bundles*, by Dale Husemöller.

Grading: Your final grade will depend on 5-6 (approximately biweekly) homework assignments, and (tentatively) a take-home final exam, weighted as follows.

Homework	70%
Final	30%

Description: Assuming knowledge of the fundamental group and singular homology, in the first part of the class we will cover singular cohomology, including the cup product and Poincare duality following Hatcher. The second portion of the class will include a brief introduction to homotopy theory, followed by a study characteristic classes and classifying spaces, emphasizing the theory of principal bundles. We will discuss Stiefel-Whitney, Euler and Chern classes, hopefully culminating in some discussion of cobordism.

The second half of the class will involve material not in Hatcher, for which notes will be produced by the instructor.

Tentative outline:

Week	Topic
1	Homology odds and ends.
2	Definition and properties of cohomology.
3	Universal coefficient theorem for homology and cohomology, Ext and Tor.
4-5	Cup product, Kunneth theorems.
6-7	Poincare duality.
8	Higher homotopy groups, cellular approximation, weak equivalence.
9	Loops and suspensions, Puppe sequence and general cohomology theories.
10	Vector bundles and principal bundles.
11	Universal bundles and characteristic classes.
12	SO and Stiefel-Whitney classes.
13	U and Chern classes.
14	Thom construction and cobordism.