

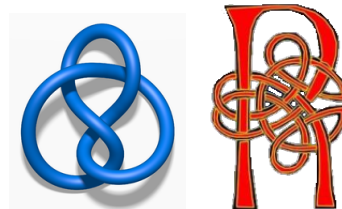
Syllabus for Math 560 Fall 2011

Selections from Geometry and Topology:

Knot Theory

TR• 1:30pm - 3:00pm • DRL 4C6

Instructor: Dr. Radmila Sazdanović
Email: radmilas@math.upenn.edu
Office: 3C5 DRL
Office Hours: M 3-4PM, T 10-11AM or by appointment



Prerequisites:

There are no formal prerequisites for this course. You should be comfortable with linear algebra. Material from Abstract algebra (370-371 or 502-503) and Introductory topology (Math 500) can be useful. But neither of these is needed, and I will not assume that you know this material.

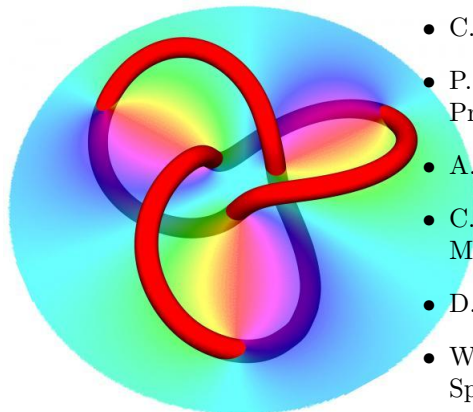
Description and Goals of this Course:

You can think of a knot as a piece of elastic string in our 3D space floating around with its endpoints joined together (stretching and bending are allowed but cutting is not). Even two knots, it is surprisingly hard to decide if they are the same or not and lots of good mathematics is needed to help answer this question.



We will begin by defining knots and continue by studying their properties, including knot projections and Reidemeister theorem, tangles, and simple knot invariants like knot polynomials (Jones, Kauffman, Alexander), colorings, and the fundamental group of knot complements. The last part of the course shall depend on student interest- we will discuss more advanced topics like the relationship to 3-manifold topology, recent developments and applications in other sciences: molecular and DNA biology (protein folding, supercoiling), physics etc.

Useful books:



- C. Adams, The Knot Book (1994, W. H. Freeman)
- P. Cromwell, Knots and Links (2004, Cambridge University Press)
- A. Sossinsky, Knots (2004, Harvard).
- C. Livingston, Knot Theory (1993, Carus Mathematical Monographs)
- D. Rolfsen, Knots and Links (1976, Publish or Perish)
- W. B. R. Lickorish, An Introduction to Knot Theory (1997, Springer GTM)

Web Pages:

Blackboard We will use **Blackboard** to post course materials, record homework, presentation, midterm, and exam grades. Please check Blackboard regularly to ensure your grades have been recorded correctly. All announcements, handouts, assignments, reading materials, and course policies will be posted on the Blackboard <http://www.library.upenn.edu/courseware/>

My Website: <http://www.math.upenn.edu/~radmilas/>

The following two websites provide the most comprehensive database of knots, links and their invariants

- *Knot Atlas* by Dror Bar Natan http://katlas.org/wiki/Main_Page
- *Knot Info* by C. Livingston and J.C. Cha <http://www.indiana.edu/~knotinfo/>
- *KnotPlot* by Rob Scharein was part of his thesis work in the Imager Computer Graphics Laboratory and it is the best visualization software for knot theory. Its add-on *TopoICE* can be used to model the shape of DNA bound by proteins (such as recombinases) which bind 2 segments of DNA and can knot or link circular DNA molecules <http://www.knotplot.com/>

Schedule: As the course progresses, I will maintain a schedule detailing what we have covered on which days as well as the homework and reading assigned on those days. This schedule will be posted on the course website.

Homework: I will assign homework each week in class and will post the assignment on the course website. I will collect homework the following week in Tuesday class. The lowest homework score will be dropped.

Exams: There will be a midterm during regular classes and a cumulative final exam. *If you have three or more finals scheduled in a 24 hour period, you can reschedule one of them. This must be done by the date given on the Fall 2011 academic calendar.*

Grading: All course grades will be tabulated on Blackboard. Please make sure you have access to the Blackboard course page. I will determine your grade as follows:

HW	40%
Midterm	30%
Presentation	30%