Math 191 - Knot Theory
Spring 2016

1. Administrative

Location: 891 Evans
Time: Tu & Th, 2pm - 3:30pm

Instructor: Chris Gerig

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Office hours: By appointment

Prerequisites: Ability to write proofs and willingness to work on open-ended problems. Math 55 and at least one 100 level math course strongly preferred.

2. Description & Course Content

Introduction to Research via Knot Theory. The mathematical study of knots aims to understand how 1-dimensional objects behave inside 3-dimensional space, and this includes the building of invariants to distinguish knots. Inspiration comes from the physical knots in our world, and applications arise in modern geometry, biology, and physics. Knots can be studied from many mathematical levels and points of view, and this provides an ideal gateway into research.

Some material: composition of knots, Reidemeister moves, links, tricolorability, knots and planar graphs, unknotting number, crossing number, genus and Seifert surfaces, satellite knots, braids, bracket polynomial and Jones polynomial, the alexander and HOMFLY polynomials, applications to physics, knots in graphs, connection to 3-manifolds, prime decomposition of knots, higher-dimensional knotting. *Selected topics according to individual interest*

Textbook: *"The Knot Book"* by Colin Adams. Only used as a foundation to branch off from.

Software: LaTeX. http://www.latex-project.org/

3. Grading

One short and one long project (including progress report and in-class presentation). Write-ups using LaTeX will be required for each project. Each student will have considerable latitude in finding problems that fit their interest. Students will work in small groups on these problems, with the majority of this work completed outside of class. Exercises may occasionally be assigned.

Final Project: 50%
Short Project: 30%
Attendance/Participation: 20%