

Honors Seminar: Low-dimensional Topology

University 2196, Fall 2015

Course Description

We will study the basics of knots, links, braids, surfaces, and maybe some three-manifolds, too. We shall find ways to describe when two such objects are somehow “the same” and when they are somehow “different.” Our emphasis is on exploration, conjecture, experiment, and creative play. Students will gain experience with visualization of objects in three dimensions, and learn to make mathematical arguments which are precise and concise. Students will also learn to ask and answer their own questions.

Basic Details:

- **Instructor:** Theron J Hitchman
- **Course Meetings:** Tuesdays and Thursdays, 12:30-1:45 at the Honors Cottage
- **Texts:** *Intuitive Topology* by Prasolov, and *The Shape of Space* by Weeks.
- **Office Hours:** Weekdays, 2-3pm, Wright Hall 327
- **web page url:** theronhitchman.github.io/low-dim-top

Learning Objectives

Process Goals

- Students will develop mathematical communications skills, and demonstrate the ability to
 - speak clearly about mathematical ideas
 - write about mathematical ideas concisely with clarity and precision
- Students will develop their mathematical creativity and demonstrate an ability to approach and solve new problems with confidence and persistence.

Mathematics Goals

- Students will develop 3d visualization skills and show an ability to clearly describe an object situated in space, or to sketch an object so described.

- Students will learn mental models for thinking about the topology of low-dimensional objects, and demonstrate an ability to describe ways in which we can say some such objects are “really the same” or are “truly different” from a topological point of view. (key words: homeomorphism, homotopy, isotopy)

Assessment:

Grades for this course will be based on the following types of assessments:

- Midterm Exam (Oral Exam? 6th or 7th week?)
- Lateterm Exam (Written exam? 12th week?)
- Class Participation: presentation, questioning, general engagement
- Final Project

Students will be involved in deciding the specifications for what constitutes passing work for the exams and the final project. (This will be discussed and decided during the term.)

The Final Grading Scheme: Each assessment will be given one of three marks: *exceeds expectations* (E), *meets expectations* (M), or *does not meet expectations* (DNM). When possible, work that does not meet expectations may be revised once in consultation with the instructor. E’s will be awarded for various forms of awesomeness.

Grades will be not lower than those determined by following the table below.

- A | any combination of two E’s and two M’s, or better
- B | any one E, and no DNM’s
- C | no DNM’s
- D | at most one DNM
- F | fail to meet the standards for a D

My Best Guess at a Project Timeline

Week 10: initial project ideas due
 Week 11: project decisions finalized
 Week 14: 1st draft of paper due
 Week 15 + Exams: presentations
 Exam Week: final papers/creative works due

Student Academic Accommodations

Please address any special needs or special accommodations with me at the beginning of the semester or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) form from Student Disability Services (SDS) (phone 319-273-2677, for deaf or hard of hearing, use Relay 711). SDS is located on the top floor of the Student Health Center, Room 103.