

**MATH 499: UNDERGRADUATE RESEARCH SEMINAR
SPRING 2016 - RICE UNIVERSITY**

Instructor. Dr. Allison H. Moore (allison.h.moore@rice.edu)
Office: HBH 456, Office hours: Wednesdays 1-3 or by appointment

Course Information. Meetings on Fridays 12:00PM - 12:50PM in HBH 423

Course Description. This class is an undergraduate research seminar devoted to understanding, conjecturing and proving new research mathematics. Instead of lectures, weekly meetings will be based on open-ended discussions. Together, we will explore assorted topics in computational and combinatorial topology. This may include research problems in knot theory or projects in topological data analysis, depending on the background and interest of the student.

Textbooks. There are no required textbooks for this class. However, you may find the following books at the library helpful for background material:

- *The Knot Book* by Adams
- *Formal Knot Theory* by Kauffman
- *An Introduction to Knot Theory* by Lickorish
- *Linear Algebra* by Friedberg, Insel and Spence
- *Algebra* by Artin
- *Algebraic Topology* by Hatcher (free online).
- *Computational Topology: An Introduction* by Edelsbrunner and Harer

Additionally, research papers and references will be distributed throughout the semester.

Grades. Your grade will be determined by both active participation and attendance (80% of the overall grade) and the completion of a term paper (20% of the overall grade) on the topic of the research project that you pursue throughout the semester. Participation and attendance is mandatory for passing the course. Students may choose to opt-out of the term paper requirement, but the maximum grade available to those who opt-out will be a 'B.'

Expectations. Due to our limited time together and the exploratory nature of the course, students are expected to be proactive about learning the topics that arise in discussions. This means reading research level math papers, explaining math to other students, attempting to work hard problems, and writing up proofs and exposition. All students are expected to actively participate in our weekly meetings.

Assignments. Reading assignments, problems and tasks may be assigned occasionally, and students can work on these at their own pace. Periodic assignments and various tasks will not be graded and there will not be any exams. However, the one exception to this is the term paper (see below), which accounts for 20% of the overall course grade.

Term paper. Completion of a term paper accounts for 20% of the overall course grade and is necessary in order to earn an ‘A.’ The specific expectations for the term paper will be discussed in greater detail later in the semester, but some rough guidelines and expectations are given here.

The topic of the paper should correspond with the research project. It may be either expository or contain original work, yet in both cases students should strive to write at a level which would be deemed acceptable by a good undergraduate research journal of mathematics. This means the paper should contain an introduction that motivates the problem, necessary background material and helpful examples, and a well-organized and carefully argued section detailing the research project itself and any relevant conjectures, claims, lemmas, propositions and theorems together with their proofs and/or a detailed explanation of the hypothesis, methods and results of a data analysis project, as is appropriate.

Additional guidelines:

- If students collaborate together to produce an original result, they may choose to submit a single paper that is coauthored together. In this case, all of the collaborators on the project are expected to contribute significantly to the content and technical writing of the paper. For expository papers, students must individually submit work of single authorship.
- Students will be expected to propose an outline for their individual or collaborative term papers midway throughout the semester.
- The paper must include a bibliography and all references must be appropriately cited.
- The paper must be grammatically correct, and the mathematical notation should be standard and sensible. It should be written with mathematical maturity and well-organized.
- The paper must be written L^AT_EX. If you’re new to L^AT_EX, I’m happy to provide you with a template to get started.
- Any figures should be neat and professional-looking. Use of Inkscape, Xfig, or some other vector-based graphics programs is recommended.

Throughout the semester, students can expect to discuss progress on their research projects with me. There will be periodic deadlines for rough draft versions of the term papers and opportunities for feedback.

Academic Integrity. Students are expected to abide by the Rice Honor Code at all times.

OWL-Space. Announcements, suggested readings and assignments will usually be posted to OWL-Space. Add yourself to OWL-Space with a NetID and check regularly.

Students with disabilities. Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first week of class. All discussions will remain confidential. Students with disabilities need to also contact Disability Support Services in the Ley Student Center.

Visit <http://students.rice.edu/students/Disability.asp> for more information.

Disclaimer. The instructor reserves the right to update the expectations outlined in this syllabus. Any modifications will be announced in class corresponding with changes made to the syllabus.