Math 495 Final Research Project–Spring 2014–200 points
Professor Ryan Blair

Goal: Each student will explore a knot theory topic of their choosing in more depth and present their research to the class during an oral presentation. In addition, each student will submit a final paper to me by 5pm on Tuesday May 13th.

I. Paper Topic:
- Each student must choose an approved topic by **Apr. 10** and email me this choice.
- Although I am happy to consider other topics here is a preapproved list of topics:
  - Braid Groups
  - The HOMFLY-PT polynomial
  - Applications of knot theory to the study of DNA and RNA synthesis.
  - Intrinsically knotted graphs
  - Chirality of knots
  - Additivity of bridge number
  - Alternating knots and why they are special
  - Width of a knot and the recognition problem for S^3
  - Applications of knot theory to physics
  - Dehn Surgery and the knot complement problem
  - The hyperbolic structure on the figure eight knot complement
  - Racks and quandles (these are generalizations of colorings)
  - Fary-Milnor Theorem.
  - My paper "Alternating Augmenations of Knots"

I. Paper Outline (20 pts):
- Due on or before **April 24 (in class).**
- Open format (e.g., bulleted ideas, table, small paragraph explanation)

Your outline should accomplish the following:
- Clearly communicate the **topic**, **background**, **theorems** and **open questions** you will discuss in the paper, and
- Provide a preliminary list (at least 3) of all references that you anticipate using for your paper.

II. Paper* (120 pts):
- Due on or before **May 13, at 5 pm.**
- Length 5-10 pages, primarily word-processed, double-spaced, 12-font
- Additional pages (e.g., figures, calculations, tables) are allowed but should not be included in the 5-10 pages

Final product should contain:

5 pts	**COVER SHEET:** Provide a cover sheet with name, date, class, and title of project.
10 pts	**EDITING:** Paper is well edited (e.g., grammar, syntax), properly formatted, and meets all guidelines.

15 pts	**BACKGROUND:** All new concepts are defined and an effort has been made to frame the topic in terms of concepts we have studied in class.
60 pts	**MATHEMATICAL UNDERSTANDING:** A clear understanding of underlying mathematical topics is demonstrated.
20 pts	**CONNECTIONS AND QUESTIONS:** If applicable, connections to other areas of science and mathematics have been discussed. Major open questions related to the topic have been discussed
10 pts	**FORMATTED REFERENCE LIST:** Complete reference list (in addition to the 5-10 pages) containing at least 3 references (one must be other than an internet URL); include all references cited, as well as those used for research.

III. Presentation (60 pts):

- In class on **May 1st May 6th and May 8th**
- Remember: your classmates will be listening to MANY presentations, so try to be as creative and enthusiastic as possible
- 15 minutes
  - Use this time to discuss the important aspects of your topic (major theorems, connections to the class, open questions)
  - Make sure to give the appropriate background and aim your talk at your fellow students.

20 pts	Presents appropriate background
20 pts	Clearly communicates an overview of important aspect(s) of the topic.
20 pts	Questions are reasonably answered to the satisfaction of the audience.