

MTH 403W Senior Project I  
Winter 2015  
Class Meets MW 3-3:50pm in MNB 130\*

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Website: <http://www.wou.edu/~beaverc>  
Office hours<sup>†</sup> : M 11-11:50, 2-2:50; W 1-1:50; F 10-10:50

**Materials:**

Papers and presentations will be created using LaTeX. There is a compiler on the math network or many are free to download.

**Goals:**

- To provide a capstone experience for your mathematics major
- To give you a chance to demonstrate your ability:
  - To read and learn mathematics independently
  - To make rigorous mathematical arguments
  - To precisely articulate (both in writing and orally) complicated and technical arguments.
- To have the experience be challenging, but one that you remember with pride and satisfaction for many years
- To have projects worthy of a professional presentation (esp. the Academic Excellence Showcase in May)
- To review mathematics content in preparation for the major field test in MTH 404W.

**Course Structure:** The course will closely model the way in which mathematical papers are written and published by professional mathematicians. The main activities are as follows.

- Class time on non presentation days will be doing problems in class on topics from your undergraduate classes in preparation for the major field test.
- Select, in consultation with the instructor, a suitable topic for a substantial senior paper / thesis / project. Follow the guidelines from the document “Finding a Senior Project Topic.”

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\*You will also have a regularly scheduled half-hour weekly meeting with me (or your advisor).

<sup>†</sup>Please feel free to drop by my office during my office hours for help. You do not need to make an appointment to come to office hours. At times other than my listed office hours you are welcome and encouraged to call or email me with questions about the course. If you have direct scheduling conflicts with my office hours and would like further help, please let me know.

- Make a short oral presentation of a topic proposal. (This is analogous to the professional mathematician choosing a research area. Presenting a proposal is common in industry and government and when seeking grants. In academia, early stages of a research project are sometimes presented in department colloquia or at meetings. Graduate students also make oral thesis proposals.)
- Research: Thoroughly digest the paper(s) or solve the problem selected for the project. This amounts to making a thorough set of informal notes containing the definitions and proofs, with all the details filled in. These notes are absolutely critical and indispensable. (Corresponds to the professional mathematician doing research.)
- Select a journal for publication and consult its guidelines for authors: In our class, there is no journal to choose, but we have “Guidelines for Authors of Senior Papers,” listed at the end of this syllabus and a latex template that can be found on my webpage.
- Writing the paper: Work on the paper/thesis/project all term giving the instructor and peers multiple opportunities to respond to drafts. Write drafts using a word processor, but writing formulas by hand as necessary. At the draft stage, avoid wasting time on appearance, save that for the final version. *Your final paper in Winter term must be submitted in LaTeX. It must be emphasized that you are not to simply paraphrasing the source material. The drafts and the paper you write must be your own work, and must differ substantially in style from the source material. Any other approach is plagiarism.*
- Reporting: At each weekly meeting, submit a typed work log, at least one to two pages in length, summarizing what was accomplished during the week. You should write in paragraph form using proper grammar, complete sentences, etc. (do not bring a short, bulleted list). Enhanced reports also include questions, comments, ah-ha moments and so forth. You will be expected to come to the meeting prepared to orally summarize your work for the week and give reports on any difficulties or triumphs experienced during the week. Such reports are a common practice in some jobs and for some grant funded work. Here they count as part of the grade. A minimum of 6 hours per week is expected, but that will not be sufficient for most weeks. Once you start submitting drafts of your report, your work log can be shorter and refer to your paper (e.g. “I wrote pages 3-6 of my paper”)
- On-going Feedback: Each week, beginning with week 5, you should submit a draft of a significant portion of the project. If you do not submit a significant amount of work each week (several additional pages), your grade on the project will be reduced. (This corresponds to the professional mathematician doing self-review of the paper or circulating it amongst colleagues for comment.)
- Submitting your final paper: After that lengthy process of writing and review, you will submit the paper at the end of this term. Then, in the jargon of scholarly publication, it will be “refereed.” The version you submit should be one which you think needs no more work.
- The referee (in our case, the instructor) will review the paper. The referee’s report will be either

- accept the paper as is (rare),
- accept the paper subject to revision (during Spring term), or
- reject the paper (and not pass the course).

In order to avoid rejection, proof-read and edit the final product carefully and also incorporate the feedback received on the drafts. (This is exactly what happens when professional papers are submitted to a journal.)

- Revising the paper: Most often, the referee’s report is that the paper has merit, but needs improvement. The revision will occur during Spring term.
- Speaking about your work: You will speak about your work in a proposal in Winter term, during a two-hour presentation Spring term, and then at Academic Excellence Showcase in Spring term on Thursday May 28, 2015. Pending funding approval we will attend the Pacific Northwest Regional Meeting of the Mathematics Association of America in April of 2015 in Tacoma, Washington. You will submit an abstract of your paper Winter term and present at the conference in Spring term. Attendance at the conference is strongly encouraged. More details will come. This experience would give you the opportunity to both demonstrate the fruits of your efforts and to meet students and professors of mathematics from other universities (networking is often crucial in a job search), which affords the chance to become part of the wider mathematical community. This process is analogous to the professional mathematician speaking about ongoing or completed work at colloquia and meetings. Finally, in the Spring term you will give a two hour presentation on your topic.

### **Important Schedule Items:**

- Class meets MW 3:00-3:50 pm in MNB 130. We will not have class Monday, January 12 or Monday January 19 (Martin Luther King Jr. holiday).
- Week 1 – Arrange a regular meeting time with your advisor. If you have not selected a topic, then your “work log” for week one will include a summary of each paper or problem you are considering for your topic. You should finalize your topic choice by the second meeting with your advisor. If you choose a problem from the list in the “Finding a Senior Project Topic” document, you must communicate that choice to me ASAP or risk someone else choosing the problem. In the event two people choose the same problem at the same time I will let the person who has done the most work on the problem have the problem.
- Week 3-4 – Topic proposals will be presented in class on Wednesday of week three and Monday of week four. See the “Proposal Guidelines” document for more information.
- Weeks 2-4 – Meet with instructor to discuss precise project content; begin & continue research; make draft outlines of the paper and submit weekly work logs.
- Weeks 5-10 – Meet with instructor; continue research and writing; submit drafts EACH week in addition to your work log.
- Finals week – Paper due Wednesday, March 18th by 5pm.

**Work Log and Paper Draft Grading** Your work log should reflect at least six hours of work for each week. It should be typed, clear and easy to read, and at least one to two pages long. It is a good idea to keep a notebook of your research and computations as you work. If your work for the week included a lot of computations, you should summarize your results in your work log rather retype long computations. Beginning week 5 you will be required to submit drafts of your paper using the senior project LaTeX formatting. Each week your submission should grow significantly. Once you start turning in drafts, your work log can be shorter than 1 page provided that your work for the week included a significant contribution to your final paper.

Your score on your work log and paper draft will be 0 – 10 with a 10 reflecting a work log that clearly communicates (at least) six hours of constructive work and progress on your final paper (beginning week 5) that keeps you on track for earning an “A” on your final senior project paper. If you fail to submit a work log or updates to your paper (beginning week 5), you will receive a 0; if you submit a work log and paper updates, but fail to show up for your meeting, you can receive at most a “5”. If you miss the meeting and fail to turn in your work log or paper updates, you will receive a “0” on the work log and a deduction of 1% from your course final grade total. Your lowest work log and paper draft score will be dropped, but you are not excused from any weekly meeting. If you must miss a meeting, you must be excused by your advisor and/or arrange a make up meeting with your advisor in order to avoid the deduction of 1% from your course final grade total.

**Course Grading:**

Oral Proposal Presentation	7%
Participation in the Presentations	3%
Work logs and paper drafts	20%
Senior Paper/Thesis	70%
Deductions	-1 % per unexcused class day or weekly meeting missed

**Appropriate Classroom Behavior:** You are ultimately responsible for your own attendance and performance. It is expected that electronic devices such as cell phones will be turned off during class. Proscribed Conduct for all students is described in the University Catalog.

**Incomplete Policy:** An Incomplete can only be granted for a student who is passing a class and has a documented emergency that prevents them from completing a small component of the course.

**Accommodations:** Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office of Disability Services at 503-838-8250 to coordinate accommodations. Students needing medical or mental health care can access the Student Health and Counseling Center by calling 503-838-8313, emailing at [health@wou.edu](mailto:health@wou.edu), or by walking in to schedule an appointment.

**Veterans and Active Military Personnel:** Veterans and Active Military Personnel with special circumstances are welcome and encouraged to communicate these, in advance if possible, to the instructor.

## Guidelines for Authors of Senior Papers

As is the case in the working world of mathematicians, including teachers, these guidelines are enforced.<sup>‡</sup>

### Content and Audience

The senior paper/thesis/project is to be an original treatment of material from multiple sources, properly cited. “Original” means it will be presented in the author’s own words, which are not overly bound to the style of the sources. In some cases, it may contain original mathematics. It should always contain original examples. All proofs omitted from the source work should be completed, if possible, in the paper, either in the body or in an appendix.

The paper should be sufficiently self-contained and clear as to be accessible to an average senior mathematics major at WOU.

### Style

Page and Section Style In the mathematics profession, a journal will usually direct authors to recent issues of the journal with the instructions to use the same style as is used in those issues. Math faculty have developed a LaTeX template that we will use. The template can be found at [http://www.wou.edu/las/natsci\\_math/math/seniorproject/](http://www.wou.edu/las/natsci_math/math/seniorproject/) . See the references for the correct bibliography style.

### Writing

The senior paper is expected to be unusually well-written with good sentence structure; easily understood and mature writing style; correct spelling, grammar and punctuation; and smooth transitions. Refer to a standard manual for matters of grammar and punctuation.

Authors should read the following for math-specific writing advice.

L. Gillman, *Writing Mathematics Well: A Manual for Authors*, Mathematical Association of America, 1987. A short, readable guide about writing proofs for publication, but much of it applies to all mathematical writing.

K. P. Lee, *A Guide to Writing Mathematics* accessed 16 September 2005 at <http://ems.calumet.purdue.edu/mcss/kevinlee/mathwriting/> or available in hardcopy from Mike Ward. Seventeen pages of practical advice with examples. Highly recommended.

### Typing

Papers, of course, should be typed using 1.5-spacing. Lee’s Guide, listed above, has some guidance on typing mathematics. Assistance in learning LaTeX is available upon request.

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<sup>‡</sup>For example, in a workshop on grant writing at the Joint Mathematics Meetings in January 2007, it was reported that a very large number of grant applications to major funding agencies like the NSF are never read because guidelines are not observed. Even small things like improper margins can disqualify a proposal. (This anecdote courtesy of Professor C. Beaver.)