MATH2705W – Technical Writing in Math

Section 10 (3720) meets asynchronously

Instructor: Ben Lantz

Email: Benjamin.Lantz@uconn.edu

Office: Webex

Office Hours

By appointment via Webex

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Course Description

This course will introduce formal writing in mathematics. A large portion of this course is devoted to learning Latex, a software used to write mathematics. Latex is an excellent tool used to express our mathematical thoughts, and I use it every day. I learned Latex in grad school, and I only wish that I learned it earlier.

In this course we are going to:

1. Write about mathematics clearly, using correct grammar, in a well-organized manner.
2. Discuss mathematical ideas and results in a clear and concise manner understood by others.
3. Understand your audience: who is the reader of your mathematical piece?
4. Explain proof in a manner that is easily understood by a reader.
5. Use clear and appropriate examples to explain ideas and illustrate points.
6. Develop documents and presentations that effectively and correctly communicate mathematical ideas.

Syllabus TL; DR

- Each week there will be a few lecture videos to watch going over new material
- You have 5 assignments in this course worth 20% of your grade each. You will submit a "first submission" of each assignment (usually on Friday at 11:59 pm) worth 5% of your grade, and then you will submit a final submission of each assignment (usually on the following Monday) worth 15% of your grade. See the schedule for details on due dates.
- You will be using Latex, a mathematical writing software, for each assignment.
- If you ever have a question or if anything arises throughout the semester, please email me at Benjamin.Lantz@uconn.edu. I am good at returning emails and can help with whatever you need.

Prerequisites

Prerequisites: ENGL 1007 or 1010 or 1011 or 2011, and MATH 1132Q or 2141Q; completion of or concurrent enrollment in either MATH 2110Q, 2142Q, 2210Q, or 2410Q; open only to Mathematics majors.

Textbook and Resources

There is no official textbook for this course, but there are many options for a text and other resources given below:

Although there is no book required for this course, we suggest "**Mathematical Writing**" by Franco Vivaldi (Springer Undergraduate Mathematics Series, 2014th Edition) as a valuable resource for this class.

LaTeX: The students can install LaTeX for free on their own machines or use online sites such as overleaf.com to typeset their papers. Supporting references:

Books on LaTeX:

- G. Grätzer, "Math into LaTeX,"
- M. R. C. van Dongen, "LaTeX and Friends."

A few other useful LaTeX resources:

- A (two-page) quick guide to LaTeX.pdf, and "The Not so Short Introduction to LaTeX.pdf."
- YouTube video by David Richeson: "A Quick Introduction to LaTeX,"

- A sample LaTeX file.zip (based on an example file by Richeson). It also includes a Beamer sample file.
- You can compile LaTeX documents using Overleaf.com, without having to install LaTeX in your machine.
- Or, install your own LaTeX compiler in your machine. For example: TeXstudio.
- Geogebra is very useful to draw diagrams that can be ported to LaTeX as images (in PDF format, for example).

General resources on writing mathematics:

- A YouTube video of Jean-Pierre Serre on "How to Write Mathematics Badly."
- Paul Halmos on "How to Write Mathematics.pdf."
- Bruce Berndt on "How To Write Mathematical Papers.pdf."
- Keith Conrad's "Advice on Mathematical Writing.pdf."
- "Good Problem: teaching mathematical writing,.pdf" maintained and updated by Martin J. Mohlenkamp (Ohio University).
- Francis Su on "Good Mathematical Writing.pdf."
- A Twitter thread on "exemplary writing in mathematics."

Academic Integrity

Cheating is prohibited in all aspects of the course. Cheating includes using others (including AI) to write assignments, asking them to complete their coursework, and copying or soliciting solutions from the internet. UCONN and I both take academic dishonesty very seriously; any academic dishonesty will result in severe consequences.

Please see the university policy at the end of the syllabus for more information on Academic Integrity.

Lecture Notes and Outline

Slides and Videos for Lecture Notes will be posted on HuskyCT.

Week 1:

- The importance of communicating mathematics and through formal writing. Why LaTeX in communicating mathematics? Installing, and compiling documents using LaTeX. Writing LaTeX papers in an online site such as Overleaf.com
- The basic elements of mathematical writing: lemmas, theorems, proofs, examples, inline and displayed equations, numbering and cross-referencing. How to arrange mathematical ideas using these structures and how to typeset them in LaTeX. Basics of mathematical logic. Translating symbols and quantifiers to words in writing.
- Understand the structure of a mathematical paper.

Week 2:

- The different types of proofs (e.g., induction, contradiction), and elements of a proof. The difference between examples, a generic example, evidence, and a proof.
- How to communicate the idea of a proof. From a schematic proof, to writing a proof in text/prose form.

Week 3:

- Using images, tables, graphs, and diagrams as part of a proof, and to illustrate a mathematical paper. The role of examples in a math paper.
- Investigate Latex in more detail and go over common problems faced throughout the session so far.

Week 4:

- How to write a paper about a theorem or a mathematician's work. How to focus the writing on the mathematical content.

Week 5:

- How to write math homework and work on creating a template that can be used in future semesters.

Communication

Please communicate with me often. I am available for questions about material at any time and I am very good at responding to emails quickly. Furthermore, please use the drop-in office hours at any time. You do NOT need to make an appointment for these times.

If you need extra time on an assignment because of unforeseen circumstances in your life, please communicate with me. I do not need to know any personal details of what is going on in your life, but I can work with you to come up with a plan on how to overcome any obstacles that may be present.

Communication is KEY! Please reach out early and often with any questions or concerns.

Assessment and Grading

The course grade will be based on 5 assignments given throughout the session (20% of your grade each). The first submission will be worth 5% of your grade and the final submission will be worth 15% of your grade. Details on those 5 assignments are given below:

Assignment	First Submission Due Date	Final Submission Due Date
1	Friday June 6th at 11:59 pm	Monday June 9th at 11:59 pm
2	Friday June 13th at 11:59 pm	Monday June 16th at 11:59 pm

3	Friday June 20th at 11:59 pm	Monday June 23rd at 11:59 pm
4	Wednesday June 25th at 11:59 pm	Friday June 27th at 11:59 pm
5	Tuesday July 1st at 11:59 pm	Thursday July 3rd at 11:59 pm

Assignment topic	**Tasks**
1. The basic elements of mathematical writing: lemmas, theorems, proofs, examples, inline and displayed equations, numbering and cross-referencing. How to arrange mathematical ideas using these structures and how to typeset them in LaTeX. (2 pages)	In this assignment the student will learn some LaTeX basics, by elaborating on a handwritten text, and transforming it into a properly typeset LaTeX document.
2. Write a precise statement and proof of the quadratic formula. (2 pages)	In this assignment the student will create a LaTeX document that states a proper statement of the quadratic formula, and contains a complete proof of the formula, followed by worked out examples.
3. Including graphics, diagrams, matrices, arrays, hyper-references, tables, and bibliography in your documents (tikz, Geogebra, etc) (3 pages)	Write a paper about a theorem or result or theory where graphs and graphics play an important role. Include a discussion that references the graphics as an aid to understand the result. Some possibilities: * Pythagoras' theorem (and/or Euclid's "Elements"). * The Four Color theorem. * Green's theorem. * Pick's theorem. * Bayes' theorem. * Euler's polyhedron formula.

4. History of Mathematics (4 pages)	Write a paper about a famous mathematician, which discusses some of their work, and illustrates their mathematical era. Discuss some of their work in detail. Some possibilities: * Pierre de Fermat and/or Andrew Wiles (and Fermat's Last Theorem). * Maryam Mirzakhani. * Emmy Noether. * David Hilbert (and Hilbert's problems). * Sophie Germain. * Felix Hausdorff. * Leibniz and Newton, and the invention of Calculus. * Evariste Galois.
5. Applied Mathematics (4 pages)	Write a paper about an application of mathematics. Some possibilities: * Cryptography. * Graphics (and computer science in general). * Engineering. * Political Science (e.g., voting methods). * Gerrymandering. * Medicine. * Biological Sciences.

Late Policy

Late work will be accepted at a 10% penalty up to 1 week after the due date. Please communicate with me if you are falling behind on an assignment.

Final Exam

There is no Final Exam for this course.

The Purpose of a "W" Course

In a writing-intensive course (W Course), writing should be integral to the learning goals and subject matter of the course. In the language of the General Education Guidelines at UConn, students should not write simply to be evaluated; they should learn how writing can ground, extend, deepen, and even enable their learning of course material. In addition to questions concerning strategies for developing ideas, clarity of organization, and effectiveness of expression and discipline specific stylistic norms, the W requirement should lead students to understand the relationship between their own thinking and writing in a way that will help them continue to develop throughout their lives and careers after graduation.

A writing course in mathematics teaches students how to communicate mathematics in a precise, concise, and clear manner. Throughout this course, your instructor will emphasize the best practices in writing mathematics, as it pertains to writing mathematical proofs. The student will learn how to gauge the level of mathematical background of the audience (the reader) and learn how to modify a document to fit the mathematical level of the reader (e.g., how much background is necessary for each type of audience). The student of a W course will write drafts, revise drafts and resubmit. The reason why it is crucial to write a draft is so that the document can be peer-reviewed and critiqued by your instructor, so that a conversation can occur about what background may be necessary, and what level of detail is required when discussing a concept or a mathematical proof. In this course, there will be much emphasis on the structure of mathematical writing (examples, lemmas, theorems, corollaries, remarks, etc.), and there will be discussions about the importance and educational power of properly chosen examples and diagrams, graphs, to illustrate a document and to illustrate a mathematical argument that may be otherwise hard to grasp by the reader.

"W" Course Grading and Revision Policy

According to university-wide policies for W courses:

- an overall passing grade on the writing components of the course (the 15+ page assignments described below) is required to pass the course, and
- all writing components of the course (the assignments described below) must go through a feedback and revision process.

Accordingly, your portfolio will not be considered complete unless you have made revisions addressing the points raised in the assessment of your initial submission and you will not pass the course without a complete portfolio that achieves a passing standard.

Grading Scale

Letter grades will be assigned using the following scale:

A	:	93.00% and above
A-	:	90.00% - 92.99%
B+	:	87.00% - 89.99%
B	:	83.00% - 86.99%
B-	:	80.00% - 82.99%
C+	:	77.00% - 79.99%
C	:	73.00% - 76.99%
C-	:	70.00% - 72.99%
D	:	63.00% - 69.99%
D-	:	60.00% - 62.99%
F	:	59.99% and below

Letter grade cutoffs may be lowered if deemed necessary (although this is not likely and should not be expected).

Policy on Academic, Scholarly, and Professional Integrity and Misconduct (ASPIM)

https://policy.uconn.edu/2023/07/11/academic-scholarly-and-professional-integrity-and-misconduct-aspim-policy-on/