

# MTH 446

## Syllabus

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|----------------------|-----------------------|----------------------|---|
| <b>Instructor:</b>   | Dr. Colin Starr       | <b>Office Hours:</b> | MWF 9:10-10:10  |
| <b>Office:</b>       | Ford 213              |                      | TTh 9:30-10:30  |
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**Required Text:** *Closer and Closer*, by Carol S. Schumacher.

**Goals:** This is Mathematics Boot Camp. The course is about both content – Real Analysis, the theoretical underpinnings of Calculus – and process – how one proves difficult results and presents difficult ideas to others. I will not be lecturing much if at all in this course. Instead, you will be presenting the examples, problems, theorems, and proofs at the board. Because of this, your attendance is mandatory.

1. Students will understand the concept of a limit.
2. Students will understand and be able to apply the major theorems in analysis.
3. Students will understand the major principles at play in analysis.
4. Students will develop presentation and critique skills.

**Assessment:** Your grade will be computed as follows:

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|-----------------------|-----|
| <b>Homework:</b>      | 20% |
| <b>Presentations:</b> | 15% |
| <b>Participation:</b> | 10% |
| <b>Quizzes:</b>       | 5%  |
| <b>Midterm Exam:</b>  | 25% |
| <b>Final Exam:</b>    | 25% |

**Homework:** There will be two kinds of homework: presentation problems (problems to present in class) and notebook problems (like traditional homework). You will need to keep both kinds in a notebook that you will turn in periodically. Both should be clearly labeled and L<sup>A</sup>T<sub>E</sub>Xed, using correct grammar, spelling, punctuation, and mathematical notation.

Notebook problems will be graded on a five-point scale: 5=excellent, 4=good but with minor errors or lack of clarity, 3=mostly correct but with a significant error or poor writing, 2=major errors, 1=little progress, 0=no attempt or no progress. Feel free to work together on these problems. I will grade these orally and e-mail you a digital file with my comments.

**Presentations:** Each day, you will turn in an index card listing the problems you are prepared to present. You should also indicate those problems you may not be ready to present but would be willing to lead a class discussion of. From those who are prepared for a particular problem, I will choose the one who most needs to present. **NOTE:** There is no penalty for presentation errors. Your presentation grade is based on the number of times you present. If your proof is incorrect, you will have a chance to correct it at the next class meeting (unless it is a small error that can be fixed as we go). I will offer suggestions for improvement in presentation when appropriate.

Presentation problems should be prepared with presentation in mind. How can you help the class understand your solution? How can you effectively communicate your ideas? Are there diagrams that would help? (Usually, there are.) Think about how to verbalize your approach as well as how to clearly write it on the board. Your job is to make the proof clear to the class. This is about more than just a solution to the problem; it is about communicating a solution to others. (For example, just copying your work from your notes to the board is a poor presentation; instead, talk through your solution as you present it, make eye contact with the other students to gauge how they are following, etc.) It is a good idea to practice it ahead of time, too.

Your audience is the class; I am not your audience. My job is to serve as a moderator, guide, and record keeper.

**Participation:** While one student is presenting, everyone else should be actively engaged in listening, taking notes, asking questions, and helping out if the presenter gets stuck. Participation will be graded daily on a two-point scale: 2=active participation, 1=passive participation (paying attention but not involved), 0=no participation or absent.

The key to an appropriate classroom dynamic for this is respect. Please be respectful to your classmates when they are presenting as well as when you are presenting and they are asking questions. All of us will make mistakes over the course of the semester, and all of us will need clarification. Real Analysis can be really, really hard. Expect errors and understand that it can easily be yours next time, and you will probably be in the right frame of mind.

It is the responsibility of the presenter to answer questions.

**Quizzes:** We will have a few quizzes during the term so I can see that you are keeping up with the main ideas. These may include definitions or proofs from the text.

**Exams:** There will be a midterm exam and a comprehensive final exam. Each will be worth 25% of your grade. The midterm will be around the week of March 18 (the week before spring break). It will consist of an in-class portion worth 5% (probably on Wednesday) and a take-home portion worth 20% (probably given the Friday before and due that Friday). The in-class portion will not include proofs; instead, it will be on definitions and some true/false and fill-in type questions. The take-home portion will have theorems to prove that you have not seen before, possibly including definitions you have not encountered before. I will give you the exam in a sealed envelope. You will have 60 hours to work the exam (including  $\LaTeX$ ing the results) once you open the envelope, so you can choose the best two and a half days you have to work on it. You may not discuss the exam with anyone except me. You are on your honor to end the exam after 60 hours. The final exam will have the same structure.

The final will be due Monday, May 6 at 5pm.

**General Info:** I expect to see you in my office quite a bit. However, this is a 400-level class, which means that I also expect a higher degree of independence, particularly given the structure of the course. My hints will be more oblique than you might be accustomed to, and I will send you away unsatisfied more often. This class is about your banging your head against the wall a lot.