

Syllabus for MATH 361, Real Analysis

College of the Holy Cross, Spring 2024

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Office Hours: 3:30pm - 5pm on Tuesdays and Wednesdays

Meeting Times and Location: 11am - 12pm on MWF, Swords 359

Course Description: The goals of this course are to provide a rigorous foundation for the concepts and theorems of single-variable calculus, and extend some of these concepts to more general sets known as metric spaces. We will begin by studying properties of the set of real numbers and convergence of sequences and series of real numbers. We will then focus on the big three value theorems of calculus, the Extreme Value Theorem, the Intermediate Value Theorem, and the Mean Value Theorem, which are the most important theorems of differential calculus. We will then consider how the notions of convergence, functional limits and continuity can be generalized to arbitrary metric spaces, and introduce several important topological concepts, including open, closed, connected and compact sets. We will conclude by studying properties of the metric space $C([a, b])$, and a number of important results involving sequences and series of continuous functions.

Prerequisites: Mathematical Structures (MATH 243)

Recommended Reading: Understanding Analysis (Undergraduate Texts in Mathematics) by Stephen Abbott, Springer, 2nd edition. We will cover most of the first six chapters.

Course Materials: All announcements, materials and grades will be posted on Canvas.

Homework: There will be weekly homework assignments starting from the second week. Homework Assignments will be posted on Canvas with their due dates. You must submit your solutions as a hard copy. Ten points will be deducted from late homework. No homework assignment will be accepted after 5 days from the due date. No homework grade will be dropped.

No help from any Internet sources is allowed. Plagiarism will not be tolerated and will be treated as a violation of the Departmental Policy on Academic Integrity.

By doing mathematics you learn mathematics. You learn math best when you approach the subject as something you enjoy. Learn to explain mathematics to your classmates. Mathematics can be fun and rewarding when there are people around you who enjoy figuring out problems as much as you do. Take advantage of this opportunity and organize study groups. I will not consider working on homework problems with your classmates as a violation of the academic honesty policy in the department. However, you must prepare and submit your own solutions.

Please follow these guidelines when you submit homework assignments:

- Put your name, the date, and the homework assignment number at the top of the first page.
- Staple multi-page assignments.
- Write neatly and show all your work.
- On the last page of your assignment, please write the name(s) of your classmate(s) with whom you work on homework problems (with an asterisk).
- Make sure you attach the honor code.

Mid-term exams: There will be three mid-term exams during the semester. The mid-term exams are 90-minute exams; they will be held from 6pm to 7.30pm on Tuesdays: February 20, March 26 and April 23. The location of the midterm exams is to be determined. No midterm exam grade will be dropped.

Final Exam: There will be a mandatory cumulative final exam in this course. Location and time of the final exam are to be determined. **Check for final exam schedule conflicts as soon as possible.**

Snow Days: If classes are cancelled due to snow, or for other official reasons, any scheduled quiz or test will occur during next class meeting.

Grading: The course grade will be determined as follows:

Final exam: 15%

Mid-term exams: 45% (15% each)

Homework: 35%

Attendance and class participation: 5%

An incomplete grade is given if you have a good attendance record, have completed all the assignments with an overall grade of at least 70%, and have missed the final exam for a valid reason. An incomplete grade is given at the discretion of the instructor.

Final Class Grade: Final exam is mandatory. If you score at least a 70% on the final exam, both your class grades before the final and after the final will be considered. Whichever one higher will be your final class grade. If you do not take the final exam, then it will be a zero on the final exam. If you miss the final exam for a valid reason, you must still take a make-up final exam and score at least a 70% on the final to be eligible for the final class grade option explained above. If you miss the final exam for a valid reason and you do not take a make-up final exam, then it will be a zero on the final exam.

If your final exam grade is less than 70%, then you do not qualify for the final class grade option explained in the previous paragraph, and the final class grade will be computed according to the criterion described in **Grading**.

Issues with the Course/Instructor: If you have issues with this course and/or instructor which you are not comfortable discussing with your instructor, you should contact the Chair of the Department of Mathematics and Computer Science, Professor Ed Soares, at esoares@holycross.edu.

Academic Honesty: A necessary prerequisite to the attainment of the goals of the College is maintaining complete honesty in all academic work. Students are expected to present their own work in exams and in any material submitted for credit. Students may not assist others in presenting work that is not their own. Offenders are subject to disciplinary action. A violation of the Department Policy on Academic Integrity will result in a 0 for that quiz or exam, and a letter describing the occurrence of academic dishonesty will be sent to the Chair of the Department of Mathematics and Computer Science and your Class Dean.

For more on Academic Integrity see:

<https://www.holycross.edu/academics/programs/mathematics-and-computer-science/node/211581/academic-integrity>

Diversity and Inclusion: It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. Any suggestions you have pertaining to diversity and inclusion are encouraged and appreciated.

Important:

- (1) Any student with special needs is encouraged to meet with me during the first week of classes to discuss accommodations. The student must bring a current Memorandum of Accommodations from the Office of Accessibility Services. The following is the link to the Office of Accessibility Services:

<https://www.holycross.edu/health-wellness-and-access/office-accessibility-services>

- (2) Please note that, consistent with applicable federal and state law, this course may be video/audio recorded as an accommodation only with permission from the Office of Accessibility Services. Students are not permitted to record the contents of this class under any other circumstances.
- (3) If you are an athlete and have conflicts with an important class activity (homework, quiz, mid-term, or final), please let me know in advance.

(4) For College's Excused Absence Policy see:

<https://catalog.holycross.edu/requirements-policies/academic-policies/#coursepolicies>

(5) All electronic devices (mobile phones, laptops etc.) must be turned off during class time, quizzes, mid-term exams and final exam.

Syllabus: Syllabus is subject to change. It is your responsibility to be aware of any changes I may make to the syllabus as they are announced in class. Students are responsible for all information given when they are absent.

Some Additional Notes:

- (1) I will hold an additional 2-hour final exam review session the day before (or two days before) the final exam. We will discuss and find a time that works for all of us. I will let you know the location before you go home for Easter Break.
- (2) We will go over worksheets in class during the semester. Since we do not have time to work on all problems in class, I will post their solutions on Canvas. However, I encourage you all to work on the problems and bring questions to my office hours.

Important Dates:

March 4 – 8	Spring Break: no classes
March 29 and April 1	Easter Break: no classes
April 24	Academic Conference Day: no classes

May 6, Monday, Last day of classes
May 9, Thursday – May 15, Wednesday, Final Exams
[Final Exam is based on all sections covered in class.](#)

[The mind is not a vessel to be filled but a fire to be kindled.](#)

— Plutarch