Math 444 Syllabus - Section X13, Fall 2021

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Class Meetings: MWF 12:00-12:50, 1060 Lincoln Hall

Course Overview: Real analysis, which is the study of the real number system and of functions and sequences of real numbers, lays the theoretical foundation for calculus. It is interesting and perhaps surprising that most of the calculations and techniques that you learn in Calculus were developed by the 17th century (see History of Calculus), but the theoretical underpinnings, in particular precise definitions of *limit*, *derivative,* and *integral*, did not appear until over a hundred years later (see History of Mathematical Analysis). So why do we need to study real analysis when we can use calculus very well without it? The first reason is the simple intellectual appeal of a rigorous foundation for the powerful techniques of calculus and for the intriguing ideas of the "infinitely small." The second reason is that real analysis includes powerful concepts that can be applied in other fields and generalized to many contexts. Ideas of real analysis play a big role in differential equations, dynamical systems, probability, statistics, economics, physics, financial mathematics and many other areas.

Topics covered by Math 444 include the real number system, limits, continuity, derivatives, the Riemann integral. Students will gain a rigorous understanding of the fundamental concepts of real analysis and will improve their ability at reading and writing mathematical arguments.

This course has significant overlap with Math 447, but Math 447 is more general in that it covers analysis on metric spaces in general, whereas Math 444 covers analysis only on the real line. The Math Department recommends that students who plan to pursue graduate work in mathematics should take Math 447 if possible.

Required Text: Introduction to Real Analysis by Robert G. Bartle and Donald R. Sherbert, 4th edition, Wiley. Hardcopy and ebook versions of the textbook are available. The University of Illinois library has paper and electronic copies. There will be readings from the textbook assigned each week and the course will follow the textbook closely.

Course Format: You will watch lecture videos and complete short quizzes before each normal class period. Each Friday at 7:00pm, a theorem/definition sheet is due, to be submitted online. Every second Saturday, homework over the previous two weeks' material is due, to be submitted online. There will be three mid-term tests, given during class time, and one cumulative final exam, on Friday, Dec. 10, 9:00-11:00am.

Because you will be watching the lecture videos in advance, class time will be primarily devoted to discussing assigned homework and entries in the theorem/definition sheets. You will have time to ask questions in class and to work with other students and with me. You can expect to complete much of the homework during class time, with only the final write-up to be done later.

Tests: The mid-terms and the final exam will be in-person, paper and pencil exams. Books and notes are not allowed to be used during exams. A calculator is not necessary, but you may use one if you wish. The test dates are Sept. 22, Oct. 20, Nov. 17 in class and the final exam on Dec. 10, 9-11am. Details can be found on the Exam Information tab in Moodle.

Office hours: I will hold regular office hours several time per week, exact times to be announced. I encourage you to come to office hours to discuss course material, homework questions, etc. with me and with other students. Because there will typically be several students together in office hours, please email me for an individual appointment at another time whenever you want to discuss something privately, such as grades, etc.

Online forum: Please make frequent use of the online forum in Moodle each week to discuss course material with other students. It is allowed and encouraged to help one another with homework assignments, but please don't simply copy from others. I will participate in the forums also.

Accommodations: To obtain disability-related accomodations, students should contact both me and the Disability Resources and Educational Services (DRES) as soon as possible. I encourage you to use any accommodations to which you are entitled.

COVID safety: All university policies will be followed. I will check your building access status at the beginning of each class period and I will show you mine as well. You can show building access using either the Safer Illinois app or the COVID-19 Boarding Pass. The university may adjust its policies as circumstances change and as knowledge about COVID is gained. See https://covid19.illinois.edu/guides/students/ for up-to-date information.

If you feel at all unwell or if you have reason to think you may be infected with COVID, then do not come to class. Instead, email me (promptly) and I will help you arrange to make up what you missed in class. Documentation will usually *not* be required. Please take your responsibility to prevent the spread of COVID very seriously.

Academic Integrity: Academic dishonesty will not be tolerated. Examples of academic dishonesty include the following:

- Cheating
- Fabrication
- Facilitating infractions of academic integrity
- Plagiarism
- Bribes, favors, and threats
- Academic interference
- Examination by proxy (letting someone else take an exam for you)
- Grade tampering
- Non-original work

Should an incident arise in which a student is thought to have violated academic integrity, the incident will be processed under the disciplinary policy set forth in the Illinois Academic Integrity Policy in the Student Code. Significant penalties will be imposed for cheating or other violations. This is not a hollow threat; I will take the time to follow through on each and every violation, and I will not show partiality to any student. You will find me flexible and understanding about difficulties you have related to this course, and you will find me firm and inflexible about cheating.

Important note: You may work together homework, quizzes, and theorem/definition sheets. However, your final write-up that you submit should be your own, not a copy of a classmate's work or a copy of a solution from the internet. On exams, all work must be strictly your own.

If you do not understand relevant definitions of academic infractions, contact the instructor for an explanation within the first week of class.

Grading Distribution (no "dropped" grades in this class):

	#	Percentages	Points	Total Points
Homework Assignments	**7**	35%	50 points each	350
Definition/Theorem Sheets	**14**	9.8%	7 points each	98
Quizzes	**102**	10.2%	1 point each	102
Midterm Exams	**3**	Each 10%	100 points each	300
Final Exam	**1**	15%	150 points	150
Course Total		100%		1000

Points	970-1000	930-969	900-929	870-899	830-869	800-829
Course grade	A+	A	A-	B+	B	B-

770-799	730-769	700-729	670-699	630-669	600-629	0-599
C+	C	C-	D+	D	D-	F

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