Math 551 Real variables I

Course title: Real variables, I
Couse instructor: Qingtian Zhang
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Office: Armstrong Hall 405,
Office Hours: MWF 9:30AM - 10:30AM, or by appointment
Times: MWF 10:30-11:20 AM, Armstrong 207

Textbook: Measure, Integration, and Real Analysis, by Sheldon Axler. Download for free at *https://measure.axler.net/*. Chapters 1-5 will be covered. We will mainly follow this book.
Prerequisite: Undergraduate real analysis, MATH 451/452 or equivalent courses. A review is at *https://measure.axler.net/SupplementMIRA.pdf*

Supplemental materials:
Real analysis: Modern techniques and their applications, by G. B. Folland. Some sections or problems may be taken from it.

Grading scheme:
Grades will be based on the homework (20 points each *10 times), 1 mid-term exam (50 points), and a comprehensive final exam (100 points).

Total points =20*10+50+100=350.
Grade: A ≥ 90% > B ≥ 80% > C ≥ 70% > D ≥ 60% > F

It is very important to do exercises after class. Most problems in the exams will be based on the exercises.
Homework will be post on e-campus every week. It will be submitted online by using a Crowdmark link on e-campus. You need to use cellphone to take pictures and then uploaded to Crowdmark. Check e-campus for details.

Some useful resources and Tips:

- Practice makes perfect! Doing more exercises can help you master the knowledge you learned in class.
- Some notices will be sent to you by email. Check your email everyday in case you do not miss any notice.
- Some tips to help you succeed the course:
    1. Preview the textbook material before the class.
    2. Review the textbook examples and do the suggested exercises by yourself.
    3. For the problems you cannot solve, go to others (instructors, tutors, classmates, and so on) for help. Do not accumulate unsolved problems.

Makeup Rules: If you miss an exam due to illness/family emergency, you must notify the instructor before the exam. A make-up exam will be granted case-by-case basis and scheduled in the last week of class (Dec 4 – Dec 7). If you miss the make-up exam, your exam score is zero. The make-up exam will be different from the regular one.

Tentative schedule:

Date	Sections and Content
8/16, Wednesday	1A: review of Riemann integral and undergrad analysis
	1B: why Riemann integral is not good enough
8/21, Monday	2A: motivation and definition of outer measure
	2A: Properties of outer measure
	2A: Outer Measure is Not Additive
8/28, Monday	2B: sigma algebra and Borel sets
	2B: Inverse images and measurable functions
	2B: Properties of measurable functions
9/4, Monday	**Labor Day**
	2B: Definition of measures
	2C: Measure spaces
9/11, Monday	2C: Properties of measures
	2D: Lebesgue measure
	2D: Lebesgue sets
9/18, Monday	2D: Cantor sets and Cantor functions
	2E: Pointwise and uniform convergence
	2E: Egorov's theorem
9/25, Monday	2E: approximation by simple functions
	2E: Luzin's theorem
	Finish chapter 2. Q&A
10/2, Monday	Review for exam
	Midterm exam (in class)
10/6	**Fall break**
10/9, Monday	3A: integration of nonnegative functions

Date	Sections and Content
	3A: monotone convergence theorem
	3A: Integration of real-valued functions
10/16, Monday	3B: Bounded convergence theorem
	3B: dominated convergence theorem
	3B: Riemann and Lebesgue integral
10/23, Monday	3B: Approximation by nice functions
	4A: Markov inequality and applications
	4A: Vitalli covering lemma
10/30, Monday	4A: Hardy-Littlewood maximal function
	4B: Lebesgue differentiation theorem
	4B: Application of LDT
11/6, Monday	4B: Derivatives, Density (optional)
	5A: Product of sigma algebra
	5A: Monotone class theorem
11/13, Monday	5A: Product of measures
	5B: Tonelli's theorem
	5B: Fubini's theorem
11/20, Monday	**Fall recess**
	Fall recess
	Fall recess
11/27, Monday	5C: Borel sets on R^n
	5C: Lebesgue measure on R^n
	5C: Partial derivatives
12/4, Monday	11C: 1D Fourier transform
12/6, Wednesday	Last lecture: review

8/22, Last day to add.
11/14, Last day to drop.

Academic Integrity Statement: The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, instructors will enforce rigorous standards of academic integrity in all aspects and assignments of their courses. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Standards Policy. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see your instructor before the assignment is due to discuss the matter.

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Please refer to the following website for the complete statements. https://tlcommons.wvu.edu/syllabus-policies-and-statements