

Math 6310: Introduction to Real Analysis I
Fall 2022

Class meetings: MWF 3:35 p.m. - 4:25 p.m in MATH 220

Instructor:

Dr. Judith Packer
MATH 227
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<http://math.colorado.edu/~packer/22math6310.html> and on Canvas

Office hours: MWF, 11:00 a.m. - 12:00 p.m., or by appointment.

Prerequisites: Math 3001 and Math 4001 (Analysis 1 and Analysis 2), or the equivalent

Text: *Real Analysis*, H.L. Royden, P.M. Fitzpatrick, Prentice Hall, 2010, 4th edition. We will cover most of Chapters 2–7, and more if time permits. The book *Real Analysis, Modern Techniques and Their Applications*, Gerald B. Folland, John Wiley and Sons, 1999, Second Edition, is also a good reference.

Course outline: This course is meant to familiarize the student with the analysis of functions of a single real variable, with an emphasis on Lebesgue measure and Lebesgue integration on the real line, together with their relationship to differentiation. Topics to be covered include: the historical development of the Lebesgue integral, a review of set theory, the structure of open sets and Borel sets on the real line, Lebesgue outer measure on \mathbb{R} , Lebesgue measurable subsets of \mathbb{R} , Lebesgue measurable extended real-valued functions, definition of the Lebesgue integral, convergence theorems in Lebesgue integration, functions defined by integrals and convolution, differentiation of monotone functions, functions of bounded variation, absolute continuity, review of metric space theory, L^p spaces, the Arzela-Ascoli Theorem, and if time permits, the Stone-Weierstrass Theorem.

Grading: Grades will be based on two in-class midterms (20% each), homework assignments assigned every two weeks or so during the course of the semester, consisting both of problems from the text and other problems (30% - sometimes I will ask for solutions to be presented during class) and a comprehensive final exam (30%). Late homework will not be accepted.

Test and exam dates:

Midterm 1: Wednesday, September 28, 2022 in class;

Midterm 2: Wednesday, November 2, 2022, in class;

FINAL EXAM: Wednesday, December 14, 2022, 1:30–4 p.m., in class. By University requirements, we must have the final exam on this date and at this time.

THERE WILL BE NO MAKE-UP EXAMS, so make sure now that you have no conflicts!

Homework and in-class presentations:

- Assignments consisting of problems from the text and other sources; these assignments will focus on learning the mathematical content of the course. You will usually have two weeks to do these problems, which will cover material studied the previous two weeks. Homework solutions will be due uploaded to Canvas by 11:59 p.m. on the due date. Because of the holiday Monday September 5, 2022 (Labor Day), the days of the week that the homework is due will vary through the semester. Some, but not all, of these problems will be graded. I will occasionally ask students to present homework problems on the board. **Handing in solutions to assigned homework that have been copied verbatim from the internet or Chegg.com or any other homework-solution-providing website is a violation of the Honor Code, and violations will be reported to the Honor Council.**

You are encouraged to work together on homework, although each student must submit an individual write-up. **Late homework will not be accepted.**

Friendly advice:

- **Attend class.** Things will often be said in class that are not covered in the text, and participating in classroom discussions is an important part of the learning process.
- **Read the book.** The text is intended to be read *in addition to* classroom lectures, and it contains many more details and examples than are possible to cover in lectures.
- **Do the homework.** Not only does it count for a significant portion of your grade, but this is one of the best ways to study and learn.
- **Come to my office hours.** I am happy to help you with the homework, or discuss anything we've done in class.

Other Important Dates:

- **September 5, 2022 (Monday):** Labor Day and University Holiday.
- **September 7, 2022 (Wednesday):** Last day to drop a course without Tuition/Fee charges and without a "W" appearing on your transcript.
- **Friday, October 28, 2022 (Friday):** Last day to drop a course via MyCUInfo; Last day for students to make arrangements with their instructor if they have three or more final exams on the same day or two final exams scheduled to meet at the same time.
- **Monday, November 21- Friday November 25, 2022 (Monday–Friday):** Fall Break, yay!
- **December 8, 2022 (Thursday):** Last day of classes, and last day to withdraw from the semester.

Miscellaneous University Rules & Regulations:

- **Classroom behavior:**

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the classroom behavior policy, the Student Code of Conduct, and the Office of Institutional Equity and Compliance:

<https://www.colorado.edu/oiec/> .

- **Requirements for COVID-19** As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu).

- **Accommodations for disabilities:**

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website at

<https://www.colorado.edu/disabilityservices/> .

Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website at

<https://www.colorado.edu/disabilityservices/students/temporary-medical-conditions> .

- **Preferred Student Names and Pronouns:**

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

- **Sexual Misconduct, Discrimination, Harrassment, and/or Related Retaliation:**

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, protected-class discrimination and harassment, and related retaliation by or against members of our community on- and off-campus. These behaviors harm individuals and our community. The Office of Institutional Equity and Compliance (OIEC) addresses these policies, and individuals who believe they have been subjected to misconduct can contact OIEC at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and support resources can be found on the OIEC website at <https://www.colorado.edu/oiec/> .

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of any issues related to these policies regardless of when or where they occurred to ensure that individuals impacted receive information about their rights, support resources, and resolution options. To learn more about reporting and support options for a variety of concerns, visit the website "Don't Ignore It" at <https://www.colorado.edu/dontignoreit/>.

- **Honor Code:** All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the Honor Code Office website at <https://www.colorado.edu/sccr/honor-code> .

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- **Religious holidays:** Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance.

See the campus policy regarding religious observances for full details at <https://www.colorado.edu/policies/observance-religious-holidays-absences-classes-or-exams> .