Math 618, Real Analysis III, Spring 2023

Class Time:	MWF 9-9:50a.m. in 210 University Hall
Instructor:	Dr. Marcin Bownik
E-Mail:	`mbownik@uoregon.edu`
Office:	323 Fenton Hall
Office Hours:	M 10–11am, W 12pm–1pm, and F 11am–12pm, or by appointment
Textbook:	*Real and Complex Analysis*, W. Rudin, 3rd ed.

1. **Background and Goals.**This course introduces students to the subject of real analysis, and to a lesser extent, complex and functional analysis. Topics include foundations of Fourier analysis and complex analysis. The course, which is the the last of three in the sequence, covers most of the chapters 8, 9, 10, 12, and 14 of the textbook.
2. **Learning Outcomes.** Students should be able to solve problems by providing clear and logical proofs involving the following concepts:
   • convolutions, distribution functions, Hardy-Littlewood maximal function, the Marcinkiewicz interpolation theorem,
   • Fourier transform, the inversion theorem, the Plancherel theorem, translation-invariant spaces
   • the Schwartz class, tempered distributions and their basic properties,
   • holomorphic functions, path integrals, the Cauchy formula, the power series representation, the open mapping theorem, the calculus of residues, Rouché's theorem, Laurent series,
   • the maximum modulus theorem, the Schwarz lemma, the Phragmen-Lindelöf theorem, the Riesz-Thorin interpolation theorem,
   • conformal mappings, linear fractional transformations, normal families, and the Riemann mapping theorem. (time permitting)
   Students should be able to give examples and counterexamples illustrating connections between the above concepts and to critically analyze all steps of a mathematical argument for correctness and clarity. In particular, self-check one's own work to find insufficiently explained steps.
3. **Exams.** There will be one midterm in-class exam on Wed. 5/17, and a final exam on Tue. 6/13, 10:15a.m.–12:15p.m.
4. **Homework.** Homework problems will be assigned every week and be due in on Wednesday on the material of the previous 1–2 weeks. Homework needs to be submitted on Canvas. Though you are strongly encouraged to work together on the problems, you must write up your solutions independently. Late homework is accepted, but it is subject to reduced credit.
   Most homework problems consists of proofs. In particular, if a problem asks for an example or counterexample, you must prove that your example has the required properties. Likewise, if a problem asks if something is true, you must not only decide whether it is true, but also provide a proof or counterexample.
5. **Attendance and classroom behavior:** Attendance, while strongly encouraged, is not required for this course. Students are expected to behave respectfully toward each other

and toward the instructor during class time. This includes refraining from using cell phones during lectures.

6. **Grading.** The grading distribution will be as follows:

Homework	40%
Midterm Exam	20%
Final Exam	40%

The precise translation of raw scores into final grades will not be determined until the end of the term. However, when the mid-term examination is returned, I will give an indication of what score range roughly corresponds to each letter grade. This determination will be made in accordance with the following grading standards, published on the Mathematics Department web page:

A: Correctly states important theorems and definitions. Applies the important theorems from the course. Constructs counterexamples when hypotheses are weakened. Constructs complete and coherent proofs using the definitions, ideas and theorems from the course. Applies ideas from the course to construct proofs that the student has not seen before.

B: Correctly states important theorems and definitions. Applies the important theorems from the course. Constructs counterexamples when hypotheses are weakened. Constructs complete and coherent proofs using the definitions, ideas and theorems from the course.

C: Correctly states important theorems and definitions. Applies the important theorems from the course when the application is direct. Constructs simple proofs using the definitions when there are very few steps between the definitions and the conclusions. Explains the most important counterexamples.

D: Can do some single step proofs and explain some counterexamples.

F: Unable to do even single step proofs or correctly use definitions.

A grade of A+ will be given only in exceptional circumstances, if a student exceeds the expectations of the class.

7. **University policies:** University policies on academic misconduct, accessible education and accommodations, mandatory reporting obligations, and emergency policies can be found at: `https://provost.uoregon.edu/standard-university-syllabus-language`