

Math 8370: Harmonic Analysis 1
Fall 2024

Class meetings: MWF 10:10 a.m.-11:00 a.m. in MATH 220

Instructor:

Dr. Judith Packer
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<http://math.colorado.edu/~packer/8370F24.html>

Office hours: MWF, 11:10 a.m. - 12:10 p.m., or by appointment either in my office or via Zoom.

Prerequisites: Math 6320 (Introduction to Real Analysis 2), or instructor consent.

Text: *A First Course in Harmonic Analysis*, Anton Deitmar, Springer Verlag, 2005, second edition. This book is available in electronic form from the CU library.

Course outline: The material to be covered includes all of Chapters 1, 2 and 3 of the Deitmar book and much of Chapters 6, 7, 10 or 11, depending on student interest. Topics to be covered include: A review of periodic functions on \mathbb{R} relating them to functions on the unit circle \mathbb{T} , trigonometric polynomials and Fourier series on the circle, including convergence problems for Fourier series on \mathbb{T} , including convergence in L^1 and L^2 ; mean, pointwise and absolute convergence. Convolution in $L^1(\mathbb{T})$. The Fourier Transform in $L^1(\mathbb{R})$: convolution in $L^1(\mathbb{R})$, approximate identities and the Poisson summation formula. The Fourier transform in $L^2(\mathbb{R})$, inversion and the Plancherel Theorem; the Poisson Summation formula. Depending on student interest we might cover one or more of the following topics: Theta series, Fourier analysis on locally compact abelian groups and Pontryagin duality; representation theory for the matrix group $SU(2)$, and/or representation theory for the Heisenberg group.

Assessment: Grades will be assigned on homework assignments (40 %), attendance and participation in terms of presentation of homework problems (10 %) and a project (oral and written) (50 %), due towards the end of classes.

Homework: 40 % of your final grade will be come from your performance on homework, which will be assigned every two and a half weeks or so. You are allowed to work together on homework, although each student must upload an individual write-up to Canvas by 11:59 p.m. of the due date. Late homework will not be accepted, and I will drop your lowest homework score. I will also drop the lowest problem score out of each homework.

Attendance and Homework participation: 10 % of your final grade will be come from your attendance and participation in class and in presenting homework, which will be assigned every two weeks to three weeks or so. It is an important part of the learning process to take part in these discussions and homework presentations. **I am blind in my left eye, so if you sit on that side of the classroom, please speak up and tell me “I have a question!!” because I cannot see raised hands on that side!**

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Final Project: Your final project is worth 50 % of your final grade. Each student will give an oral presentation based on their written project, so please reserve the exam period for our course, Sunday, December 15, 7:30 p.m.- 10 p.m. for presentations (both giving them and listening to them).

Important Dates:

- **September 11 (Wed.), 11:59 p.m.:** Last day to drop a course without Tuition/Fee charges and without a “W” appearing on your transcript.
- **November 1 (Fri.), 11:59 p.m.:** 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.
- **November 1 (Fri.), 11:59 p.m.:** Last day for students to withdraw from the university for Spring semester. All withdrawals are assessed 100% of tuition and fees (\$0 refund) and “W” grades are posted to transcripts.

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, <http://disabilityservices.colorado.edu/> .

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 at <https://www.colorado.edu/disabilityservices/students/temporary-medical-conditions> on the Disability Services website.

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. In this class, assignments will either be rescheduled or dropped from grading calculations depending on the nature of the conflict. If you have a conflict, please advise me as soon as possible so that arrangements can be made. See full details at <https://www.colorado.edu/policies/observance-religious-holidays-absences-classes-or-exams>

Miscellaneous University Rules & Regulations:

- **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> .

- **Classroom behavior policy:**

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 policies on classroom behavior at <http://www.colorado.edu/policies/classbehavior.html> and on the Student Code of Conduct at the website <https://www.colorado.edu/sccr/> .

- **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.

- **Requirements for Infectious Diseases:**

Members of the CU Boulder community and visitors to campus must follow university, department, and building health and safety requirements and all public health orders to reduce the risk of spreading infectious diseases. The CU Boulder campus is currently mask optional. However, if masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class. Students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct & Conflict Resolution. Students who require accommodation because a disability prevents them from fulfilling safety measures related to infectious disease will be asked to follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

For those who feel ill and think you might have COVID-19 or if you have tested positive for COVID-19, please stay home and follow the further guidance of the Public Health Office (at <https://www.colorado.edu/healthcenter/coronavirus-updates/symptoms-and-what-do-if-you-feel-sick>). For those who have been in close contact with someone who has COVID-19 but do not have any symptoms and have not tested positive for COVID-19, you do not need to stay home.

- **Statement on Discrimination and Harrassment:**

The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website,

<http://www.colorado.edu/odece/>

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.