

Math 8330, Functional Analysis 1
Fall 2023

Class meetings: MWF 1:25 p.m.- 2:15 p.m., in DUAN G2B47

Instructor:

Dr. Judith Packer
MATH 227
packer@colorado.edu
<http://math.colorado.edu/~packer/238330.html> and Canvas.

Office hours: MWF, 10:10 a.m.- 11:10 a.m. in MATH 227, or by appointment via Zoom.

Prerequisites: Math 6320 (Real Analysis 2), or the equivalent.

Text: “*A Course in Functional Analysis*”, Second Edition, John B. Conway, Graduate Texts in Mathematics, vol. 96, Springer, New York, NY, 1990. We will cover most of Chapters III, IV and V, and parts of Chapter VI from the text (Chapters I and II can be reviewed, but this material was covered in Math 6310 and Math 6320). For your reference, other useful books are: “*Functional Analysis*”, Second Edition, by W. Rudin, McGraw-Hill, 1991, “*Methods of Modern Mathematical Physics Volume I: Functional Analysis*”, by M. Reed and B. Simon, Academic Press, 1980, and “*Banach Algebra Techniques in Operator Theory*”, Second Edition, by R. Douglas, Graduate Texts in Mathematics, vol. 179, Springer, New York, NY, 1998.

Course outline: Topics to be covered include: A review of Banach space theory – bounded linear functionals and the Hahn-Banach Theorem, and bounded linear operators between Banach spaces, the Open Mapping Theorem and Closed Graph Theorem, the Uniform Boundedness Principle; locally convex topological vector spaces, continuous linear functionals on topological vector spaces, subspaces, extension of linear functionals and the the generalized Hahn-Banach Theorem, convexity and the Krein-Milman theorem. Other topics will be covered as time permits.

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

Homework: 50% of your final grade will be come from your performance on homework, which will be assigned every two 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.

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!**

CONTINUED ON NEXT PAGE ...

Final Project: 40% of your final grade will be come from your performance on a project on a specialized topic in functional analysis to be chosen in consultation with the instructor. The project will have both oral and written components: you must give a 25-minute oral presentation on all or some of the material contained in a short paper you have written. The topic of your project can be related to your thesis topic if you wish, or it can be on something else. The presentations of these projects will be given during the last two weeks of classes. **Please keep our final exam period, Tuesday, December 19, 2023, 4:30 p.m. to 7 p.m., free, for potential project presentations.**

Other Important Dates:

- **September 13, 2023 (Wed.):** Last day to drop a course without Tuition/Fee charges and without a “W” appearing on your transcript.
- **November 3, 2023 (Fri.):** 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.
- **December 14, 2023 (Thursday):** Last day of classes.

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/> .

- **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, please let me know immediately if you have a religious observance that conflicts with an exam.

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

- **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.

CONTINUED ON NEXT PAGE ...

- **Requirements for Infectious Diseases, continued:**

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.

- **Accommodations for Disabilities, Temporary Medical Conditions, and Medical Isolation:**

Disability Services (website: <https://www.colorado.edu/disabilityservices/>) determines accommodations based on documented disabilities in the academic environment. 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. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance.

If you have a temporary medical condition or required medical isolation for which you require accommodation, see Temporary Medical Conditions on the Disability Services website at <https://www.colorado.edu/disabilityservices/students/temporary-medical-conditions>. Also let me know as soon as possible.

- **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.

- **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> .

CONTINUED ON NEXT PAGE ...

- **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.

Visit the Office of Institutional Equity and Compliance (OIEC) website <https://www.colorado.edu/oiec/> for more information about university policies, reporting options, and support resources. If you believe you may have been subjected to misconduct, email OIEC (cureport@colorado.edu) or call 303-492-2127.

Faculty and graduate instructors are required to inform OIEC when they learn of any issues related to these policies regardless of when or where they occurred. This ensures that individuals impacted receive information about their rights, support resources, and resolution options. Visit the “Don’t Ignore It” website at <https://www.colorado.edu/dontignoreit/> to learn more about reporting and support options.