

MATH 7338 SYLLABUS

FALL 2023

Course Number: Math 7338 A

Course Name: Functional Analysis

Lecture Time: TuTh 5:00-6:15 p.m.

Lecture Room: Skiles 308

Instructor: Dr. Christopher Heil

Email Address: heil@math.gatech.edu

Office Hours: Tu 4:30-5:00pm, Th 4:00-5:00pm, Skiles 218D.

Course Web Page: Canvas.

Prerequisites: Math 6337 *and* Math 6338.

Lecture Notes: Will be posted to Canvas.

Related Texts. These are copyrighted materials. Please be respectful of the author's intellectual property and do not re-post or distribute the Ebooks without permission.

- C. Heil, *A Basis Theory Primer*.

The Ebook for the text is available for free. You should be logged onto a Georgia Tech computer or have the Georgia Tech VPN activated. Then go to SpringerLink and download the text:

<https://link.springer.com/book/10.1007%2F978-0-8176-4687-5>

Additional material, including an Errata List, is available at

<http://people.math.gatech.edu/~heil/primer>

- C. Heil, *Metrics, Norms, Inner Products, and Operator Theory*.

Download at:

<https://link.springer.com/book/10.1007%2F978-3-319-65322-8>

Additional material, including an Errata List, is available at

<https://heil.math.gatech.edu/metricnote>

- C. Heil, *Introduction to Real Analysis*.

Download at:

<https://link.springer.com/book/10.1007/978-3-030-26903-6>

Additional material, including an Errata List, is available at

<https://heil.math.gatech.edu/real/>

Topics.

- Norms on finite-dimensional spaces.
- The dual of L^p .
- Proof of the Hahn–Banach Theorem.
- Compact operators and the Spectral Theorem.
- Radon measures and the dual of C_0 .
- Topological Vector Spaces and the weak and weak* topologies.
- Distributions.

Grading. We will have 5 homework assignments and one take-home final exam. Homeworks will be scored as follows.

5 Homeworks	25 points each
<u>Final Exam (take home)</u>	<u>50 points</u>
TOTAL	150 points

Letter grades will be based on your accumulated points at the end of the semester, according to standard 90%, 80%, 70%, 60% cutoffs (although I may adjust the cutoffs downward at the end of the semester, depending on class distribution):

135–150	A
120–134	B
105–119	C
90–104	D
0–89	F

At the end of the course, I'll evaluate the class distribution and decide if a curve is needed. I'll only curve *down* from the above cutoffs, not up.

Homework. All assessments will be electronic. Homework assignments will be posted on Canvas, and papers will be submitted electronically through Canvas. A subset of the problems on each assignment will be selected for grading. Late homeworks will not be accepted without advance permission.

Homeworks must be written in clear, complete sentences. You will not receive credit if the grader does not understand your writing.

I encourage you to type your homeworks using TeX or another mathematical typesetting system. I will provide sample TeX files that you can use as templates. Handwritten homeworks are acceptable, but be sure to write only on the *front side* of the page, otherwise bleed-through will be a problem. Use a good scanner to create a pdf file that you can submit through Canvas. Don't try to take pictures of the paper with a phone, it's just not readable.

You are allowed (and encouraged) to work together with other students on the homework, as long as you each *independently* write up your own solutions. You are also allowed (and encouraged) to ask me questions, although you should try to think about the problems before asking.

Piazza. Piazza is enabled for for class discussion. You can post questions to me or to the class here. Our class signup link is at: <https://piazza.com/gatech/fall12023/math7338a>

Academic Integrity. All students are expected to comply with the Georgia Tech Honor Code. Any evidence of cheating or other violations of the Georgia Tech Honor Code will be submitted directly to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. The institute honor code is available at <http://www.honor.gatech.edu>

Accommodations for Students with Disabilities. If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/> as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Covid.

- Lectures will normally be delivered in person using the whiteboard, and will not be recorded.
- Please attempt to maintain social distancing in the classroom.
- *If you get sick.* If you are sick, please respect the other students' health and do not attend class. The lectures will closely follow the lecture notes, so if you miss a class you should be able to keep up just by reading the lecture notes. Also check with other students in class to see if you can get a copy of their notes. Feel free to email me if you're not sure what sections of the lecture notes are being covered in class. All assignments are take-home, including the final exam.
- *If I get sick.* If I get sick, I will post an announcement on Canvas. If I am able to, I will give the lecture virtually over Zoom via Canvas at our usual classtime. If I cannot do that, I will try to record a lecture later and post it to Canvas. In any case, I will try to notify you as soon as possible via Canvas.
- If you have not done so, I encourage you to get vaccinated now. We know the vaccines are effective protection against Covid-19, and the best way to protect yourself and others. If you are unvaccinated, you are at risk of contracting Covid-19 and infecting others, with potentially severe consequences for you or someone else. Please seek medical advice from your healthcare provider or a member of our Stamps Health Services team led by Dr. Ben Holton, if you have doubts or concerns about getting vaccinated.