

Syllabus

Course Information

Course Number: MATH 608

Course Title: Real Variables II

Section: 600

Time: MWF 9:10--10:00

Location: BLOC 123

Credit Hours: 3

Course website: drbaskin.github.io/teaching/608/

Instructor Details

Instructor: Dean Baskin

Office: BLOC 614B

E-Mail: dbaskin@tamu.edu

Office Hours: Monday 1:30-2:30 and Friday 10-11.

Course Description

Banach spaces, theorems of Hahn-Banach and Banach-Steinhaus, the closed graph and open mapping theorems, Hilbert spaces, topological vector spaces and weak topologies.

Course Prerequisites

The prerequisite for this course is MATH 607, which covers abstract Lebesgue measure and integration.

Course Learning Outcomes

This course, together with Math 607, covers the fundamental theorems and examples of graduate Real Analysis: analysis on topological spaces, basic results from Functional Analysis, and the study of L^p spaces. These are the topics whose knowledge is tested on the Real Analysis qualifying exam. The course also provides the background for further study and research in various fields of Mathematical Analysis, including Functional and Harmonic Analysis, Banach spaces, Operator Algebras and Operator Theory, Probability theory, and PDEs.

Textbook and/or Resource Materials

Real Analysis, Modern Techniques and Their Applications by Folland, 2nd ed., Wiley, ISBN 978-0-471-31716-6.

Grading Policy

The course grading will be based on the results of two midterm exams, a final exam, and weekly homework and take-home quizzes.

Grade components

Highest midterm exam	25%
Other midterm exam	15%
Final exam	30%
Homework	25%
Take-home quizzes	5%
Total	100%

A total score of 90% or more guarantees an A, a score of 80% or more a B, 70% or more a C, 60% or more a D. More practically, an A grade should signify that you are well-placed to pass the qualifying exam.

Assessment timeline: (dates subject to modification)

Midterm exam 1: February 19 (Wednesday), in class.

Midterm exam 2: March 26 (Wednesday), in class.

Final exam: May 2 (Friday), 8-10am.

Homework: Due weekly on Wednesdays.

Homework

The homework has two parts: standard homework and take-home quizzes.

The standard homework consists of designated exercises to be graded, and additional practice problems not to be turned in. The practice problems are an invaluable resource to help you keep up with the class and prepare for exams, even if they are ungraded.

Homework will be collected on Fridays. You are welcome (indeed, encouraged) to work together, but each student must submit their own homework solutions, **written in their own words**.

Straight copying of homework is **not allowed**. No late homework will be accepted, but the two lowest homework scores will be dropped.

Write homework solutions in clear handwriting (or type it, if you prefer). Always label your assignment with your name and staple all pages together.

The take-home quizzes are assigned with the weekly homework but should be turned in separately. They will typically contain the more challenging and/or interesting problems. The two lowest scores will be dropped.

Late Work Policy

Late work will not be accepted and make-up work will not be offered in cases of unexcused absence.

Make-up exams will be allowed only due to excused absences and the timeline must be discussed with the instructor following Student Rule 7. If you foresee the need to be absent during an exam, you must notify the instructor in advance.

Course Schedule

Course topics

TOPICS	TIME	READING
Point set topology. Analysis on topological spaces.		

Urysohn's lemma and Tietze extension theorem. Convergence and nets. Compactness. Tychonoff's theorem. Arzela--Ascoli theorem. Stone--Weierstrass theorem.	(3 weeks)	Chapter 4
Elements of functional analysis. Banach spaces. Bounded linear operators and functionals. Baire category theorem. Hahn--Banach theorem. Open mapping theorem. Closed graph theorem. Uniform boundedness principle. Topological vector spaces and weak topologies. Alaoglu's theorem. Hilbert spaces.	(5 weeks)	Chapter 5
L^p spaces. Hölder and Minkowski inequalities. The dual of L^p . Integral operators. Convolution.	(3 weeks)	Chapters 6, 8.2
Measures as functionals. Radon measures. Riesz representation theorem for compact and locally compact spaces. Regularity properties.	(2 weeks)	Chapter 7

Keys to success

Attend class! Solve all the homework problems well before the exams. Spend more than 7 hours per week, spread out over multiple days working on the problems. Getting stuck and unstuck is important -- don't rush to the internet for homework solutions. Form study groups to discuss the course material and homework problems. Read ahead in the text.

University Policies

This section outlines the university level policies. The TAMU Faculty Senate established the wording of these policies.

Attendance Policy

The university views class attendance and participation as an individual student responsibility.

Students are expected to attend class and to complete all assignments.

Please refer to **Student Rule 7** (<https://student-rules.tamu.edu/rule07/>) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to **Student Rule 7** (<https://student-rules.tamu.edu/rule07/>) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” (**Student Rule 7, Section 7.4.1** (<https://student-rules.tamu.edu/rule07/>)).

“The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” (**Student Rule 7, Section 7.4.2** (<https://student-rules.tamu.edu/rule07/>)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (**See Student Rule 24** (<https://student-rules.tamu.edu/rule24/>)).

Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” (**Section 20.1.2.3, Student Rule 20** (https://aggiehonor.tamu.edu/Rules-and-Procedures/Rules/Honor-System-Rules))).

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You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu (<https://aggiehonor.tamu.edu/>).

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources office on your campus (resources listed below). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Texas A&M at College Station

Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit <https://disability.tamu.edu/> (<https://disability.tamu.edu/>).

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](https://rules-saps.tamu.edu/PDFs/08.01.01.M1.pdf) (<https://rules-saps.tamu.edu/PDFs/08.01.01.M1.pdf>)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.


Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

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Students wishing to discuss concerns related to mental and/or physical health in a confidential setting are encouraged to make an appointment with **University Health Services** (<https://uhs.tamu.edu/appointments/index.html>) or download the **TELUS Health Student Support app** (<https://uhs.tamu.edu/mental-health/student-support.html>) for 24/7 access to professional counseling in multiple languages. Walk-in services for urgent, non-emergency needs are available during normal business hours at University Health Services locations; call 979.458.4584 for details.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's **Title IX webpage** (<https://titleix.tamu.edu/>).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors influencing a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care practices by utilizing the resources and services available through **University Health Services** (<https://uhs.tamu.edu/>). The **TELUS Health Student Support** (<https://uhs.tamu.edu/mental-health/student-support.html>) app provides access to professional counseling in multiple languages anytime, anywhere by phone or chat, and the 988 Suicide & Crisis Lifeline offers 24-hour emergency support at 988 or **988lifeline.org**  (<http://988lifeline.org/>).

Texas A&M College Station

Students needing a listening ear can contact University Health Services (979.458.4584). 24-hour emergency help is also available through the 988 Suicide & Crisis Lifeline (988) or at

988lifeline.org  (<http://988lifeline.org/>).

Click **here** (<https://facultysenate.tamu.edu/important-faculty-updates/minimum-syllabus-requirements>) for more information on Texas A&M University's syllabus requirements.

