

MATH 409 SYLLABUS

Fun with epsilon

Welcome to MAT 409, an awesome analysis adventure awaits you! This is the survival manual for this course, where you can find all the administrative info you need to know, such as office hours, grading, and other goodies. Feel free to e-mail me if you have any other questions.

Disclaimer: Any item on this syllabus is subject to change. Any in-class or online announcement, verbal or written, is considered official addendum to this syllabus.

1. AT A GLANCE

Course Name	MATH 409 – Advanced Calculus I
Term	Fall 2021
Class times and location	Section 502: TuTh 12:45 – 2:00 pm in BLOC 104
Instructor Name	Peyam (π -m) Tabrizian
E-mail	drpeyam@tamu.edu or drpeyam@math.tamu.edu
	Please check your TAMU email account regularly because this is where class emails will be sent.
Office	353 Blocker
Office Hours	W 3:00 – 4:30 pm Th 2:15 – 3:45 pm + by appointment
	Office Hours will be through zoom, but you are allowed to request in-person office hours by appointment
Zoom Link for OH	https://tamu.zoom.us/my/drpeyam

2. LOGISTICS

Course Description: (Credit 3) The official description includes: Axioms of the real number system; point set theory of \mathbb{R}^1 ; compactness, completeness and connectedness; continuity and uniform continuity; sequences, series; theory of Riemann integration.

Prerequisites: Math 300. This is a very proof-heavy course and I expect you to be familiar with proof techniques like induction or contradiction.

Calculator Policy: Calculators are **NOT** allowed in the course; you won't really need to use them, you'll do everything with the power of your mind 😊

Learning Outcomes: In this course, we're re-learning all the concepts of calculus, but from a rigorous point of view, hence the title *advanced* calculus. By the end of the course, you should be able to apply precise mathematical reasoning in reading, understanding, and writing proofs of theorems in analysis. We will cover the following chapters of the textbook:

- Introduction (Chapter 1)
- Sequences (Chapter 2)
- Continuity (Chapter 3)
- Differentiation (Chapter 5)
- The Riemann Integral (Chapter 6)

Sequences and series of functions (Chapter 4) will be covered in Math 410 (Advanced Calculus II)

What this course is really about: I highly doubt that you'll forget the techniques you'll learn in this course because they are essential to human survival. That said, as Steve Krantz puts it in his book *How to teach Mathematics*, there is another goal of teaching this course. Namely, real purpose of this course is to teach you about mathematical discourse and critical thought. Just like in rhetoric, philosophy or politics, mathematics has its own language and way of thinking. How do mathematicians deal with an unknown problem? What methods do they use? What do they do when a given method doesn't work? Getting acquainted with all those different types of discourses is what your college education is really about.

Textbook:

- **Required:** *Elementary Analysis: The Theory of Calculus (2nd edition)* by Kenneth A. Ross, Springer, ISBN 978-1461462705. This is the main textbook of the course, and I am expecting you to thoroughly read it.

Note: The electronic version of the textbook is **FREELY** available through the TAMU library on SpringerLink

- **Recommended:** *Real Mathematical Analysis* by Charles Pugh, 2nd edition, Springer, ISBN 978-3-319-33042-6. This is the book I used when I learned analysis, and I owe much of my analysis knowledge from that book. Even though the material is more difficult than Ross, it is fun to read and has very interesting problems and pictures.
- **Recommended:** *Principles of Mathematical Analysis* by Walter Rudin, 3rd edition, McGraw Hill, ISBN 978-0-07-054235-8. This is the gold standard of analysis and is the analysis book everyone's talking about. I personally prefer Pugh's book, but Rudin a great reference book for after the course is over.
- **Recommended:** *Advanced Calculus: A Course in Mathematical Analysis* by Patrick Fitzpatrick, Brooks Cole, ISBN 978-0-53-492612-0. I like this one as well, it's kind of like a happy medium between Ross and Pugh, especially if you find the latter too hard to read.

Note: If you have any desire to go to math grad school, I highly recommend looking at the Pugh and Rudin textbooks above, since they are a bit harder than the Ross book.

Online resources you can use:

- [Course website](#): (subject to change) This is the main course website, where you can find the lecture notes, YouTube videos, and study guides/practice exams.
- [Canvas](#): Here is where I'll post announcements and you can check your grades. You will also upload your homework assignments there

- [Campuswire](#): A forum-like tool like Canvas Discussions or Piazza, but cooler, where you can post questions and either your classmates or I can answer them.
- [YouTube Channel](#): My YouTube channel, where you'll find useful videos related to this course.
- [TikTok channel](#): I also have a TikTok channel with fun math-related videos, although I haven't posted on there in a while

3. GRADING (the part you've all been waiting for)

The course grading will be based on the tables below. Due to FERPA privacy issues, I cannot discuss grades over email or phone. If you have a question about your grade, please come see me through Zoom.

Grade Breakdown

Activity	Date	Percent
Homework	Weekly (except exam weeks)	25%
Midterm 1	Thursday, September 30	20%
Midterm 2	Thursday, November 4	20%
Final Exam	Friday, December 15	35%
TOTAL		100%

Note: There is also an extra credit opportunity, see below

- **Grading Scale:**

Range	Grade
[90,100]	A
[80,90)	B
[70,80)	C
[60,70)	D
[0,60)	F

Note: The scales below are a guarantee. For example, if you get 85, you are guaranteed at least a B. It is certainly possible that I round something like a 79.8 to a B, but this is up to my discretion

Exams: There will be 2 midterms and a final exam in this class. Bring your Texas A&M student ID and a pencil to all exams. The *tentative* dates for the exams are as follows. Exam dates will be announced the previous week. The midterms will be held in the usual lecture room at the usual lecture time, so from 12:45 – 2 pm in 104 BLOC

Midterm 1: Thursday, September 30
Midterm 2: Thursday, November 4
Final Exam: Friday, December 15, 8 – 10 am

Note: Your final exam grade can replace your lowest midterm grade (if that is in your favor), so technically, the final exam could count up to 55% of your grade.

The exams are closed book, closed notes, and no calculators are allowed. They are cumulative

Graded Homework: Homework is due every Friday at 11:55 pm, except for exam weeks. You will upload your homework assignments on Canvas. There will be lots of homework, but remember that it's also worth 25 percent of your grade. It's very important to take homework seriously, because this is the key way to absorb the concepts in the course and to do well on the exams. On every homework, 2 or 3 problems will be thoroughly graded, and the rest will be graded on completeness, so make sure to attempt all the problems. **NO** late homework is accepted, except if you have a university-approved excuse. Your lowest **3** homework assignments are dropped.

Homework/Exam etiquette: Please write your answers in complete sentences. You are **NOT** allowed to use the symbol \therefore : write 'therefore' instead. If your answer only involves math symbols and no English sentences at all, it won't get full credit

Extra Credit: You have an opportunity to earn 1% Extra Credit in this course. In order to do so, you have to be one of the top 10 posters (out of the 25-35 students in this class) on the [Campuswire](#) forum, so make sure to create posts and respond to your peer's posts regularly

WARNING: This is not an easy course, and you shouldn't take this too lightly. Do NOT take this course if you need a 'filler' course. I will make you work very hard in this course, and there will be lots of homework. On the other hand, there will be many times where you'll feel overwhelmed and lost. Your feelings are completely **NORMAL**; I felt the exact same way when I took that class. Analysis is a workout; you can't build those math muscles without making them work. Please don't drop the ball; at the end, your hard work will be rewarded with infinite mathematical knowledge 😊

4. MISCELLANEOUS INFORMATION

Math Learning Center Support: The Math Learning Center (MLC) offers various forms of support, even for Math 409 (!) both online and face-to-face, including drop-in [Help Sessions](#), Tutoring by Appointment, Week-in-Review sessions and other activities. Additionally, the MLC hosts an archive of Supplemental Material, such as Python tutorial videos and recorded review sessions.

Grade Appeals: If you believe an error has been made in grading, you have until the next class period after the exam is handed back to let me know. Otherwise, you must accept the grade you received.

Classroom Respect: Please refrain from using electronic devices during class, as doing so distracts not only you, but also those around you.

Copyright: All printed handouts and web-materials are protected by US Copyright Laws. No multiple copies can be made without written permission by the instructor. [I explicitly allow you to distribute my notes, videos, and exams.](#)

Additional Helpful Links:

- Math Learning Center: <https://mlc.tamu.edu/>
- Academic Calendar: <http://registrar.tamu.edu/General/Calendar.aspx>
- Final Exam Schedule: <http://registrar.tamu.edu/General/finalschedule.aspx>

Note: As with any math class, it is *very* important that you keep up with the suggested homework and that you do not fall behind. [Please do not hesitate to ask questions](#)

in class, to come to my office hours, or to send me an e-mail. I am here to help you enjoy and succeed in this course

Campus Safety Measures: To help protect Aggieland and stop the spread of COVID-19, Texas A&M University urges students to be vaccinated and to wear masks in classrooms and all other academic facilities on campus, including labs. Doing so exemplifies the Aggie Core Values of respect, leadership, integrity, and selfless service by putting community concerns above individual preferences. COVID-19 vaccines and masking — regardless of vaccination status — have been shown to be safe and effective at reducing spread to others, infection, hospitalization, and death.

Statement on Mental Health and Wellness: Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. Emergency 24-hour help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Attendance Policy: Students experiencing personal injury or illness that is too severe for the student to attend class (including students isolating or quarantining due to COVID-19 protocols) qualify for an excused absence (See [Student Rule 7, Section 7.2.2.](#)) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in Student Rule 7.

Makeup exams will only be allowed provided the above guidelines are met. You will be allowed to make up a missed exam during one of the scheduled makeup times provided by the Math Department. According to Student Rule 7, you are expected to attend the scheduled makeup unless you have a university-approved excuse for missing the makeup time as well. If there are multiple makeup exam times, you must attend the *earliest* makeup time for which you do not have a university-approved excuse. The list of makeup times will be available here: [Make up exams](#). **You have no later than 48 hours after the exam to request a make-up exam.**

Academic Integrity: Cheating and other forms of academic dishonesty **will not** be tolerated. Please do not compromise your integrity for the sake of temporary benefits.

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

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: <http://aggiehonor.tamu.edu>

Americans with Disabilities Act (ADA): The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit the following link: <https://disability.tamu.edu>.

Title IX and Statement on Limits to Confidentiality: Texas A&M University and the College of Science are committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws provide guidance for achieving such an environment. Although class materials are generally considered confidential pursuant to student record policies and laws, University employees - including instructors - cannot maintain confidentiality when it conflicts with their responsibility to report certain issues that jeopardize the health and safety of our community. As the instructor, I must report (per Texas A&M System Regulation 08.01.01) the following information to other University offices if you share it with me, even if you do not want the disclosed information to be shared:

- Allegations of sexual assault, sexual discrimination, or sexual harassment when they involve TAMU students, faculty, or staff, or third parties visiting campus.

These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In many cases, it will be your decision whether or not you wish to speak with that individual. If you would like to talk about these events in a more confidential setting, you are encouraged to make an appointment with the Student Counseling Service (<https://scs.tamu.edu/>).

Students and faculty can report non-emergency behavior that causes them to be concerned at <http://tellsomebody.tamu.edu>.

5. TENTATIVE SCHEDULE

Note: As the name indicates, this schedule is *extremely tentative*, and subject to modification. For a more accurate schedule, check out the one on the course website

#		Date	Section	Lecture Title
1	Tu	Aug 31	1, 2	Natural Numbers, Rational Numbers (I)
2	Th	Sep 2	2, 3	Rational Numbers (II), Real Numbers
	F	Sep 3		HW 1 due
3	Tu	Sep 7	4	Completeness Axiom (I)
4	Th	Sep 9	4, 5, 7	Completeness (II), Infinity, Limits of sequences (I)
	F	Sep 10		HW 2 due
5	Tu	Sep 14	7, 8	Limits (II), Discussion about Proofs
6	Th	Sep 16	9	Limit Theorems for Sequences
	F	Sep 17		HW 3 due
7	Tu	Sep 21	10	Monotone Sequences and Cauchy Sequences
8	Th	Sep 23	11	Subsequences (I)
	F	Sep 24		HW 4 due
9	Tu	Sep 28	11, 12	Subsequences (II), Limsup
10	Th	Sep 30		Midterm 1 (covers 1-10)
	F	Oct 1		No HW
11	Tu	Oct 5	13	Metric Spaces (I)
12	Th	Oct 7	13	Metric Spaces (II)
	F	Oct 8		HW 5 due
13	Tu	Oct 12	14	Series
14	Th	Oct 14	15	Series Tests
	F	Oct 15		HW 6 due
15	Tu	Oct 19	17	Continuous functions (I)
16	Th	Oct 21	17, 18	Continuous functions (II), Properties of Continuity (I)

	F	Oct 22		HW 7 due
17	Tu	Oct 26	18, 19	Properties of continuity (II), Uniform Continuity (I)
18	Th	Oct 28	19	Uniform Continuity (II)
	F	Oct 29		HW 8 due
19	Tu	Nov 2	20	Limits of functions (I)
20	Th	Nov 4		Midterm 2 (covers 11-19)
	F	Nov 5		No HW due
21	Tu	Nov 9	20, 28	Limits of functions (II), Derivatives
22	Th	Nov 11	29	Mean Value Theorem (I)
	F	Nov 12		HW 9 due
23	Tu	Nov 16	29, 30	Mean Value Theorem (II), L'Hôpital's Rule
24	Th	Nov 18	32	Riemann Integral (I)
	F	Nov 19		HW 10 due
25	Tu	Nov 23	32	Riemann Integral (II), Properties of the Integral (I)
	Th	Nov 25		No class (thanksgiving)
	F	Nov 26		No HW
26	Tu	Nov 30	33	Properties of the Integral (II)
27	Th	Dec 2	34	The Fundamental Theorem of Calculus
	F	Dec 3		HW 11 due
28	Tu	Dec 7		Catch-up / Review
	F	Dec 10		No HW / Quiz
	W	Dec 15		Final Exam from 8-10 am, covers 1 – 34

Finally, sit back, relax, and enjoy the show 😊 This course will be extremely challenging, but I promise you that all your hard work will be worth it. I hope that you will fall in love with analysis as much as I did!