

The University of Texas at Austin Department of Mathematics

College of Natural Sciences

MATH MAJOR NEWSLETTER

Fall 2023

ACADEMIC CALENDAR

OCT 30 – NOV 10

Spring 2024 Registration

Nov 20 – 25

Fall break / Thanksgiving; no classes held

Dec 4

Last class day

Dec 7 – 9 & 11

Final exams

Dec 11 – 15

Spring 2024 registration period for continuing and readmitted students

Jan 16

First day of classes

UPCOMING SPRING 2024 REGISTRATION

Please do read your university emails and SANs. Follow the preregistration steps found in the SANs and/or emails from your advisor. **Step 1:** Run a degree audit for the degree you plan to pursue (select the correct Catalog).

Step 2: List the courses you plan to take on the spring Advising Worksheet(s) (use course numbers, not unique numbers); include questions or explanations under "Student Comments."

Step 3: Read your advisor's response on the Worksheet as they may make recommendations.

If you wish to make an appointment with Olivia Biehle (olivia.biehle@austin.utexas.edu), Jennifer McHam (jennifer.mcham@austin.utexas.edu), or Nathaniel Sulapas (nathaniel.sulapas@austin.utexas.edu) please email them directly. If you wish to meet with a faculty advisor email the Math, Physics, and Astronomy advising office at mpaadv@austin.utexas.edu to schedule an advising appointment via Zoom or phone.

Learn more about how to register for classes here.

Spring 2024 Course Schedule

Mathematics Courses & Prerequisites

Highlighted Mathematics Courses Offered Spring 2024

M 375T Complex Analysis & Application TTh 11 am-12:30 pm (53963) Dr. Beckner. The study of complex analysis opens a door to a marvelous landscape with many beau8ful and elegant ideas and theorems. This class will be a rigorous development of Complex Analysis star8ng from scratch. First will be Cauchy's theorem, and then move to applica8ons using conformal mapping, contour integrals, Fourier transform, and zeta functions. Stein's Princeton Lectures on Complex Analysis will be used as a reference text. Prerequisite: M 361K or M 365C with a grade of at least C.

M 375T Actuarial Modeling/Simulation MWF 9 am-10 am (53964) Prof. Cepparo. A first course in Applied Bayesian Analysis and Basic Neural Networks for actuarial science and mathematics majors. An introduction to a Bayesian Modeling approach that explores the underlying mathematics and fundamental Markov chain Monte Carlo simulation in detail. All discussions and applications are data driven with interesting real case studies. Predictive modelling with posterior distributions and insightful graphics. Model assessments with ethical implications interwoven from simple regression to hierarchical linear and nonlinear models. We will employ R to aid in our computations, simulations, and statistical analyses. Prerequisite: M 358K or M 378K with a grade of at least C.

M 375T Dynamical Systems TTh 12:30-2 pm (53965) Dr. Bowen. A dynamical system consists of a geometric or topological space with a self-map representing the passage of time. The theory focuses on long-term asymptotic behavior. There is a wide range of applications (weather forecasting, internet search, patterns in prime numbers, etc.). This course will serve as an introduction to the main mathematical ideas including recurrence/mixing, entropy, low-dimensional dynamics, hyperbolic or chaotic dynamics, ergodic theory, and so on.

M 375T History of Mathematics MW 1:30-3 pm (53970) Dr. Dunlop. (Same as: CTI 371M) This course presents mathematics as a historical phenomenon, considering when, where, how, and even why mathematical ideas arose, and how they were transmitted. We will study the development of arithmetic and geometry: in ancient Egypt, Mesopotamia, Greece, and India; through the medieval period; and in early modern Europe. We will consider the emergence of algebra and analysis, and end with case studies from the 20th century (Ramanujan and Cambridge mathematics, and the mathematicians of the American Space Program). Material should be accessible to students with a solid precalculus background. To satisfy Independent Inquiry and Writing Flag requirements, students will complete a substantial (12-15 page) paper on a topic of their choice and will exchange preliminary drafts for comments.

M 375T Introductory Game Theory MW 2:30-4 pm. (53975) Dr. Thomas. (Same as: ECO 354K, CS 378) This course is an introduction to game theory, i.e., decision-making in a strategic context. Its objective is to provide a thorough understanding of the core concepts and analytical methods of game theory at an undergraduate level. At the end of this course, a student should be familiar with fundamental concepts and models of non-cooperative game theory, be able to analyze these models mathematically at a level of difficulty appropriate for an economics undergraduate and understand how to apply these models to shed light on real-world phenomena.

SPRING 2024 MATHEMATICS COURSES CARRYING UNIVERSITY FLAGS

Writing Flag

53515	Μ	325K	Discrete Mathematics	Martines, T
53530	Μ	325K	Discrete Mathematics	Austin, J
53675	Μ	333L	Structure Of Modern Geometry	Osborn, J
53680	Μ	333L	Structure Of Modern Geometry	Osborn, J
53690	Μ	339D	Intro Fin Math for Actuaries	Cudina, M
53970	Μ	375T	History Of Mathematics	Dunlop, K

Ethics Flag

53910 M 371E Learn Assistant Experience in Math

Independent Inquiry Flag

53530	Μ	325K	Discrete Mathematics	Austin, J
53650	Μ	328K	Introduction To Number Theory	Miner, Z
53655	Μ	328K	Introduction To Number Theory	Miner, Z
53670	Μ	329F	Theory Of Interest	Austin, J
53685	Μ	339C	Actuarial Case Studies	Walch, A
53955	Μ	375D	Discovery: An Introduction to Advanced Study in Mathematics	
53970	Μ	375T	History Of Mathematics	Dunlop, K

Additionally, many mathematics courses carry the Quantitative Reasoning flag.

SPRING 2024 MATHEMATICS COURSES OFFERED IN INQUIRY BASED LEARNING FORMAT

53675	Μ	333L	Structure of Modern Geometry	Osborn, J
53680	М	333L	Structure of Modern Geometry	Osborn, J
53710	М	339U	Actuarial Contingent Payments I	Harper, S
53715	Μ	339V	Actuarial Contingent Payments II	Harper, S
53780	М	343L	Applied Number Theory	Sadun, L
53780 53865	M M	343L 362K	Applied Number Theory Probability I	Sadun, L Maxwell, M
53780 53865 53895	M M M	343L 362K 367K	Applied Number Theory Probability I Topology I	Sadun, L Maxwell, M Payne, S

MATHEMATICS, PHYSICS, & ASTRONOMY ADVISING WEBSITE

You will find information about the following registration matters on the <u>Mathematics, Physics, & Astronomy Advising</u> <u>website</u>: Registration Tips; <u>Applying for Honors Mathematics Courses</u> (M 427J Honors or M 341 Honors); and <u>Requesting to</u> <u>take M 371E</u>, <u>Mathematics Conference Courses</u>, <u>Honors Tutorial Course</u>, <u>Graduate Mathematics Courses</u>, and more.

MATH MAJOR DEGREE OPTIONS

You will find the degree checklists for each of the mathematics major degree options <u>here</u>. In particular, I want to highlight in this newsletter the variety of pathways through earning the BS Mathematics degree. All students pursuing the Bachelor of Science in Mathematics (Option VII: Mathematics) degree must complete a lower-division calculus sequence, a minimum of 33 hours of upper-division coursework in mathematics, an introductory computer programming course, and a Math in Context course.

The Bachelor of Science in Mathematics allows each student to choose a concentration based on their own academic and career goals. While earning a BS Mathematics degree a student may choose to follow a pathway in pure mathematics, applied mathematics, statistics and probability, data science, scientific computation, actuarial science, or UTeach. The <u>BS</u> <u>Mathematics Pathways</u> provide guidance on relevant courses and certificate programs for these different fields and applications of mathematics. These pathways prepare graduates to either enter the workforce or to pursue graduate studies.

Q: How do I satisfy the Math in Context degree requirement?

A: Dr. Austin is willing to consider *any course in any college* on campus that is an upper division course and uses mathematics above calculus. Have you found an interesting course? Meet with Dr. Austin, share the syllabus, and she will decide if the course will satisfy your Math in Context degree requirement. The courses listed on the degree plan under the Math in Context degree requirement automatically count, but you may need Dr. Austin or Olivia Biehle to secure the seat in the non-mathematics courses for you. These automatic Math in Context courses include M 374M; PHY 329, 336K, 352K; CS 341, 342, 345, 346, 353, 367; CH 353, 354; and EE 411, 325, 360C, 362K.

NETWORKING



There are various organizations with which you might like to connect while you are a math major here at UT. There is a general <u>Mathematics</u> open Facebook group within UT Austin. The <u>UT Math Club</u> is an active group of undergraduate math majors who meet to discuss and share their wisdom as they navigate through being a UT math major, apply for and participate in summer research opportunities, and head towards graduate school. We have recently created a UT Mathematics LinkedIn group which we encourage all of you to join!

The purpose of <u>The UT chapter of Association for Women in Mathematics (AWM)</u> is to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences. The <u>UT Actuarial Science Club (ASC)</u> is open to students of all majors and academic backgrounds who have an interest in furthering their academic and professional careers. Whether you've never heard of an actuary before or you're already on your way to your ASA, the Actuarial Science Club has something for you! <u>UT Mathematics and Science Teachers of Tomorrow (MASTT)</u>

is a student-led organization whose activities help to promote the success of UTeach pre-service teachers in STEM fields (science, technology, engineering and mathematics) at the University of Texas at Austin. The <u>UT chapter of the Society of</u> <u>Industrial & Applied Mathematics (SIAM)</u> promotes promote interaction between members of the applied mathematics community at UT Austin, across departments, institutes, and professional marks. <u>Gamma Iota Sigma</u> is a recently established Risk Management, Insurance, and Actuarial Science fraternity.

Check out Dr. Austin's compilied resources on her *website* under Student Opps.

JOB PREPARATION

Take full advantage of <u>CNS Career Services</u> while you are a student. This is a great resource for our students! Seek out projectbased courses and internships while you are an undergraduate. Be sure to highlight these in your personal statement when applying for jobs. Explore CNS Career Services <u>Career Guide for Mathematics Majors</u>! You can be a mathematics major or a mathematics actuarial science major AND become certified to teach middle school and high school mathematics all in four years. If you are interested, please see the <u>UTeach Program in Natural Sciences</u> or email Professor <u>Pamela Elias</u>. If you have ever thought about becoming a certified teacher in the state of Texas, you owe it to yourself to try it out with a program that is nationally recognized for its success at training highly qualified math, science, computer science and engineering teachers.



MENTORING PROGRAMS

Each semester, Natural Sciences Council organizes and hosts the college's largest undergraduate networking event, <u>CNS Connections</u>, which facilitates communication between UT College of Natural Sciences (CNS) students and current industry professionals from the Austin area. The goal of the event is to provide CNS students with early exposure to a diverse variety of professions through partaking in face-toface conversations with current industry representatives.

This year, CNS Connections will take place on Wednesday, November 1, 2023, from 5:00pm to 8:00pm at the William C. Powers Student Activity Center, Jr. Ballroom (2.410). Come out to connect with company representatives and expand your professional network! The attire is business casual, and refreshments will be provided. Check the <u>CNS</u> <u>Connections</u> website for registration information.

The <u>Directed Reading Program</u> (DRP) pairs undergraduate students with graduate student or faculty mentors to undertake independent projects in mathematics. Any undergraduate student may apply for DRP and, if accepted, will be assigned an appropriate graduate mentor. The student and the mentor will agree on a project. It can be based on reading through a book or an article, but the project is not limited to such things.

The <u>SIAM Applied Mathematics Mentorship</u> program pairs undergraduate students whose interests lie in the applications of mathematics with experienced academics to mentor the undergraduate students as they discover their paths forward. If you can answer "Yes" to any of the following questions, then check back at the beginning of the semester to apply for the <u>SIAM</u> <u>Applied Mathematics Mentorship</u> program. Do you an applied mathematics idea or application you're interested in? Do you want to know which mathematics courses fit your interests the best? Do you want to know the best ways to improve your graduate school application profile? Do you want to discover opportunities for applied mathematicians in industry?

NOVEMBER 29 MATHEMATICS CAREER PANEL

We will hold a Mathematics Career Panel on Wednesday, November 29, 2:00-2:50 pm. Registration is required. Be on the lookout for this event in <u>Handshake</u> and via an email from Dr. Austin.

OUTREACH OPPORTUNITIES

With registration for the Spring 2024 semester coming soon, we want to take a moment to share about UTeach - Natural Sciences Program. UTeach - Natural Sciences is a widely recognized teacher preparation program that offers extensive in-theclassroom teaching experience, interdisciplinary skills, and current pedagogical strategies and practices taught to you by extremely successful and knowledgeable master teachers. By the end of the UTeach program, you will be fully certified to teach STEM at the middle or high school level in the state of Texas. This program can fulfill the certification requirement for students on a BSA degree plan. UTeach provides flexible entry points no matter how far along you are in your degree plan. The UTeach program is open to any student, in any college, and students do not have to change their major to join! Sign up for the first course in the program, UTS 101 when you register! We look forward to having you join our program! For more information, attend an information session; find details at <u>https://uteach.utexas.edu/</u>.

While you're planning your courses for Spring 2024, we invite you to sign up for the <u>UTeach Outreach</u> class! UTeach Outreach: CH 207K or CH 371K allows you to teach hands-on science lessons with a partner at local elementary and middle schools while receiving course credit at UT! This unique course is planned around your schedule and provides opportunities

to boost your resume with leadership roles in your area of interest and improve your communication and presentation skills while helping the community. You can receive two (CH 207K) or three (CH 371K) graded credit hours of science or elective credit, depending on your major and prerequisites. Check with your advisor for the type of credit you could receive. See course registration details and more information at <u>https://outreach.uteach.uteas.edu/undergraduates</u>.

Each fall Dr. Austin organizes a *Math Fun Day* for elementary-age children. This fall *Math Fun Day* will be Sunday, November 5, 2023. Each spring Dr. Austin organizes the mathematics department activities for <u>STEM Girl Day at UT</u>, which will be held on Saturday, February 24, 2024. Reach out to Dr. Austin if you are interested in these outreach opportunities.

2023-2024 UNDERGRADUATE MATHEMATICS CONFERENCES

Texas Undergraduate Mathematics Conference

Steven F. Austin State University

October 27-28, 2023

*The conference will pay for students' hotel room and food Friday night, Saturday morning, and Saturday afternoon (students that present and students that attend will be funded for the conference) there may be a small registration fee for students (\$5)



**This conference has two keynote speakers and all other research talks are undergraduate students. This is a great conference for a student to give their first research presentation.

Texas Section Meeting of the MAA

Texas State University March 22-24

* There is NO funding available from the conference, but this year it is close so our students can attend and present and not have to travel!

**There is the opportunity to present research for undergraduate students, graduate students, and faculty

Texas Undergraduate Groups & Dynamics Conference (2024 website not yet up)

University of Texas at Austin

April 2024 (dates TBA)

*The conference will pay for students' food Friday night, Saturday morning, and Saturday afternoon (students that present and students that attend will be funded for the conference) there may be a small registration fee for students (\$5-\$15) **This conference has two keynote speakers and all other research talks are undergraduate students. This is a

great conference for a student to give their first research presentation. And it is local so we would love to see all our undergrads that have done research present!!

Gulf States Math Conference

Steven F. Austin State University

Feb 2024 (dates TBA)

*Conference will pay for students hotel room Friday and Saturday nights, food Friday night, Saturday morning, Saturday afternoon, Saturday night, Sunday morning

**This is a mentoring conference for students interested in attending graduate school but need guidance. Attendees are asked to come in mentoring groups, one faculty member with 2-3 undergraduate students. Students can reach out to Dr. Theresa Martines (theresa.martines@austin.utexas.edu) if they are interested as she would have to nominate them to attend (there is no general call for registration, students must be invited by a faculty member attending).

***There is an undergraduate research poster session in which students can participate.

UNDERGRADUATE RESEARCH/TRAVEL GRANTS

- Travel support available! Undergraduate students can apply for partial support for travel, lodging, and meals for the 2024 JMM. More info: <u>http://ow.ly/mumi50KPIQt</u>
- Did you participate in the FRI and Inventors Program? If so, then you can request funds to support your conference participation via this <u>form</u>.
- To help students share their research, the <u>Office of Undergraduate Research offers awards</u> to cover travel expenses to conduct or present research or creative activity that has been accepted or submitted for presentation at an academic or professional conference.
- <u>SIAM Student Travel Awards</u> are given to help students gain the experience and exposure that comes from attending and presenting at SIAM conferences.

BE FEATURED IN UPCOMING NEWSLETTERS

Please contact <u>Dr. Austin</u> if you would like to be featured in an upcoming UT Math Major Newsletter! We would like to share your research or internship experiences or awards you receive.

SELF CARE

UT's October 21st <u>Mindfulness Summit</u>: We Belong Here is a conference style mindfulness experience with a keynote, different mindfulness-based guided activities, choose your own mindful adventures, and concluding with a community picnic with lunch provided. Join us for an inclusive mindfulness event. Experience a keynote speech from Chaka Mahone-

founder of DAWA Heals, diverse guided activities, choose your own mindful



The Mindfulness Summit: We Belong Here

adventures and a community picnic. Guided breakout sessions include yoga, dance, meditation, chosen family tree art project, mindful art making, singing bowls, and mindfulness in the museum. Or choose your own mindful adventure from a variety of options throughout the Blanton grounds! No prior experience is necessary – everyone is welcome! Whether you're new to mindfulness or have been practicing for a while, this event offers a welcoming environment for all. Presented by mindful UT, Healthyhorns Sleep, Gender and Sexuality Center, and Blanton Museum of Art.

RESOURCES



Email the <u>Math</u>, <u>Physics</u>, and <u>Astronomy advising</u> office at <u>mpaadv@austin.utexas.edu</u> if would like a list of math tutors available for hire. If you are enrolled in calculus, be sure to utilize the <u>Calculus Lab</u>. For many mathematics courses the <u>Sanger Learning Center</u> is a valuable resource. Moreover, did you know that the UT Counseling and Mental Health Center offers a wide variety of free workshops and events intended to provide valuable life skills? Check them out <u>here</u>.

Finances may already be a concern when you are a college student. Support services are available if you need them. These UT partners are here for you: <u>Texas Global at The University of Texas at Austin</u> (for International Students and Scholar Services), <u>Office of the Dean of Students at UT Austin</u> (for UT Outpost Food Delivery and for Student Emergency Services), and <u>Financial and Administrative Services, UT Austin</u>.

The Office of the <u>University Ombuds for Students</u> is here to listen to your concerns in a safe setting about life at the university and confidentially discuss interpersonal difficulties, university policies, university bureaucracy, and conflict resolution techniques.

CNS <u>CARE Counselors</u> Nic Dahlberg, 512-232-9247, Damaris Rodriquez, 512-471-7162, and Katie Griffin, 512-232-3685, are here to support you through various life events. Please don't hesitate to reach out to us if you need anything at all. We are located in WCH 2.224 and have office hours weekly.

<u>Longhorns Online</u> is a robust site that provides information about academics, advising, student support services and other important online contacts designed to help Longhorns successfully navigate their educational path during their time at UT Austin and beyond.

Delve into the resources from <u>CNS Career Services.</u> Follow the <u>Chamber of Commerce Austin job opportunities</u> website. Check out the Handshake blog on <u>Getting Hired Remotely</u>. Enhance your skills through <u>LinkedInLearning</u> offered through UT.



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REQUESTING LETTERS OF RECOMMENDATION

What to do well before requesting letters of recommendation

First, make meaningful connections with your mathematics faculty as you will need at least three faculty members in your field of study to write letters of recommendation for you during your senior year. To write strong letters on your behalf they need to know you, how you work with others, how you work independently, and your overall potential. Be an active participant in your mathematics courses, attend office hours, ask your professors about their research, get to know your professors, and allow them to get to know you. Second, you must check in with your academic advisor and/or faculty advisior at least once a semester to see that you are taking the best mathematics coures to prepare you for your desired career or graduate school program.

Third, network, network, network. Participate in your school's math club, actuarial science club, or future mathematics teachers club. Finally, I would add that volunteering for outreach opportunities is a great way to connect with the larger community, serve as a math ambassador, bring mathematics alive, and enhance your own communication skills. (Continue reading Dr. Austin's advice here.)

GRADUATE SCHOOL PREPARATION

Juniors, spend the summer before your senior year compiling the list of schools to which you will apply. In the fall, have fellow students, CNS Career Services, and/or Dr. Austin proofread your statement of purpose. By November be prepared to request letters of recommendation from at least three faculty members (at least two of which will probably be mathematics facutly). When you request letters of recommendation, provide your letter writers with your resume, statement of purpose, and a spreadsheet or chart listing all schools to which you are applying. (In this spreadsheet or chart include the name of the school, the particular program to which you are applying, due dates, and method of letter submission.)

Sophomores and Freshmen, check in with Dr. Austin once a semester or at least once a year to see that you are taking the best mathematics coures to prepare you for graduate school. Participate in our Directed Reading Program, UT Math Club, and UT AWM. Read my comments at the top of this page about making meaningful connections with your mathematics faculty.

Find more graduate school resources here.

"From a relatively young age I started to realize the interaction between mathematics and other areas of science and how they are interacting with each other. That makes you feel that what you are doing is beautiful and important."

Luis A. Caffarelli, 2023 Abel Prize Laureate