Introduction

Mathematics is the science dealing with data, measurement, and scientific observations; with inference, deduction and proof; and with the development of analytical models of biological, chemical, physical, and social systems.

The Department of Mathematics offers the Bachelor of Science (B.S.) and the Bachelor of Arts (B.A.) degrees. Students intending to pursue graduate studies in Mathematics or who intend to pursue scientific or engineering careers or careers in financial mathematics are encouraged to choose the B.S. option. Students may also choose a B.S. in environmental science with an option in environmental modeling. Students considering a major in mathematics should have a strong mathematics background and excellent analytical skills.

Mathematics majors find employment in many different areas: biomedical research, financial institutions, actuarial firms, government agencies, and teaching. In industry, mathematicians are often important members of multidisciplinary teams working on complex projects and are part of operations and logistics groups.

Department research and teaching interests include differential geometry, operator algebras and operator theory, nonlinear partial differential equations, partial differential equations, ordinary differential equations, dynamical systems, machine intelligence, scientific computation, bifurcation theory, symmetry, numerical analysis, complex analysis, computational fluid dynamics, and more.
**Faculty**

**Chairman:** Matthew Nicol

**Professors:**
Giles Auchmuty, Robert Azencott, David Blecher, Bernhard Bodmann, Sunčica Čanić, Garry Etgen, Siemion Fajtlowicz, Wenjiang Fu, Roland Glowinski, Jiwen He, Ronald Hoppe, Shanyu Ji, Gordon Johnson, Krešimir Josić, Klaus Kaiser, Edward Kao, Yuri Kuznetsov, Demetrio Labate, Jeff Morgan, Matthew Nicol, Matthew O’Malley, Maxim Olshanskii, Tsorng-Whay Pan, Manos Papadakis, Vern Paulsen, Min Ru, Ilya Timofeyev, Andrei Török

**Associate Professors:**
Yuliya Gorb, Gordon Heier, William Ott, Mikhail Perepelitsa, Charles Peters, Richard Sanders, Mark Tomforde, Charles Tucker, David Wagner, Philip Walker

**Assistant Professors:**
Vaughn Climenhaga, Mehrdad Kalantar, Zachary Kilpatrick, Daniel Onofrei, Annalisa Quaini, Jingmei Qiu

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**The Undergraduate Program**

The department offers two degree programs in mathematics, the Bachelor of Arts degree and the Bachelor of Science degree. The option in Mathematical Finance under the Bachelor of Science degree, and a B.S. in Mathematical Biology are also available. Math majors that are interested in teaching at the high school level are encouraged to become a part of the *teachHOUSTON* program. The requirements for a major in mathematics are described below.

At least 30 advanced semester hours in mathematics which must include: MATH 3325, 3330, 3331, 3333, one of (3334 or 3335 or 3364 or 3364), and 4389; as well as a minimum of 9 semester hours of 4000-level mathematics. Of the 9 hours at the 4000 level, one senior sequence (6hrs) is required. Students may choose from the following: MATH (4331 & 4332), (4335 & 4336), (4350 & 4351), (4364 & 4365), (4377 & 4378), (4335 & 4362), (4320 &4380) or (4309 & 4310).
Students who choose to major in mathematics with the **Option in Mathematical Finance** must complete the following requirements in addition to the special requirements for the Bachelor of Science degree:

**Requirements:**
At least 30 advanced semester hours in mathematics which must include: MATH 3325, 3331, 3333, 3338, 3339, 3340, 4320 and 4380, and 4389; as well as a minimum of 3 semester hours of 4000-level mathematics. Accounting requirements (6hrs.) include: ACCT 2331 and ACCT 2332. Economics requirements (6hrs.): ECON 3332, ECON 3334.

*Capstone requirements of the College of Natural Science and Mathematics may be fulfilled by: a minor (minor in Economics or Finance is encouraged), senior honors thesis, or senior research project.*

Students who choose to major in **Mathematical Biology** must complete the following requirements in addition to the special requirements for the Bachelor of Science degree:

**Requirements:**
Biology requirements (23hrs) include: BIOL 1361/1161, 1362/1162, 3301, 3311, 3306, 3324, and 4374. Biochemical and Biophysical sciences requirements include: BCHS 3304. Mathematics requirements (27hrs) include: MATH 1431, 1432, 2433, 2331, 3331, 3338, 3339, and a minimum of 3 semester hours of 4000-level mathematics. Interdisciplinary (6hrs) requirements include: BIOL/MATH 4309 and 4310. Chemistry requirements (13hrs) include: CHEM 1331, 1111, 1332, 1112, 3331, 3221. Physics requirements (8hrs) include: PHYS 1321, 1121, 1322, 1122.

*By virtue of the interdisciplinary nature of the program, students who complete the requirements for the B.S. degree in Mathematical Biology have satisfied the capstone requirement of the College of Natural Science and Mathematics.*
**teachHOUSTON**

**Goals:**

1. To attract and retain more students into secondary math, science, and computer science career paths.

2. To establish an enriched pre-service curriculum that integrates modern technological teaching tools, opportunities to experience the joy of scientific discovery and problem solving, and mastery of the subject matter.

3. To graduate many outstanding science and math teachers/leaders every year who are masters of their discipline, know how to use technology to enhance learning, and involve students in scientific inquiry.

Students who choose teachHouston must complete the following requirements in addition to the special requirements for the Bachelor of Science or the Bachelor of Arts degree:

**Requirements:**

At least 30 advanced semester hours in mathematics which must include: MATH 3311, 3325, 3330, 3331, 3333, 3379, and 4389, with a minimum of 9 semester hours of 4000-level mathematics. One of the following senior sequences must be completed: MATH (4331 & 4332), (4335 & 4336), (4335 & 4362), (4350 & 4351), (4364 & 4365), (4377 & 4378) or (4320 & 4380), (4309 & 4310). CUIN requirements (14hrs) include: CUIN 1101, 1102, 3350, 3351, 3352, 4350. Education courses (6hrs) include: EDUC 4314, 4315. One of the following (3hrs) is required: BIOL 4340/CHEM 4340/PHYS 4320.

By virtue of the interdisciplinary nature of the program, students who complete the requirements for the B.S. or B.A. degree in teachHouston have satisfied the capstone requirement of the College of Natural Science and Mathematics.

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**teachHOUSTON continued**

**teachHOUSTON** is a non-profit organization at the University of Houston which prepares and supports mathematics and science majors for careers in secondary education. If you are an undergraduate who wants to teach mathematics or science at the high school level, then teachHOUSTON is for you.

Established in 2007, the teachHOUSTON program was created to address the shortage of qualified math and science teachers in our country. Modeled after a successful format at the University of Texas at Austin, teachHOUSTON is a new collaborative project of the University of Houston College of Natural Sciences and Mathematics, the College of Education, and local school districts.

For more information on the program and what is offered for participating students, please visit the following link: [http://www.teachhouston.uh.edu/About_Us.html](http://www.teachhouston.uh.edu/About_Us.html)
Minor in Mathematics

Students who choose to minor in mathematics must complete the general requirements for a minor as well as a minimum of 18 semester hours of mathematics courses, of which at least nine must be advanced (3000-4000 level). Of the nine or more advanced hours, at least three semester hours must be at the 4000-level and no special problems or selected topics courses are permitted.

Students must earn a 2.00 minimum cumulative grade point average on all courses attempted in the minor discipline at the University of Houston. Courses which by catalog statement cannot be applied toward a degree in Natural Sciences and Mathematics, or which have other relevant catalog restrictions will not be included in the minor grade point average.

Students interested in minoring in math may do so by visiting: https://forms.nsm.uh.edu/minor-request

Undergraduate Advising Center (UAC)

Undergraduates’ first stop for academic advising in the College of Natural Sciences and Mathematics is the Undergraduate Advising Center. The college recommends that you meet with your advisor at least once a semester. Your advising session will be most productive if you have questions ready when you meet with the advisor.

**UAC Location:** 115 Fleming (Bldg. 564), 713-743-2626

**UAC Advisor Contact Information:**
Susan Clements: 713-743-8530, (swclemen@central.uh.edu)

**Departmental Contacts:**
Dr. Jiwen He, Director of Undergraduate Studies: (jiwenhe@math.uh.edu)

Treina Tai McAlister, Communications Manager: (tai@math.uh.edu)
Careers in Mathematics

1.) Energy industry for technical and analytical positions:
   A.) Companies that service energy industry: oil companies, software
       companies, oil and gas investment banks, energy lending firms, engineering
       consultancies, etc.).
   1.) These companies need employees who can analyze data, model
       future growth, calculate economics and are able to communicate their
       findings to an audience. Most companies purchase commercial
       software for modeling future oil and gas production, but these
       sophisticated programs are best handled by mathematicians.

2.) Careers that involve problem-solving and logic skills.

3.) Careers involving categorical proof theory, type theory, programming
    languages, logics for knowledge representation, logics of context, linear
    logic, intuitionistic modal logic and linguistic applications of logic.

4.) Consultant: someone who provides expert advice, usually to another
    company or agency.
   A.) Consulting for the Federal Government and other corporations, coworkers
       may obtain quantitative degrees such as: mathematics, statistics, quantitative
       finance, or computer science (in the range of BS to PhD).
   1.) Work involved: building computer models, forecasting techniques,
       market research, statistical analysis and data mining (large amounts of
       data or building a mathematical model to estimate unknown values).

5.) Actuarial Science: Actuaries take a series of exams in order to be credentialed.
   A.) The first three actuarial exams cover topics such as: statistics, calculus
       and life contingencies.
   B.) The use of Algebra to Complex Calculus and Statistics, is helpful in
       understanding different methodologies.

6.) Statisticians and Analysts: analysis of data, regardless of its source;
    application of mathematical and statistical concepts; formulation of valid
    conclusions.

7.) Scientists: Computational mathematics and problem solving skills are
    essential for the solution of various equations concerning multiple scientific
    areas. Ex: An understanding of the atmosphere requires the derivation and
    interpretation of complex equations that describe the fluid motion of gases,
    heat transfer, radiation, chemical interactions and reactions, and much more.

8.) Instructors: This can vary from teaching at the middle school level to the
    college level. Professors usually have expertise in either Pure or Applied
    mathematics, although, both can be closely related.

9.) Programmers

10.) Mathematicians in Medical Science: Mathematicians contribute to this
    area by creating mathematical models, clinical studies, software, and
    databases for innovative medical procedures and medical cures.

11.) Employment in the Pharmaceutical Field

12.) A Career in Cryptography

To be up-to-date, check out The American Mathematical Society (AMS), The
Society for Industrial and Applied Mathematics (SIAM), and The Mathematical
Association of America (MAA) websites, which I’ve provided below:

http://www.ams.org/profession/career-info/career-index
http://www.siam.org/careers/
http://www.maa.org/careers/
Keene: (Math B.S.)
“"I recently finished student teaching at my old high school and waiting on word about being hired there; I know I’m guaranteed a job somewhere in the district (Aldine ISD), but I wanna work at Aldine Sr...kinda a trip working alongside your old high school teachers, but I’ve made some awesome friends there! Who knew I’d be close friends with old teachers one day?”

Malik: (Math; Minor: Cosc)
“Actually Tai, there was an email you sent us about an employer who came to campus last semester, Fairfield Industries. I’m currently working for them! Thanks for giving us the info, it really helps!! :)”

Paz: (Math; Minor: Mexican American Studies)
“I am currently teaching Algebra 1 at Chavez High School here in Houston. I am also in the Alternative Certification Program and taking the required courses at St. Thomas.”

Bruns: (Math B.S.)
“I got a summer job off of the UH job boards at Reliant doing retail pricing. Then when I graduated I used that as my experience to get an analyst position at Direct (Direct Energy as a Pricing & Structuring Analyst. I am down on the trading floor and my job is to develop energy cost profiles for clients. It is like being an Actuary for the energy market. It took me five months to land, but the effort finally paid off. There are two people on the trading floor that have MS Applied math from UH from a couple years ago, and the person I replaced was UH Applied Math (I believe). Lots of economist degrees in my group as well). I worked non-stop building great analytic models and finally got my shot at trading. I did well in real-time trading and was recently promoted to spec (commodities) trading this February. Haha, my math background was instrumental. I use statistics and probability models for 12 hours a day. It’s hard to turn the brain off at the end of the day.” (Current position: NE/NY Short Term Trader at Direct Energy)”

Haygood: (Math B.A.; Minor: Education)
“...Teaching at La Porte High School - 9th and 10th grade math and 12th grade science.”

Cucco: (Math; Minor: Cosc)
“I was hired as a Consultant at CampbellWilson in Dallas TX. www.CampbellWilson.com. I’m primarily doing database management, application development, and other projects that involve data manipulation. I am enjoying it. My favorite things are having problems to solve, a license to solve them in a creative manner, and computer programming. This job is just what I was hoping for. I had been applying to some jobs in the DFW area through Monster and CareerBuilder, but I never would have looked for this job since it is in the healthcare industry. A headhunter contacted me after seeing my resume, told me about the company and set up the interview time. For the hiring process, I had three interviews with who would become my manager, and the two people on her team. They asked me a few questions about my past experiences, school, work etc., but they were primarily concerned with my ability to learn new things and adapt to changing environments. I feel that being exposed to so many different concepts through learning Math & Comp Sci has greatly shortened my learning curve, which was one of my big selling points. Another great thing about the company is this: the founding partner, Manie Campbell, is also a UH grad =)”

Gallegos: (Math B.S. FMO)
“I am currently working at San Jacinto College as a research analyst (Senior Research Analyst) in the Institutional Research and Effectiveness office. I obtained this position shortly after graduating from UH in 2010. Majoring in math gave me the analytical, statistical, and programming skills I needed to land this position. I use SAS to program and build statistical reports using student data. These reports are used by administration to make informed decisions that impacts student success. Although I despaired taking computer science during my undergrad career, I am so grateful that I did. Computer programming and the analytical skills I obtained at UH, helped me learn the SAS programming language I use at work everyday. As a math major I initially thought I was going to end up teaching high school math, but I learned that with a math background you can go into any field, math is everywhere! For me, it’s in higher education.”

Mosely: (Math B.S.; Minor: Education)
“I’m teaching AP Statistics (High School) in Cypress-Fairbanks ISD.”
Alumni Careers & Testimonials

N. Tran: (Math B.A. Minor: Business HR Management)
“...I originally got into the energy industry in '09 where the recession was at its lowest and no one was hiring. So I decided to take a job as a receptionist for a small energy consulting company to work my way up. The owner of the company said because I have a math degree, she choose me over all the other candidates; knowing that math will help me think and solve problems in a more pragmatic and logical way, especially in this industry (even as a receptionist, they wanted something who could think for themselves).

Same with my current position (Senior Account Manager at Atlas Commodities, LLC); my superiors, each, have discussed how they like the fact that I studied mathematics in college, they are confident in my analytically thinking abilities. I use math everyday at work. Some of my responsibilities require outside of the box thinking yet still being able to systemically organize new procedures. Another responsibility is to organize large amounts of data and make sense of it; using excel and reading graphs and charts. I’m picking up a lot of computer skills: logic thinking, writing/creating formulas, how programs work; and applying it to my responsibilities...”

Logan: (Math)
“I am working in Sugar Land at Fairfield Industries as a geophysical analyst. I found the company through the Texas Career Fair because they hire primarily math & physics majors. The geophysical industry is usually unknown to undergrads but is a great option since it is math, physics and computer science related.”

A. Sameei: (Math B.S. & M.A.; Finance M.S.)
“My degree in Math is the driving factor that lead to my ability to become a trader (Trader at EP ENERGY). More often than not companies need quantitative thinkers...especially in analytical role (i.e.risk quant analysts, traders, marketing, etc...). The biggest hurdle for math graduates is learning the fundamentals of the underlying business in order to properly apply meaningful analysis. Once you’ve reached a point where you are comfortable with the business model then sky is the limit for math graduates, in my opinion.”

Bui: (Math)
“Hi, I got a job at an engineering firm as a Control Systems engineer in the oil and gas industry.”

L. Ha: (Math; MBA)
“My degree in Math degree in December 2007 and got hired as a math teacher at Scarborough High School in January 2008. I taught math for 2.5 years, but decided to pursue a new career in 2010 because teaching did not work out for me. The economy in 2010 was really bad; therefore, it was really hard for me to find another job. As a result, I went back to school to do Master of Business Administration Specializing in Accountancy. I am graduating this April and am currently seeking an Accounting Position. I was able to do well in Accounting because of my math background. I still love numbers and math.”

Taylor: (Math B.S. FMO)
“I am currently an accountant at a commercial lender. Having a math degree helped me to secure a position within sales. I was able to evaluate small business financials and help the business owners secure financing for equipment. My degree helped me to quickly move positions into the accounting department where I learn how the finance industry works, and all of the different financial aspects of the company. I enjoy working in the finance industry and growing money through monetary investments. All of my math background has helped me grow quickly (6 months) within the company.”

Mela: (Math; Minor: Education)
“Teaching math at Lamar High school.”

Medina: (Math B.A., Minor: Asian American Studies)
“I’m a Geophysical Seismic Pre-Processor at a Seismic Ventures Inc. in Stafford. I do data input and preliminary analysis on seismic data. Basically I...map the layers of earth to find places to drill and sell the processed data. For more information, go to: www.seismicventures.com. Having the math background, with a little computer science, helps you on this field because of the major’s emphasis on the broad and fundamental. If you are not capable of looking at the big picture, it will always be harder to find the proper solution.”
Alumni Careers & Testimonials continued...

R. Vo: (Math B.S.; Minor: Cosc)
“I got my bachelor’s in mathematics and computer science, with magna cum laude, in Spring 2016. I am now gainfully employed as a Software Engineer at Capital One in Plano, TX.”

Undergraduate Courses (commonly offered for Math Majors)

- MATH 1431: Calculus I
- MATH 1432: Calculus II
- MATH 1450:1451: Accelerated Calculus
- MATH 2331: Linear Algebra
- MATH 2131: Linear Algebra Labs w/MATLAB
- MATH 2433: Calculus III
- MATH 3311: Functions and Modeling
- MATH 3325: Transition to Advanced Mathematics
- MATH 3330: Abstract Algebra
- MATH 3331: Differential Equations
- MATH 3333: Intermediate Analysis
- MATH 3334: Advanced Multivariable Calculus
- MATH 3335: Vector Analysis
- MATH 3336: Discrete Mathematics
- MATH 3338: Probability
- MATH 3339: Statistics for the Sciences
- MATH 3340: Introduction to Fixed Income Mathematics
- MATH 3363: Introduction to Partial Differential Equations
- MATH 3364: Introduction to Complex Analysis
- MATH 3379: Introduction to Higher Geometry
- MATH 4309: Mathematical Biology
- MATH 4310: Biostatistics
- MATH 4315: Graph Theory with Applications
- MATH 4320: Introduction to Stochastic Processes
- MATH 4331;4332: Introduction to Real Analysis
- MATH 4335;4336: Partial Differential Equations
- MATH 4340: Nonlinear Dynamics and Chaos
- MATH 4350;4351: Differential Geometry
- MATH 4355: Mathematics of Signal Representation
- MATH 4364;4365: Numerical Analysis
- MATH 4366: Numerical Linear Algebra
- MATH 4377: Advanced Linear Algebra I
- MATH 4378: Advanced Linear Algebra II
- MATH 4380: A Mathematical Introduction to Options
- MATH 4383: Number Theory
- MATH 4388: History of Mathematics
- MATH 4389: Survey of Undergraduate Mathematics