Mathematics (B.S.)

Mathematics is both a profession and an indispensable tool for many types of work. As a tool, mathematics is a universal language that has been crucial in formulating and expressing ideas not only in science and engineering, but also in many other areas such as business and the social sciences. As probably the oldest and most basic science, it provides the key to understanding the major technological achievements of our time. Of equal importance, knowledge of mathematics may help provide a student with the type of uncompromising and clear-sighted thinking useful in considering the problems of many other disciplines. The Mathematics degree program encompasses mathematics, statistics, and applied mathematics.

Applied mathematics and statistics continue to enjoy a rapid growth. Students have the opportunity of applying their expertise to any of a number of fields of application. For the student to be more effective in such applications, Mathematics also offers degree programs allowing additional emphasis in the areas of actuarial science, computer science, electrical engineering, and management.

Those interested in obtaining both a B.S. in Mathematics and Teacher Certification in the state of Texas should consult the UT Dallas Teacher Development Center or the UTeach of fice for specific requirements as soon as possible after formal admission to the University. See the Teacher Education Certification Program section of the catalog for additional information.

The Mathematics degree program also prepares students for graduate studies. An accelerated B.S./M.S. Fast Track program is available which provides the opportunity for undergraduate students to satisfy some of the requirements of the master's degree while they are completing the bachelor's degree in Mathematics.

Faculty

**Professors:** Larry P. Ammann, Michael Baron, Sam Efromovich, Matthew J. Goeckner, M. Ali Hooshyar, Wieslaw Krawcewicz, Patrick L. Odell (Emeritus), Istvan Ozsvath, Viswanath Ramakrishna, Ivor Robinson (Emeritus), Robert Serfling, Janos Turi, John W. Van Ness (Emeritus)

**Associate Professors:** Zalman I. Balanov, Pankaj Choudhary, Mieczyslaw Dabkowski

**Assistant Professors:** Yan Cao, Tobias Hagge, Qiongxia Song

**Clinical Associate Professor:** Natalia Humphreys

**Research Assistant Professor:** Qingwen Hu

**Senior Lecturers III:** David L Lewis, Paul Stanford, Bentley T Garrett,

**Senior Lecturers II:** Manjula Foley, Yuly Koshevnik, Joanna Robinson, William Monte Scott

**Senior Lecturers I:** Mohammad Akbar, Diana Cogan, Malgorzata Dabkowska, Anatoly Eydelzon, Richard Ketchersid, Brady McCary, Jigarkumar Patel, Michael Tseng

**Adjunct Professors:** Jose Carlos Gomez Larranage, Adolfo Sanchez Valenzuela

**Affiliated Faculty:** Herve Abdi (BBS), Raimund J. Ober (ECS/EE), Alain Bensoussan (JSOM), Titu Andreescu (ECS/SME), John Wiorkowski (JSOM)

The Program in Mathematics

Students seeking a degree in Mathematics may specialize in Mathematics, Statistics, or
Applied Mathematics, and receive a B.S. degree. Each specialization allows some flexibility in electives so that students can better adapt their degree plans to their educational goals.

Mathematics Specialization: For students interested in a career in mathematics and for students interested in continuing on to graduate work in mathematics, applied mathematics, math education, and related areas.

Statistics Specialization: For students interested in probability and statistical models and their use in data analysis and decision-making and for students interested in continuing on to graduate work in statistics, biostatistics, actuarial science, and other statistics related areas.

Applied Mathematics Specialization: For students interested in mathematics for the purpose of using it broadly in various areas of application and for students interested in continuing on to graduate work in applied mathematics and related areas.

The UTeach option may be added to the BS degree in Mathematics. UTeach Dallas Option degree plans are streamlined to allow students to complete both a rigorous Bachelor of Science or Bachelor of Arts degree and all course work for middle or high school teacher certification in four years. Teaching Option degrees require deep content knowledge combined with courses grounded in the latest research on math and science education. While most graduates go on to classroom teaching, UTeach alums are also prepared to enter graduate school and to work in discipline related industry.

Bachelor of Science in Mathematics

Degree Requirements (120 hours)

All majors with specialization in either Mathematics or Statistics are strongly urged to meet with assigned departmental advisors every semester.

I. Core Curriculum Requirements: 42 hours

Communication (6 hours)
- 3 hours Communication (RHET 1302)
- 3 hours Communication Elective (NATS 4310 or MATH 4390 or MATH 4399)

Social and Behavioral Sciences (15 hours)
- 6 hours Government (GOVT 2301 and GOVT 2302)
- 6 hours American History
- 3 hours Social and Behavioral Science Elective

Humanities and Fine Arts (6 hours)
- 3 hours Fine Arts (ARTS 1301)
- 3 hours Humanities (HUMA 1301)

Mathematics and Quantitative Reasoning (6 hours)
- 6 hours Calculus (MATH 2417 and 2419)
Science (9 hours)

*Mathematics/Applied Mathematics Specialization*

- PHYS 2125 Physics Laboratory I
- PHYS 2126 Physics Laboratory II
- PHYS 2325 Mechanics
  - or PHYS 2421 Honors Physics I - Mechanics and Heat
- PHYS 2326 Electromagnetism and Wave
  - or PHYS 2422 Honors Physics II - Electromagnetism and Waves

And an additional science course approved by the assigned departmental advisor.

*Statistics Specialization*

- PHYS 2325/2125 Mechanics with Laboratory and PHYS 2326/2126 Electromagnetism and Waves with Laboratory
  - or PHYS 2421 Honors Physics I - Mechanics and Heat with Laboratory and PHYS 2422 Honors Physics II - Electromagnetism and Waves with Laboratory
  - or CHEM 1311/1111 and CHEM 1312/1112 General Chemistry I and II with Laboratory

And an additional science course approved by the assigned departmental advisor.

II. Major Requirements: 48 hours

Major Preparatory Courses (15 hours)

- CS 13374 Computer Science I
- MATH 2417 Calculus I3,5
- MATH 24184 Linear Algebra
- MATH 2419 Calculus II3,5
- MATH 24204 Differential Equations with Applications
- MATH 24514 Multivariable Calculus with Applications

Major Core Courses (21 hours)

- MATH 3310 Theoretical Concepts of Calculus
- MATH 3311 Abstract Algebra I
- MATH 3379 Complex Variables
- MATH 4301 Mathematical Analysis I
- MATH 4302 Mathematical Analysis II
MATH 4334 Numerical Analysis
NATS 4310 Advanced Writing in the Natural Sciences and Mathematics
STAT 4351 Probability

Major Related Courses (12 hours)

Applied Mathematics Specialization
MATH 4341 Topology
MATH 4355 Methods of Applied Mathematics
MATH 4362 Partial Differential Equations
STAT 4382 Stochastic Processes

Mathematics Specialization
MATH 3312 Abstract Algebra II
MATH 3380 Differential Geometry
MATH 4341 Topology
3 hours upper-division guided elective

Statistics Specialization
STAT 3355 Data Analysis for Statisticians and Actuaries
STAT 4352 Mathematical Statistics
STAT 4382 Stochastic Processes
3 hour upper-division guided elective

III. Elective Requirements: 30 hours

Advanced Electives (6 hours)

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites.

Free Electives (24 hours)

Both lower- and upper-division courses may count as electives, but the student must complete at least 51 hours of upper-division credit to qualify for graduation.

BS in Actuarial Sciences

The department offers a BS in Actuarial Sciences (see the program within this catalog for additional information).
Mathematics or Statistics with Computer Science Emphasis

Applied Mathematics Specialization or Statistics Specialization together with following courses:

- CS 2305 Discrete Mathematics for Computing I
- CS 2336 Computer Science II
- CS 3305 Discrete Mathematics for Computing II
- CS 3376 C/C++ Programming in a UNIX Environment
- CS 3345 Data Structures and Introduction to Algorithmic Analysis
- CS 4337 Organization of Programming Languages
- CS 3340 Computer Architecture

Mathematics or Statistics with Electrical Engineering Emphasis

Applied Mathematics Specialization or Statistics Specialization together with following courses:

- EE 3101 Electrical Network Analysis Laboratory
- EE 3111 Electronic Circuits Laboratory
- EE 3120 Digital Circuits Laboratory
- EE 3301 Electrical Network Analysis
- EE 3311 Electronic Circuits
- EE 3320 Digital Circuits
- EE 4301 Electromagnetic Engineering I

Mathematics or Statistics with Management Emphasis

Mathematics Specialization, Applied Mathematics Specialization or Statistics Specialization together with following courses:

- ACCT 2301 Introductory Financial Accounting
- ACCT 2302 Introductory Management Accounting
- BLAW 2301 Business and Public Law
- FIN 3320 Business Finance
- MIS 3300 Introduction to Management Information Systems
- OBHR 3310 Organizational Behavior

NOTE: Students transferring into Mathematics at the upper division level are expected to have completed all of the 1000- and 2000- level mathematics core course requirements.
Bachelor of Science in Mathematics with UTeach Option

Degree Requirements (120 hours)

I. Core Curriculum Requirements\(^1\): 42 hours

**Communication (6 hours)**
- 3 hours Communication (RHET 1302)
- 3 hours Communication Elective (NATS 4390/NATS 4399)\(^2\)

**Social and Behavioral Sciences (15 hours)**
- 6 hours Government (GOVT 2301 and GOVT 2302)
- 6 hours American History
- 3 hours Social and Behavioral Science Elective

**Humanities and Fine Arts (6 hours)**
- 3 hours Fine Arts (ARTS 1301)
- 3 hours Humanities (HUMA 1301)

**Mathematics and Quantitative Reasoning (6 hours)**
- 6 hours Calculus (MATH 2417 and 2419)\(^3\)

**Science (9 hours)**

*Mathematics/Applied Mathematics Specialization*
- PHYS 2125 Physics Laboratory I
- PHYS 2126 Physics Laboratory II
- PHYS 2325 Mechanics
  - or PHYS 2421 Honors Physics I - Mechanics and Heat
- PHYS 2326 Electromagnetism and Waves
  - or PHYS 2422 Honors Physics II - Electromagnetism and Waves and an additional acceptable science course

*Statistics Specialization*
- PHYS 2325/2125 Mechanics with Laboratory and PHYS 2326/2126 Electromagnetism and Waves with Laboratory
  - or PHYS 2421 Honors Physics I - Mechanics and Heat with Laboratory and PHYS 2422 Honors Physics II - Electromagnetism and Waves with Laboratory
  - or CHEM 1311/1111 and CHEM 1312/1112 General Chemistry I and II with Laboratory

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\(^1\) The Core Curriculum Requirements are designed to provide a broad foundation in various disciplines.

\(^2\) The Communication Elective must be selected from a list of approved courses.

\(^3\) The Calculus requirement can be fulfilled by MATH 1417 and 2419 for students interested in actuarial science or financial mathematics.
II. Major Requirements: 50 hours

Major Preparatory Courses (17 hours beyond core curriculum)
- **CS 1337** Computer Science I
- **MATH 2417** Calculus I
- **MATH 2418** Linear Algebra
- **MATH 2419** Calculus II
- **MATH 2420** Differential Equations with Applications
- **MATH 2451** Multivariable Calculus with Applications

Major Core Courses (21 hours beyond core curriculum)
- **MATH 3310** Theoretical Concepts of Calculus
- **MATH 3311** Abstract Algebra I
- **MATH 3379** Complex Variables
- **MATH 4301** Mathematical Analysis I
- **MATH 4302** Mathematical Analysis II
- **MATH 4334** Numerical Analysis
- **NATS 4390/4399** Research Methods
- **STAT 4351** Probability

Major Related Courses (12 hours)

**Applied Mathematics Specialization**
- **MATH 4341** Topology
- **MATH 4355** Methods of Applied Mathematics
- **MATH 4362** Partial Differential Equations
- **STAT 4382** Stochastic Processes

**Mathematics Specialization**
- **MATH 3312** Abstract Algebra II
- **MATH 3321** Geometry
- **MATH 4341** Topology
3 hours upper-division guided elective
Statistics Specialization

- **STAT 3355** Data Analysis for Statisticians and Actuaries
- **STAT 4352** Mathematical Statistics
- **STAT 4382** Stochastic Processes
- 3 hour upper-division guided elective

III. Elective Requirements: 28 hours

**Advanced Electives (6 hours)**

All students are required to take at least six hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. UTeach courses can fulfill this requirement.

**UTeach Requirements (18 hours beyond core curriculum and advanced electives)**

- **NATS 1141** UTeach Step 1
- **NATS 1143** UTeach Step 2
- **NATS 3341** Knowing and Learning in Mathematics and Science
- **NATS 3343** Classroom Interactions
- **HIST 3328** History and Philosophy of Science and Medicine
- **NATS 4390** Research Methods
- **NATS 4341** Project-Based Instruction
- **NATS 4694** UTeach Student Teaching, 8-12 Science and Mathematics
  or **NATS 4696** UTeach Student Teaching, 4-8 Science and Mathematics
- **NATS 4141** UTeach Student Teaching Seminar
- **MATH 3303** Introduction to Mathematical Modeling

**Free Electives (4 hours)**

Both lower- and upper-division courses may count as electives, but the student must complete at least 51 hours of upper-division credit to qualify for graduation.

Minor in Mathematics

Students not majoring in Mathematics or Statistics may obtain a minor in Mathematics or Statistics by satisfying the following requirements: 18 credit hours of mathematics or statistics, 12 hours of which must be chosen from the following courses:

Mathematics Minor: **MATH 3310, MATH 4334** and two more upper-division mathematics courses that satisfy degree requirements by students in Mathematics.

Statistics Minor: **STAT 4351, STAT 4352** and two more upper-division mathematics courses that satisfy degree requirements by students in Statistics.
Fast Track Baccalaureate/Master’s Degrees

For students interested in pursuing graduate studies in Mathematics, the Mathematics Department offers an accelerated B.S. / M.S. Fast Track that involves taking graduate courses instead of several advanced undergraduate courses. Acceptance into the Fast Track is based on the student's attaining a GPA of at least 3.200 in all mathematics classes and being within 30 hours of graduation. Fast Track students may, during their senior year, take 15 graduate hours that may be used to complete the baccalaureate degree. After admission to the graduate program, these 15 graduate hours may also satisfy requirements for the master's degree. Fast Track programs are offered in mathematics with specializations in applied mathematics and statistics.

1. Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parentheses are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.

2. A Major course requirement that also fulfills a Core Curriculum requirement. If hours are counted in the Core Curriculum, students must complete additional coursework to meet the minimum requirements for graduation. Course selection assistance is available from the undergraduate advisor.

3. Two hours of Calculus are counted as electives; six hours are counted in Core Curriculum.

4. Indicates a prerequisite class to be completed before enrolling in upper-division classes.

5. MATH 2417 and 2419 requirements can be fulfilled by completing MATH 2413, 2414, and 2415.

6. Approval of Mathematics department advisor required.

7. Another MATH course, i.e. MATH 3380, may be substituted if MATH 3321 is not offered.

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