School of Natural Sciences and Mathematics

Mathematics (BS)

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 BS in Mathematics and Teacher Certification in the state of Texas should consult the Teacher Development Center or UTeach Dallas office for specific requirements as soon as possible after formal admission to the university. See the Teacher Education Certification Programs section of the catalog for additional information.

The Mathematics degree program also prepares students for graduate studies. An accelerated BS/MS 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, Zalman I. Balanov, Michael I. Baron, Vladimir Dragovic, Sam Efromovich, Matthew J. Goeckner, M. Ali Hooshyar, Wieslaw Krawcewicz, Susan E. Minkoff, L. Felipe Pereira, Dmitry Rachinskiy, Viswanath Ramakrishna, Robert Serfling, Janos Turi, John Zweck

Professors Emeritus: Patrick L. Odell, Ivor Robinson, John W. Van Ness

Associate Professors: Swati Biswas, Yan Cao, Pankaj K. Choudhary, Mieczyslaw K. Dabkowski, Yulia Gel

Assistant Professors: Mohammad Akbar, Maxim Arnold, Bhargab Chattopadhyay, Min Chen, Tobias Hagge, Qingwen Hu, Frank Konietschke, Yifei Lou, Oleg Makarenkov, Tomoki Oshawa,
Qiongxia (Joanne) Song

Clinical Professor: Ronald D. Dearing

Clinical Associate Professor: Natalia Humphreys

Senior Lecturers III: David L. Lewis, Paul Stanford

Senior Lecturers II: Manjula Foley, Bentley T. Garrett, Yuly Koshevnik, William M. Scott

Senior Lecturers I: Diana Cogan, Malgorzata Dabkowska, Anatoly Eydelzon, Brady McCary, Jigarkumar Patel

Affiliated Faculty: Hervé Abdi, Titu Andreescu, Alain Bensoussan, Raimund J. Ober, John J. Wiorkowski

The Program in Mathematics

Students seeking a degree in Mathematics may specialize in Mathematics, Statistics, or Applied Mathematics, and receive a BS 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 coursework 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 semester credit hours)¹

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 semester credit hours

Communication: 6 semester credit hours

COMM 1311 Survey of Oral and Technology-based Communication
RHET 1302 Rhetoric

Mathematics: 3 semester credit hours

MATH 2417 Calculus

Life and Physical Sciences: 6 semester credit hours

Mathematics/Applied Mathematics Specialization

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

Statistics Specialization

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

Or
CHEM 1311 General Chemistry I
CHEM 1312 General Chemistry II

Language, Philosophy and Culture: 3 semester credit hours

HUMA 1301 Exploration of the Humanities

Or

Select any 3 semester credit hours from Language, Philosophy and Culture core courses (see advisor)

Creative Arts: 3 semester credit hours

ARTS 1301 Exploration of the Arts
Or

Select any 3 semester credit hours from Creative Arts core courses (see advisor)

American History: 6 semester credit hours

Select any 6 semester credit hours from American history core courses (see advisor)

Government/Political Science: 6 semester credit hours

GOVT 2305 American National Government
GOVT 2306 State and Local Government

Social and Behavioral Sciences: 3 semester credit hours

Select any 3 semester credit hours from Social and Behavioral Sciences core courses (see advisor)

Component Area Option: 6 semester credit hours

MATH 2417 Calculus I\(^3\) \(^4\)
MATH 2419 Calculus II\(^3\) \(^4\)
PHYS 2125 Physics Laboratory I\(^5\)

II. Major Requirements: 48 semester credit hours

Major Preparatory Courses: 15-16 semester credit hours beyond Core Curriculum

*For Mathematics Specialization*

PHYS 2125 Physics Laboratory I\(^5\)
PHYS 2325 Mechanics\(^5\)
PHYS 2126 Physics Laboratory II
PHYS 2326 Electromagnetism and Waves\(^5\)

*For Statistics Specialization*

PHYS 2125 Physics Laboratory I\(^5\)
PHYS 2325 Mechanics\(^5\)
PHYS 2126 Physics Laboratory II
PHYS 2326 Electromagnetism and Waves\(^5\)

Or

CHEM 1311 General Chemistry I\(^3\)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CHEM 1312</td>
<td>General Chemistry II</td>
<td>3</td>
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For All

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CS 1337</td>
<td>Computer Science I</td>
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<td>MATH 2417</td>
<td>Calculus I</td>
<td>3, 4, 7</td>
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<tr>
<td>MATH 2418</td>
<td>Linear Algebra</td>
<td>6</td>
</tr>
<tr>
<td>MATH 2419</td>
<td>Calculus II</td>
<td>3, 4, 7</td>
</tr>
<tr>
<td>MATH 2420</td>
<td>Differential Equations with Applications</td>
<td>6</td>
</tr>
<tr>
<td>MATH 2451</td>
<td>Multivariable Calculus with Applications</td>
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Major Core Courses: 21 semester credit hours

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>MATH 3310</td>
<td>Theoretical Concepts of Calculus</td>
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</tr>
<tr>
<td>MATH 3311</td>
<td>Abstract Algebra I</td>
<td></td>
</tr>
<tr>
<td>MATH 3379</td>
<td>Complex Variables</td>
<td></td>
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<tr>
<td>MATH 4301</td>
<td>Mathematical Analysis I</td>
<td></td>
</tr>
<tr>
<td>MATH 4302</td>
<td>Mathematical Analysis II</td>
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<tr>
<td>MATH 4334</td>
<td>Numerical Analysis</td>
<td></td>
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<tr>
<td>STAT 4351</td>
<td>Probability</td>
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</table>

Major Related Courses: 12 semester credit hours

Applied Mathematics Specialization

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>MATH 4341</td>
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<tr>
<td>MATH 4355</td>
<td>Methods of Applied Mathematics</td>
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<tr>
<td>MATH 4362</td>
<td>Partial Differential Equations</td>
<td></td>
</tr>
<tr>
<td>STAT 4382</td>
<td>Stochastic Processes</td>
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Mathematics Specialization

<table>
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<th>Course Title</th>
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<tr>
<td>MATH 3312</td>
<td>Abstract Algebra II</td>
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<td>MATH 3380</td>
<td>Differential Geometry</td>
<td></td>
</tr>
<tr>
<td>MATH 4341</td>
<td>Topology</td>
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</table>

3 semester credit hours upper-division guided elective

Statistics Specialization
STAT 3355 Data Analysis for Statisticians and Actuaries
STAT 4352 Mathematical Statistics
STAT 4382 Stochastic Processes

3 semester credit hours upper-division guided elective

III. Elective Requirements: 30 semester credit hours

Electives: 30 semester credit hours

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

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

BS in Actuarial Science

The department offers a BS in Actuarial Science (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 (120-121 semester credit hours)**

1. **Core Curriculum Requirements: 42 semester credit hours**

   **Communication: 6 semester credit hours**
   - **COMM 1311** Survey of Oral and Technology-based Communication
   - **RHET 1302** Rhetoric

   **Mathematics: 3 semester credit hours**
   - **MATH 2417** Calculus 1

   **Life and Physical Sciences: 6 semester credit hours**

2. **Mathematics/Applied Mathematics Specialization**

   - **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

**Statistics Specialization**

**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

Or

**CHEM 1311** General Chemistry I

**CHEM 1312** General Chemistry II

**Language, Philosophy and Culture: 3 semester credit hours**

**HUMA 1301** Exploration of the Humanities

Or

Select any 3 semester credit hours from Language, Philosophy and Culture core courses (see advisor)

**Creative Arts: 3 semester credit hours**

**ARTS 1301** Exploration of the Arts

Or

Select any 3 semester credit hours from Creative Arts core courses (see advisor)

**American History: 6 semester credit hours**

Select any 6 semester credit hours from American history core courses (see advisor)

**Government/Political Science: 6 semester credit hours**

**GOVT 2305** American National Government

**GOVT 2306** State and Local Government

**Social and Behavioral Sciences: 3 semester credit hours**

Select any 3 semester credit hours from Social and Behavioral Sciences core courses (see advisor)

**Component Area Option: 6 semester credit hours**

**MATH 2417** Calculus 1

II. Major Requirements: 51-52 semester credit hours

Major Preparatory Courses: 15-16 semester credit hours beyond Core Curriculum

_For Mathematics Specialization_

- **PHYS 2125** Physics Laboratory I
- **PHYS 2325** Mechanics
- **PHYS 2126** Physics Laboratory II
- **PHYS 2326** Electromagnetism and Waves

_For Statistics Specialization_

- **PHYS 2125** Physics Laboratory I
- **PHYS 2325** Mechanics
- **PHYS 2126** Physics Laboratory II
- **PHYS 2326** Electromagnetism and Waves

Or

- **CHEM 1311** General Chemistry I
- **CHEM 1312** General Chemistry II

_For All_

- **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: 24 semester credit 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
STAT 4351 Probability

Major Related Courses: 12 semester credit 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 semester credit hours upper-division guided elective

Statistics Specialization

STAT 3355 Data Analysis for Statisticians and Actuaries
STAT 4352 Mathematical Statistics
STAT 4382 Stochastic Processes

3 semester credit hours upper-division guided elective

III. Elective Requirements: 27 semester credit hours

UTeach Requirements: 27 semester credit hours

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
Fast Track Baccalaureate/Master's Degrees

For students interested in pursuing graduate studies in Mathematics, the Mathematics Department offers an accelerated BS / MS 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 (grade point average) 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 semester credit hours that may be used to complete the baccalaureate degree. After admission to the graduate program, these 15 graduate semester credit 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. Incoming freshmen must complete and pass UNIV 1010 Freshman Seminar and the corresponding school-related freshman seminar course. Students, including transfer students, who complete their core curriculum at UT Dallas must take UNIV 2020.

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

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

4. Three semester credit hours of Calculus are counted to fulfill the Mathematics Core Requirement with the remaining five semester credit hours to be counted under Component Area Option Core.

5. Six semester credit hours of Physics are counted under Science core, and one semester hour of Physics (PHYS 2125) is counted under Component Area Core.

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

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

8. Approval of Mathematics department advisor required.

9. Six semester credit hours of Physics are counted under Science core, and one semester credit hour of Physics (PHYS 2125) is counted under Component Area Core.
10. Another MATH course, i.e. MATH 3380, may be substituted if MATH 3321 is not offered.

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