

Department of Mathematics

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J. Matthew Douglass, Chair

Faculty

Professors Brand, Gao, Jackson, Johnson, Kallman, Kung, Mauldin, Monticino, Neuberger, Urbanski. *Associate Professors* Allaart, Allen, Anghel, Betelu, Brozovic, Cherry, Conley, Douglass, Iaia, Liu, Quintanilla, Richter, Shepler, Song. *Assistant Professor* Sari. *Lecturer* Teel.

Introduction

The department offers programs of study leading to the BA, MA, MS and PhD degrees with a major in mathematics, and the BSMTH. Its faculty is dedicated to excellence in scholarship and teaching. The faculty supports a strong program of instruction and research, having as its core a solid foundation of mathematical theory that furnishes the tools necessary to address and solve crucial problems in maintaining, improving and protecting the world. The program also promulgates mathematics as a discipline in its own right, a body of pure knowledge with exceptional power, enabling its practitioners and those who diligently study it to be adaptable and effective forces in the workplace.

Students who earn degrees in mathematics readily obtain jobs with high-technology companies and in business, industry, government and teaching. Salaries and working conditions compare with those of engineers and scientists.

Students who plan to major in mathematics, physics, chemistry, biology or computer science should have had four years of mathematics in high school, including pre-calculus. Students who are required to take mathematics as part of their degree program in college should have had at least two years of algebra and one year of geometry in high school.

Required Placement and Testing

The Department of Mathematics enforces prerequisites for MATH 1100, 1190, 1350, 1400, 1580, 1600, 1610, 1650, 1680 and 1710. Students not meeting prerequisites for courses in which they enroll are required to drop the course or face academic penalty.

New students will receive notification of placement in mathematics from the Office of Admissions. Placement is based on materials submitted for admission to UNT including SAT/ACT scores and class rank. Enrollment in mathematics courses beyond the initial placement will depend upon the score on the ACCUPLACER College-Level Mathematics Test.

For more information about placement procedures, please contact the mathematics advising office at 940-565-4045.

Prerequisites

- MATH 1100, 1580, 1680: MATH 1010 with grade of C or better, or UNT mathematics department approval. A passing THEA mathematics score does not substitute for the MATH 1010 prerequisite.
- MATH 1190, 1350, 1400, 1600, 1650: MATH 1100 or equivalent with grade of C or better, or UNT mathematics department approval.

Programs of Study

The department offers undergraduate and graduate programs in the following areas:

- Bachelor of Arts,
- Master of Arts,
- Master of Science, and
- Doctor of Philosophy, all with a major in mathematics; and
- Bachelor of Science in Mathematics.

Bachelor of Arts with a Major in Mathematics (Non-Teacher Certification)

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 120 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor of Arts degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Arts and Sciences requirements. The department suggests ENGL 1310 and 2700 for satisfying the English Composition and Rhetoric core requirements.

2. **Major Requirements:** 34 hours of mathematics courses, which must include:

- a. Mathematics Core (16 hours): MATH 1710, 1720, 2700, 2730 and 3000.
- b. At least one of MATH 3510 or 3610 must be taken in satisfying other requirements.
- c. Depth Requirement (6 hours): One of the following areas:
 - Analysis: two of the following: MATH 3350, 3410, 3420, 3610, 3740, 4100, 4200, 4520.
 - Algebra: two of the following: MATH 3400, 3510, 3520, 4430, 4450.
 - Probability/Statistics: two of the following: MATH 3680, 4610, 4650.
 - Geometry/Topology: two of the following: MATH 3740, 4060, 4500.
- d. Breadth Requirement (9 hours): One course in each of the three areas not used to satisfy the depth requirement.
- e. Mathematics elective (3 hours): One additional upper-level mathematics course numbered 3350 or higher.

3. Other Course Requirements:

- Three laboratory science courses are required, as follows:

Option I

- a. BIOL 1710/1730.
- b. One course from PHYS 1710/1730 or CHEM 1410/1430.
- c. One additional course from: BIOL 1720/1740, CHEM 1410/1430, CHEM 1420/1440, PHYS 1710/1730 or PHYS 2220/2240.

Mathematics majors with a minor in geography or geology may also choose GEOL 1610 and GEOG 1710 in parts a and c above.

Option II

Students double majoring in mathematics and another discipline (typically biology, chemistry, physics or engineering) which requires at least 12 hours of laboratory science may use the same laboratory science courses that satisfy the other major requirements to also satisfy the laboratory science requirement for the mathematics major.

- Proficiency in a foreign language equivalent to 2050 is required. Students intending to pursue a graduate degree in mathematics are encouraged to study French, German or Russian.

4. **GPA:** Students must achieve at least a 2.0 GPA in all mathematics courses above 3350.

5. **Computer Competency:** Students taking mathematics courses at the 2000 level or above are expected to be competent in computer programming, using languages such as BASIC, C, C++, Fortran, PASCAL or Java. This competency can be obtained through completion of CSCE 1020 or 1030 or consent of the department.

6. **Minor Requirements:** One of the following is required:

- a. A minor of at least 18 hours (6 advanced). A minor in statistics does not fulfill this requirement.
- b. Completion of the certificate in actuarial science. Students must take MATH 3680, 4610 and 4650 for fulfilling degree requirements; students are also encouraged to take MATH 3350 and 3740. Also, no mathematics courses may be chosen for fulfilling the elective requirements of the certificate.

**BA with a Major in Mathematics
(Non-Teacher Certification)**

The following four-year plan is one example of a variety of ways in which you can complete your chosen degree in four years, and will serve as guide for you to design your pathway to degree completion. Variations will depend on whether you need to take prerequisites or have college credit from exams or dual enrollment.

The College of Arts and Sciences expects you to have completed the State recommended high school program and be ready to enroll for Language 2040 or a mathematics course above college algebra. If you are not prepared for this level, the necessary prerequisites will either replace electives or increase the hours required for the degree.

FRESHMAN YEAR

FALL	HOURS
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing I*	3
LANG 2040, Foreign Language (intermediate, may be used to satisfy a portion of the Understanding the Human Community requirement)**	3
MATH 1710, Calculus I**	4
PSCI 1040, American Government*	3
Humanities*	<u>3</u>
Total	16

SPRING	HOURS
ENGL 2700, Technical Writing (recommended)*	3
LANG 2050, Foreign Language (intermediate, may be used to satisfy a portion of the Understanding the Human Community requirement)**	3
MATH 1720, Calculus II	3
Computer Competency or Elective (see major requirements)	4
Laboratory Science (see major requirements)**	3-4
Total	16-17

SOPHOMORE YEAR

FALL	HOURS
HIST 2610, United States History to 1865*	3
MATH 2700, Linear Algebra and Vector Geometry	3
MATH 2730, Multivariable Calculus	3
Laboratory Science (see major requirement)**	3-4
Visual and Performing Arts*	3
Total	15-16

SPRING	HOURS
HIST 2620, United States History Since 1865*	3
MATH 3000, Real Analysis I	3
MATH Depth requirement (advanced, see major requirements)	3
Laboratory Science (see major requirements)**	3-4
Minor	3
Total	15-16

JUNIOR YEAR

FALL	HOURS
MATH 3510, Introduction to Abstract Algebra I, or MATH 3610, Real Analysis II (see major requirements)	3
MATH Depth requirement (advanced, see major requirements)	3
PSCI 1050, American Government*	3
Minor	3
Minor	3
Total	15

SPRING	HOURS
MATH Depth requirement (advanced, see major requirements)	3
Elective	3
Minor	3
Minor (advanced)	3
Social and Behavioral Sciences*	3
Total	15

SENIOR YEAR	HOURS
FALL	
MATH Breadth requirement (advanced, see major requirements)	3
MATH Breadth requirement (advanced, see major requirements)	3
Elective (advanced)	3
Elective	3
Minor (advanced)	3
Total	15

SPRING	HOURS
MATH Elective (3350 or higher)	3
Elective (advanced)	3
Elective (advanced)	3
Elective (advanced)	3
Total	12

*See the University Core Curriculum section of this catalog for approved list of course options.

** See Arts and Sciences degree requirements section of this catalog for approved list of course options.

Actual degree audits may vary depending on availability of courses in a given semester.

Some courses may require prerequisites not listed.

Students may wish to use opportunities for electives to complete a minor of their choice or secondary education courses for teacher certification.

Bachelor of Arts with a Major in Mathematics (Teacher Certification)

Completion of these course requirements does not guarantee the student's certification. For information about additional certification requirements, consult the Teach North Texas academic advisor.

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 120 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor of Arts degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Arts and Sciences requirements. The department suggests ENGL 1310 and 2700 for satisfying the English Composition and Rhetoric core requirements.

2. **Major Requirements:** 37 hours of mathematics courses, which must include:

- Mathematics Core (16 hours): MATH 1710, 1720, 2700, 2730 and 3000.
- Secondary Teacher Preparation (12 hours): MATH 2100, 3680, 4050 and 4060.

- c. Analysis (3 hours): One of the following: MATH 3350, 3410, 3420, 3610, 3740, 4100, 4200 or 4520.
- d. Algebra (3 hours): One of the following: MATH 3400, 3510, 3520, 4430 and 4450.
- e. Elective (3 hours): One additional upper-level mathematics course numbered 3350 or higher. Recommended courses are MATH 3400, 3410, 3740, 4450 and 4610.
- f. At least one of MATH 3510 or 3610 must be taken in satisfying other requirements.

3. Other Course Requirements:

- a. Three laboratory science courses are required, as follows:
 - BIOL 1710/1730
 - One course from CHEM 1410/1430 and PHYS 1710/1730
 - One course from BIOL 4700, CHEM 4700 and PHYS 4700.

Equivalent honors courses can also be used to satisfy this requirement. Students seeking certification in both math and physics are required to take PHYS 1710/1730, 2220/2240 and 3010/3030.

- b. Proficiency in a foreign language equivalent to 2050 is required; students are encouraged to choose Spanish for the foreign language requirement.
- c. Perspectives on Science and Mathematics is required: this may be satisfied by taking UCRS 4000 or any other course approved by the co-directors of Teach North Texas.

4. **GPA:** Students must achieve at least a 2.0 GPA in all mathematics courses above 3350.

5. **Computer Competency:** Students taking mathematics courses at the 2000 level or above are expected to be competent in computer programming, using languages such as BASIC, C, C++, Fortran, PASCAL or Java. This competency can be obtained through completion of CSCE 1020 or 1030 or consent of the department.

6. **Minor Requirement:** A minor in mathematics and science secondary teaching, administered by Teach North Texas, is required.

**BA with a Major in Mathematics
(Teacher Certification)**

The following four-year plan is one example of a variety of ways in which you can complete your chosen degree in four years, and will serve as guide for you to design your pathway to degree completion. Variations will depend on whether you need to take prerequisites or have college credit from exams or dual enrollment.

The College of Arts and Sciences expects you to have completed the State recommended high school program and be ready to enroll for Language 2040 or a mathematics course above college algebra. If you are not prepared for this level, the necessary prerequisites will either replace electives or increase the hours required for the degree.

FRESHMAN YEAR

	HOURS
FALL	
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing I*	3
LANG 2040, Foreign Language (intermediate, may be used to satisfy a portion of the Understanding the Human Community requirement)**	3
MATH 1710, Calculus I**	4
TNTX 1100, Secondary Teacher Education Preparation I: Inquiry Approaches to Teaching	1
Computer Competency or Elective (see major requirements)	<u>4</u>
Total	15
SPRING	
BIOL 1710/1730, Principles of Biology I and Laboratory	4
ENGL 2700, Technical Writing*	3
LANG 2050, Foreign Language (intermediate, may be used to satisfy a portion of the Understanding the Human Community requirement)**	3
MATH 1720, Calculus II	3
MATH 2100, Functions and Modeling for Secondary Mathematics Instruction	3
TNTX 1200, Secondary Teacher Education Preparation II: Inquiry-Based Lesson Design	<u>1</u>
Total	17

SOPHOMORE YEAR

FALL	HOURS
CHEM 1410/1430, General Chemistry for Science Majors and Laboratory, or PHYS 1710/1730, General Technical Physics and Laboratory (PHYS 1710/1730 required for MATH/PHYS certification)	4
EDSE 3500, Knowing and Learning in Mathematics and Science	3
MATH 2700, Linear Algebra and Vector Geometry	3
MATH 2730, Multivariable Calculus	3
PSCI 1040, American Government*	<u>3</u>
Total	16
SPRING	HOURS
EDSE 4000, Classroom Interactions	3
MATH 3000, Real Analysis I	3
MATH 3680, Applied Statistics	3
PSCI 1050, American Government*	3
Visual and Performing Arts*	<u>3</u>
Total	15

JUNIOR YEAR

FALL	HOURS
HIST 2610, United States History to 1865*	3
MATH 3510, Introduction to Abstract Algebra I, or MATH 3610, Real Analysis II (see major requirements)	3
MATH analysis or algebra requirement (advanced, see major requirements)	3
Elective or PHYS 2220/2240, Electricity and Magnetism and Laboratory (required for MATH/PHYS certification)	3–4
Social and Behavioral Science*	<u>3</u>
Total	15–16
SPRING	HOURS
HIST 2620, United States History Since 1865*	3
MATH 4050, Advanced Study of the Secondary Mathematics Curriculum	3
MATH 4060, Foundations of Geometry	3
UCRS 4000, Science in Ancient and Modern Times	3
Elective or PHYS 3010/3030, Modern Physics and Laboratory (required for MATH/PHYS certification)	<u>3–4</u>
Total	15–16

SENIOR YEAR

FALL	HOURS
BIOL 4700, Procedures and Materials for Science Instruction, or CHEM 4700, Procedures and Materials for Science Instruction, or PHYS 4700, Procedures and Materials for Science Instruction	3
EDSE 4500, Project-Based Instruction	3
MATH elective (3350 or higher)	3
Elective	3
Elective	2
Humanities*	<u>3</u>
Total	17
SPRING	HOURS
EDSE 4128, Student Teaching Seminar	1
EDSE 4608/4618, Student Teaching I and II in Mathematics and Science	6
Elective	<u>3</u>
Total	10

*See the *University Core Curriculum* section of this catalog for approved list of course options.

** See *Arts and Sciences degree requirements* section of this catalog for approved list of course options.

Actual degree audits may vary depending on availability of courses in a given semester.

Some courses may require prerequisites not listed.

Bachelor of Science in Mathematics (Non-Teacher Certification)

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 120 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor of Science degree as specified in the “General University Requirements” in the Academics section of this catalog and the College of Arts and Sciences requirements. The department suggests ENGL 1300 and 2700 for satisfying the English Composition and Rhetoric core requirements.

2. **Major Requirements:** 40 hours of mathematics courses, which must include:

- Mathematics Core (16 hours): MATH 1710, 1720, 2700, 2730 and 3000.
- At least one of MATH 3510 or 3610 must be taken in satisfying other requirements.
- Depth Requirement (9 hours): One of the following areas:
 - Analysis: MATH 3610 and two of the following: MATH 3350, 3410, 3420, 3740, 4100, 4200, 4520.
 - Algebra: MATH 3510 and two of the following: MATH 3400, 3520, 4430, 4450.

- Probability/Statistics: MATH 3680, 4610 and 4650.
 - Geometry/Topology: MATH 3740, 4060 and 4500.
- d. Breadth Requirement (9 hours): One course in each of the three areas not used to satisfy the depth requirement.
- e. Mathematics elective (6 hours): Two additional upper-level mathematics courses numbered 3350 or above.

3. Other Course Requirements:

a. Three laboratory science courses are required as follows:

Option I. Biology Emphasis

- both BIOL 1710/1730 and 1720/1740; and
- one of PHYS 1710/ 1730 or CHEM 1410/1430.

Option II. Chemistry Emphasis

- both CHEM 1410/1430 and 1420/1440; and
- BIOL 1710/1730.

Option III. Physics Emphasis

- both PHYS 1710/1730 and PHYS 2220/2240; and
- BIOL 1710/1730.

Option IV. Students double majoring in mathematics and another discipline (typically biology, chemistry, physics or engineering) which requires at least 12 hours of laboratory science may use the same laboratory science courses that satisfy the other major requirements to also satisfy the laboratory science requirement for the mathematics major.

Option V. Students with a minor in geography or geology may use GEOL 1610, GEOL 1710, and either PHYS 1710/1730 or CHEM 1410/1430 to satisfy the laboratory science requirement for the mathematics major.

b. **Foreign Language Requirement:** Students may complete either of two options to satisfy the College of Arts and Sciences foreign language requirement:

Option I: Proficiency in a foreign language equivalent to 1020 is required. Students intending to pursue a graduate degree in mathematics are encouraged to study French, German or Russian.

Option II: Complete 6 hours of technical writing courses from the following: ENGL 2700, 4180, 4190 and 4250.

4. **GPA:** Students must achieve a grade point average of at least 2.0 in all mathematics courses above 3350.

5. **Computer Competency:** Students taking mathematics courses at the 2000 level or above are expected to be competent in computer programming, using languages such as BASIC, C, C++, Fortran, PASCAL or Java. This competency can be obtained through completion of CSCE 1020 or 1030 or consent of the department.

6. **Minor Requirements:** One of the following is required:

- a. A minor of at least 18 hours (6 advanced). A minor in statistics does not fulfill this requirement.
- b. Completion of the certificate program in actuarial science. Students must take MATH 3680, 4610 and 4650 for fulfilling degree requirements; students are also encouraged to take MATH 3350 and 3740. Also, no mathematics courses may be chosen for fulfilling the elective requirements of the certificate program.

**BS in Mathematics
(Non-Teacher Certification)
Language Option II**

The following four-year plan is one example of a variety of ways in which you can complete your chosen degree in four years, and will serve as guide for you to design your pathway to degree completion. Variations will depend on whether you need to take prerequisites or have college credit from exams or dual enrollment.

The College of Arts and Sciences expects you to have completed the State recommended high school program and be ready to enroll for Language 2040 or a mathematics course above college algebra. If you are not prepared for this level, the necessary prerequisites will either replace electives or increase the hours required for the degree.

FRESHMAN YEAR

FALL	HOURS
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing II*	3
MATH 1710, Calculus I	4
PSCI 1040, American Government*	3
Humanities*	3
Understanding the Human Community*	<u>3</u>
Total	16

SPRING	HOURS
ENGL Composition II requirement (ENGL 2700, Technical Writing recommended)*	3
MATH 1720, Calculus II	3
PSCI 1050, American Government*	3
Computer Competency or Elective (see major requirements)	4
Understanding the Human Community*	<u>3</u>
Total	16

SOPHOMORE YEAR

FALL	HOURS
HIST 2610, United States History to 1865*	3
MATH 2700, Linear Algebra and Vector Geometry	3
MATH 2730, Multivariable Calculus	3
Laboratory Science (see major requirements)**	3–4
Minor	<u>3</u>
Total	15–16

SPRING	HOURS
HIST 2620, United States History Since 1865*	3
MATH 3000, Real Analysis I	3
MATH Breadth or Depth (advanced, see major requirements)	3
Laboratory Science (see major requirements)**	4
Minor	<u>3</u>
Total	16

JUNIOR YEAR

FALL	HOURS
MATH 3510, Introduction to Abstract Algebra I, or MATH 3610, Real Analysis II (see major requirements)	3
MATH Breadth or Depth requirement (advanced, see major requirements)	3
Laboratory Science (see major requirements)**	4
Minor	3
Minor	<u>3</u>
Total	16

SPRING	HOURS
MATH Breadth or Depth requirement (advanced, see major requirements)	3
MATH Breadth or Depth requirement (advanced, see major requirements)	3
Minor (advanced)	3
Minor (advanced)	3
Social and Behavioral Sciences	<u>3</u>
Total	15

SENIOR YEAR

FALL	HOURS
MATH Breadth or Depth requirement (advanced, see major requirements)	3
MATH Elective (3350 or higher)	3
Elective (advanced)	3
Elective	3
Visual and Performing Arts (advanced)*	<u>3</u>
Total	15

SPRING	HOURS
MATH Elective (3350 or higher)	3
Elective (advanced)	3
Elective	3
Technical Writing Elective (advanced, see major requirements)	<u>3</u>
Total	12

*See the *University Core Curriculum* section of this catalog for approved list of course options.

** See *Arts and Sciences degree requirements* section of this catalog for approved list of course options.

Actual degree audits may vary depending on availability of courses in a given semester.

Some courses may require prerequisites not listed.

Students may wish to use opportunities for electives to complete a minor of their choice or secondary education courses for teacher certification.

Bachelor of Science in Mathematics (Teacher Certification)

Degree Requirements

Completion of these course requirements does not guarantee the student's certification. For information about additional certification requirements, consult the Teach North Texas academic advisor.

- Hours Required and General/College Requirements:** A minimum of 120 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor of Science degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Arts and Sciences requirements. The department suggests ENGL 1300 and 2700 for satisfying the English Composition and Rhetoric core requirements.
- Major Requirements:** 43 hours of mathematics courses, which must include:
 - Mathematics Core (16 hours): MATH 1710, 1720, 2700, 2730 and 3000.
 - Secondary Teacher Preparation (12 hours): MATH 2100, 3680, 4050 and 4060.
 - Analysis (3 hours): One of the following: MATH 3350, 3410, 3420, 3610, 3740, 4100, 4200, 4520.
 - Algebra (3 hours): One of the following: MATH 3400, 3510, 3520, 4430, 4450.
 - Elective (9 hours): Three additional upper-level mathematics courses numbered 3350 or higher. Recommended courses are MATH 3400, 3410, 3740, 4450, 4610 and 4650.
 - At least one of MATH 3510 or 3610 must be taken in satisfying other requirements.

3. Other Course Requirements:

a. Three laboratory science courses are required as follows:

Option I: BIOL 1710/1730, BIOL 1720/1740 and BIOL 4700.

Option II: CHEM 1410/1430, CHEM 1420/1440 and CHEM 4700.

Option III: PHYS 1710/1730, PHYS 2220/2240 and PHYS 4700. Students seeking certification in both mathematics and physics are required both to use this option and to also take PHYS 3010/3030.

b. **Foreign Language Requirement:** Students may complete either of two options to satisfy the College of Arts and Sciences foreign language requirement:

Option I: Proficiency in a foreign language equivalent to 1020 is required. Students are encouraged to choose Spanish for the foreign language requirement.

Option II: Complete 6 hours of technical writing courses from the following: ENGL 2700, 4180, 4190 and 4250.

c. Perspectives on Science and Mathematics is required: this may be satisfied by taking UCRS 4000 or other course approved by the co-directors of Teach North Texas.

4. **GPA:** Students must achieve a grade point average of at least 2.0 in all mathematics courses above 3350.

5. **Computer Competency:** Students taking mathematics courses at the 2000 level or above are expected to be competent in computer programming, using languages such as BASIC, C, C++, Fortran, PASCAL or Java. This competency can be obtained through completion of CSCE 1020 or 1030 or consent of the department.

6. **Minor Requirements:** A minor in mathematics and science secondary teaching, administered by Teach North Texas, is required.

**BS in Mathematics
(Teacher Certification)**

The following four-year plan is one example of a variety of ways in which you can complete your chosen degree in four years, and will serve as guide for you to design your pathway to degree completion. Variations will depend on whether you need to take prerequisites or have college credit from exams or dual enrollment.

The College of Arts and Sciences expects you to have completed the State recommended high school program and be ready to enroll for Language 2040 or a mathematics course above college algebra. If you are not prepared for this level, the necessary prerequisites will either replace electives or increase the hours required for the degree.

FRESHMAN YEAR

FALL	HOURS
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing I*	3
PSCI 1040, American Government*	3
MATH 1710, Calculus I**	4
TNTX 1100, Secondary Teacher Education Preparation I: Inquiry Approaches to Teaching	1
Computer Competency or Elective (see major requirements)	4
Total	15
SPRING	HOURS
ENGL 2700, Technical Writing*	3
MATH 1720, Calculus II	3
MATH 2100, Functions and Modeling for Secondary Mathematics Instruction	3
PSCI 1050, American Government*	3
TNTX 1200, Secondary Teacher Education Preparation II: Inquiry-Based Lesson Design	1
Laboratory Science (see major requirements)** or PHYS 1710/1730, General Technical Phys- ics and Laboratory (required for MATH/ PHYS certification)	4
Total	17

SOPHOMORE YEAR

FALL	HOURS
EDSE 3500, Knowing and Learning in Mathematics and Science	3
LANG 1020, Foreign Language (elementary), or advanced technical writing**	3-4
MATH 2700, Linear Algebra and Vector Geometry	3
MATH 2730, Multivariable Calculus	3
Laboratory Science (see major requirements)** or PHYS 2220/2240, Electricity and Magne- tism and Laboratory (required for MATH/ PHYS certification)	4
Total	16-17

SPRING	HOURS
EDSE 4000, Classroom Interactions	3
MATH 3000, Real Analysis I	3
MATH 3680, Applied Statistics	3
Understanding the Human Community*, or Elective	3
Visual and Performing Arts*	3
Total	15
JUNIOR YEAR	
FALL	HOURS
BIOL 4700, Procedures and Materials for Science Instruction, or CHEM 4700, Procedures and Materials for Science Instruction, or PHYS 4700, Procedures and Materials for Science Instruction	3
HIST 2610, United States History to 1865*	3
MATH 3510, Introduction to Abstract Algebra I, or MATH 3610, Real Analysis II (see major requirements)	3
MATH Elective (3350 or higher)	3
Social and Behavioral Sciences*	3
Total	15
SPRING	HOURS
HIST 2620, United States History Since 1865*	3
MATH 4050, Advanced Study of the Secondary Mathematics Curriculum	3
MATH 4060, Foundations of Geometry	3
UCRS 4000, Science in Ancient and Modern Times	3
Understanding the Human Community*, or Elective	3
Total	15
SENIOR YEAR	
FALL	HOURS
EDSE 4500, Project-Based Instruction	3
MATH Elective (3350 or higher)	3
MATH Elective (3350 or higher)	3
Elective or PHYS 3010/3030, Modern Physics and Laboratory (required for MATH/PHYS certification)	3-4
Elective	1-2
Humanities*	3
Total	16-18
SPRING	HOURS
EDSE 4608/4618, Student Teaching I and II in Mathematics and Science	6
EDSE 4128, Student Teaching Seminar	1
MATH analysis or algebra requirement (advanced, see major requirements)	3
Total	10

*See the *University Core Curriculum* section of this catalog for approved list of course options.

** See the *math major requirements* for approved list of course options.

Students choosing the foreign language option (see major requirements) will also satisfy the Understanding the Human Community component of the University Core Curriculum.

Students choosing the technical writing option (see major requirements) will need to satisfy the Understanding the Human Community core component by selecting from approved course options in the "University Core Curriculum" in the Academics section of this catalog.

Actual degree audits may vary depending on availability of courses in a given semester.

Some courses may require prerequisites not listed.

Preparing for Graduate School

It is to be emphasized that the above are minimal requirements for an undergraduate degree in mathematics. For students who plan to go to graduate school in mathematics, the department strongly recommends the following courses: MATH 3410, 3510, 3610 and 4500. Other advanced courses should be selected in consultation with the faculty and the undergraduate advisor in the Department of Mathematics.

Minor in Mathematics

Students planning to minor in mathematics should consult the undergraduate advisor of the Department of Mathematics. A minor consists of at least 18 hours and usually includes MATH 1710, 1720, 1780 or 2700, and 2730 or 2770, plus 6 advanced hours. Neither MATH 1350 nor 1351 may be included in the minor, except for elementary education majors.

Minor in Statistics

A minor in statistics requires MATH 1710, 1720, 2730, 3680, 4610 and 4650. In addition, one additional course concerning the application of statistical methods to another discipline must be taken. This course must be chosen in consultation with the undergraduate advisor in the Department of Mathematics. These courses include, but are not limited to, the following: CHEM 3451, DSCI 3870, ECON 4870 and 4875, GEOG 3190, PHYS 4110 and 4310, PSCI 3300, and PSYC 3630.

Teacher Certification

The College of Arts and Sciences encourages students to explore teaching at the secondary level as a career option. The student's academic advisor in the Dean's Office for Undergraduates and Student Advising in GAB, Room 220, can assist students with specific requirements for teacher certification

in Mathematics. Upon completion of this program, students will be prepared to sit for the certification examinations in Mathematics. Students should consult with the mathematics faculty advisor for additional certification options.

Requirements utilizing a BA degree:

MATH 1710, 1720, 2100, 2700, 2730, 3000; MATH 3510 or 3610; MATH 4050; and 9 advanced hours from approved list (see major requirements).

See major for additional course work and GPA requirements.

Requirements utilizing a BS degree:

MATH 1710, 1720, 2100, 2700, 2730, 3000; MATH 3510 or 3610; MATH 4050; and 15 advanced hours from approved list (see major requirements).

See major for additional course work and GPA requirements.

Requirements utilizing a BA degree with Certification in Mathematics/Physics: MATH 1710, 1720, 2100, 2700, 2730, 3000; MATH 3510 or 3610; MATH 4050; 9 advanced hours of mathematics from approved list (see major requirements); PHYS 1710/1730, 2220/2240, 3210, 3220. *See major for additional course work and GPA requirements.*

Requirements utilizing a BS degree with Certification in Mathematics/Physics: MATH 1710, 1720, 2100, 2700, 2730, 3000; MATH 3510 or 3610; MATH 4050; 15 advanced hours of mathematics from approved list (see major requirements); PHYS 1710/1730, 2220/2240, 3210, 3220. *See major for additional course work and GPA requirements.*

Students must also complete the required minor in mathematics and science teaching. For more information, students should contact the Teach North Texas office in the General Academic Building, Room 461.

All state certification requirements and information on required examinations is available on the web site of the State Board for Educator Certification (SBEC), www.sbec.state.tx.us.

Minor in Mathematics and Science Secondary Teaching

Individuals interested in pursuing certification in math or science teaching at the secondary level may wish to pursue a minor through the Teach North Texas program. See "Teach North Texas" in the College of Arts and Sciences section of this catalog.

Certificate in Actuarial Science

Students interested in this interdisciplinary certificate program should contact the undergraduate advisor of the mathematics department. To be admitted into this program, students must complete the following courses: MATH 2700, 2730; either MATH 3680 or ECON 4630 or DSCI 3710; ECON 1100, 1110; CSCE 1020 or 1030 (CSCE 1040 is encouraged but not required); and FINA 3770.

This certificate requires 18 hours of courses: ECON 4870 and five elective classes selected from prefixes MATH, ECON, FINA and RMIN. Electives should be selected both for broad knowledge of the actuarial field and for preparation for the rigorous examination process prescribed by the Society of Actuaries and the Casualty Actuary Society. These five courses must be selected from the following:

- a. For students not majoring in mathematics, MATH 3350, 3410, 3740, 4610 and 4650. Recommended courses are MATH 4610 and 4650. For math majors, these classes may not be used for fulfilling certificate requirements.
- b. FINA 4200, 4210, 4300, 4310 and 4400. Recommended courses are FINA 4200, 4210 and 4310.
- c. RMIN 2500 or any 4000-level RMIN course. Recommended courses are RMIN 2500, 4200 and 4310. Students are also encouraged to seek internships that may be pursued in conjunction with RMIN 4800.
- d. ECON 4030, 4180 and 4875.
- e. Any other course must receive approval from the undergraduate advisor of the Department of Mathematics.

This program should prepare students for the preliminary actuarial exams, as follows:

- a. Actuarial Exam 1/P: MATH 4610. Students are encouraged to take MATH 4610 and attempt Exam 1/P before the end of the junior year.
- b. Actuarial Exam 2/FM: FINA 3770 and 4210.
- c. VEE (Validation by Educational Experience)-Economics: ECON 1100 and 1110.
- d. VEE-Applied Statistical Methods: ECON 4030 and 4870.
- e. VEE- Corporate Finance: FINA 3770 and 4200.

More information about the actuarial exams, the VEE requirements, careers in actuarial science and internship opportunities may be found at www.beanactuary.org, www.soa.org and www.casact.org.

Certificate in Statistics

A certificate in statistics consists of MATH 3680, 4610, 4650, and one additional course concerning the application of statistical methods to another discipline, chosen in consultation with the undergraduate advisor in the Department of Mathematics. Acceptable courses include, but are not limited to, the following: CHEM 3451, DSCI 3870, ECON 4870 and 4875, GEOG 3190 and 4410, PHYS 4110 and 4310, PSCI 3300, and PSYC 3630.

Graduate Degrees

The department offers degree programs leading to the Master of Arts, Master of Science and Doctor of Philosophy. For information, consult the *Graduate Catalog*.

Scholarships and Financial Assistance

The department administers five scholarship funds: the E. H. Hanson Scholarship, the Roger L. Perry Memorial Scholarship, the Mildred Masters McCarty Scholarship, the John Ed Allen Scholarship and the John W. Neuberger Scholarship. Jobs as tutors and graders also are available for mathematics majors. Contact the mathematics department office for information and application forms.

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.

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J. Baird Callicott, Chair

Faculty

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Introduction

The great virtue of philosophy is that it teaches not what to think, but how to think. It is the study of meaning, of the principles underlying conduct, thought and knowledge. The skills it hones are the ability to analyze, to question orthodoxies and to express things clearly. However arcane some philosophical texts may be ... the ability to formulate questions and follow arguments is the essence of education.... Philosophy is, in commercial jargon, the ultimate "transferable work skill."

— The Times, London, August 15, 1998

The study of philosophy has always been an important component of higher learning. Indeed, in the early Greek proto-universities, the Academy of Plato and the Lyceum of Aristotle, philosophy was the very foundation of all study. In the history of the European universities, from the 13th century to the present, philosophy has retained a significant place in the curriculum, even when challenged by advocates of religion, belles lettres, science or business. It has been studied as an end in itself, in its relation to other areas and as a preparation for studies in law, theology and medicine.