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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.

Department of Mathematics

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Neal Brand, Chair

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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, 1650 and 1680. Students not meeting prerequisites for courses in which they enroll will be at risk of being administratively dropped from their mathematics classes.

Students who have successfully completed the prerequisites described below will be asked on the first day of class to provide proof in the form of:

- a grade report, transcript, or Degree Audit Reporting System (DARS) printout reflecting the transfer course,
- an AP or CLEP score report, or
- a UNT mathematics department permit form.

Students who cannot provide this proof must pass a placement exam and provide a copy of the results to the instructor.

Prerequisites

- MATH 1100: MATH 1010 with a passing grade, or a UNT mathematics department permit form. A passing THEA mathematics score does not substitute for the MATH 1010 prerequisite.
- MATH 1190, 1350, 1400, 1650, 1680: MATH 1100 or equivalent with grade of C or better, or a UNT mathematics department permit form. MATH 1350 or MATH 1351 does not satisfy the College of Arts and Sciences degree requirement.

Permit Forms

UNT mathematics department permit forms may be obtained in advance of, or during, the first week of classes from the Department of Mathematics during specified office hours.

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

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 128 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.

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

- a. Mathematics Core (16 hours): MATH 1710, 1720, 2510, 2700 and 2730.
- 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: MATH 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 (3 hours): One additional upper-level mathematics course numbered 3350 or higher.
- f. All students seeking Secondary Teacher Certification must take MATH 4050.

3. **Other Course Requirements:** Three laboratory science courses are required, as follows:

- a. One course from BIOL 1710/1730, GEOG 1710 and GEOL 1610
- b. One course from PHYS 1710/1730 and CHEM 1410/1430
- c. One additional course from BIOL 1710/1730, 1720/1740, GEOG 1710, GEOL 1610, PHYS 1710/1730, 2220/2240, CHEM 1410/1430 and 1420/1440.

Equivalent honors courses can also be used to satisfy this requirement.

Proficiency in a foreign language equivalent to 2050 is required. Students wishing to pursue careers in elementary or secondary education are encouraged to choose Spanish for the foreign language requirement. 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:** A minor of at least 18 hours (6 advanced).

BA with a Major in Mathematics

Following is one suggested four-year degree plan. Students are encouraged to see their adviser each semester for help with program decisions and enrollment. Students are responsible for meeting all course prerequisites.

FRESHMAN YEAR

| FALL | HOURS |
|---|----------|
| ENGL 1310, College Writing I* | 3 |
| LANG 2040, Foreign Language (intermediate, see major requirements)** | 3 |
| MATH 1710, Calculus I | 4 |
| Natural/Life Sciences (see major requirements)** | 4 |
| Social and Behavioral Sciences* | <u>3</u> |
| Total | 17 |

| SPRING | HOURS |
|---|----------|
| ENGL 1320, College Writing II* | 3 |
| LANG 2050, Foreign Language (intermediate, see major requirements)** | 3 |
| MATH 1720, Calculus II | 3 |
| Natural/Life Sciences (see major requirements)** | 4 |
| Communication** | <u>3</u> |
| Total | 16 |

SOPHOMORE YEAR

| FALL | HOURS |
|---|----------|
| MATH 2510, Real Analysis I | 3 |
| MATH 2730, Multivariable Calculus | 3 |
| PSCI 1040, American Government* | 3 |
| Humanities* | 3 |
| Physical Science (see major requirements)** | <u>4</u> |
| Total | 16 |

| | |
|---|--------------|
| SPRING | HOURS |
| MATH BA Depth (advanced) | 3 |
| MATH 2700, Linear Algebra and Vector Geometry | 3 |
| PSCI 1050, American Government* | 3 |
| Computer Competency (see major requirements)** | 4 |
| Visual and Performing Arts* | <u>3</u> |
| Total | 16 |
| JUNIOR YEAR | |
| FALL | HOURS |
| HIST 2610, United States History to 1865* | 3 |
| MATH BA Depth (advanced) | 3 |
| MATH BA Breadth (advanced) | 3 |
| Minor | 3 |
| Minor | <u>3</u> |
| Total | 15 |
| SPRING | HOURS |
| HIST 2620, United States History Since 1865* | 3 |
| MATH BA Breadth (advanced) | 3 |
| Literature** | 3 |
| Minor | 3 |
| Minor (advanced) | <u>3</u> |
| Total | 15 |
| SENIOR YEAR | |
| FALL | HOURS |
| MATH BA Breadth (advanced) | 3 |
| Cross-Cultural, Diversity and Global Studies* | 3 |
| Minor (advanced) | 3 |
| Elective (advanced) | 3 |
| Elective (advanced) | 3 |
| Elective (advanced) | <u>3</u> |
| Total | 18 |
| SPRING | HOURS |
| MATH Elective (above 3350) | 3 |
| Elective (advanced) | 3 |
| Elective (advanced) | 3 |
| Minor (advanced) | 3 |
| Wellness* | <u>3</u> |
| Total | 15 |

**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 plans/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

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 128 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.

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

- Mathematics Core (16 hours): MATH 1710, 1720, 2510, 2700 and 2730.
- 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.
- Breadth Requirement (9 hours): One course in each of the three areas not used to satisfy the depth requirement.
- Mathematics elective (6 hours): Two additional upper-level mathematics courses numbered 3350 or above.
- All students seeking Secondary Teacher Certification must take MATH 4050.

3. **Other Course Requirements:** Three laboratory science courses are required. This requirement may be satisfied by one of the following two options:

- Emphasis on Life Science
 - Two of these must be either BIOL 1710/1730 and 1720/1740 or GEOG 1710 and GEOL 1610.
 - The third course must be either PHYS 1710/1730 or CHEM 1410/1430.
- Emphasis on Physics or Chemistry
 - Two of these must be either PHYS 1710/1730 and 2220/2240 or CHEM 1410/1430 and 1420/1440.
 - The third course must be BIOL 1710/1730, GEOG 1710 or GEOL 1610.

Equivalent honors courses can also be used to satisfy this 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 wishing to

pursue careers in elementary or secondary education are encouraged to choose Spanish for the foreign language requirement. 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. **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 of 18 hours (6 advanced).

BS in Mathematics

Following is one suggested four-year degree plan. Students are encouraged to see their adviser each semester for help with program decisions and enrollment. Students are responsible for meeting all course prerequisites.

FRESHMAN YEAR

| | HOURS |
|--|--------------|
| FALL | |
| ENGL 1310, College Writing I* | 3 |
| LANG 1010, Foreign Language (elementary, or Option II, see major requirements)** | 3-4 |
| MATH 1710, Calculus I | 4 |
| Natural/Life Sciences (see major requirements)* | 4 |
| Social and Behavioral Sciences* | <u>3</u> |
| Total | 17-18 |

| | HOURS |
|--|--------------|
| SPRING | |
| ENGL 1320, College Writing II* | 3 |
| LANG 1020, Foreign Language (elementary, or Option II, see major requirements)** | 3-4 |
| MATH 1720, Calculus II | 3 |
| Communication** | 3 |
| Natural/Life Sciences (see major requirements)* | <u>4</u> |
| Total | 16-17 |

SOPHOMORE YEAR

| | HOURS |
|---|--------------|
| FALL | |
| MATH 2510, Real Analysis I | 3 |
| MATH 2730, Multivariable Calculus | 3 |
| PSCI 1040, American Government* | 3 |
| Humanities* | 3 |
| Physical Science (see major requirements)** | <u>4</u> |
| Total | 16 |

| | HOURS |
|---|--------------|
| SPRING | |
| MATH BS Depth (advanced) | 3 |
| MATH 2700, Linear Algebra and Vector Geometry | 3 |
| PSCI 1050, American Government* | 3 |
| Computer Competency (see major requirements) | <u>4</u> |
| Visual and Performing Arts* | <u>3</u> |
| Total | 16 |

JUNIOR YEAR

| | HOURS |
|---|--------------|
| FALL | |
| HIST 2610, United States History to 1865* | 3 |
| MATH BS Depth (advanced) | 3 |
| MATH BS Breadth (advanced) | 3 |
| Minor | 3 |
| Minor | <u>3</u> |
| Total | 15 |

| | HOURS |
|--|--------------|
| SPRING | |
| HIST 2620, United States History Since 1865* | 3 |
| MATH BS Depth (advanced) | 3 |
| MATH BS Breadth (advanced) | 3 |
| Literature** | 3 |
| Minor | 3 |
| Minor (advanced) | <u>3</u> |
| Total | 18 |

SENIOR YEAR

| | HOURS |
|---|--------------|
| FALL | |
| MATH BS Breadth (advanced) | 3 |
| MATH Elective (above 3350) | 3 |
| Cross-Cultural, Diversity and Global Studies* | 3 |
| Elective (advanced) | 3 |
| Minor (advanced) | <u>3</u> |
| Total | 15 |

| | HOURS |
|----------------------------|--------------|
| SPRING | |
| MATH Elective (above 3350) | 3 |
| Elective (advanced) | 3 |
| Elective (advanced) | 3 |
| Minor (advanced) | 3 |
| Wellness* | <u>3</u> |
| Total | 15 |

**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 plans/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.

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 adviser in the Department of Mathematics.

Minor in Mathematics

Students planning to minor in mathematics should consult the undergraduate adviser 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.

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 adviser 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 adviser for additional certification options.

Requirements utilizing a BA degree:

MATH 1710, 1720, 2510, 2700, 2730; MATH 3510 or 3610; MATH 4050; and 12 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, 2510, 2700, 2730; MATH 3510 or 3610; MATH 4050; and 18 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, 2510, 2700, 2730; MATH 3510 or 3610; MATH 4050; 12 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, 2510, 2700, 2730; MATH 3510 or 3610; MATH 4050; 18 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 21 hours in upper-level education courses (EDSE 3800, 3830, 4060, 4070, 4108, 4118, 4840) and meet all GPA requirements to apply for state certification. In order to enroll for the first required education course, the student must make application to the certification program in the College of Education in Matthews Hall, Room 105.

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.

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.

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