The Department of Mathematics offers the following undergraduate and graduate programs. Specific requirements for these programs are listed within this Department of Mathematics section in the following order:

### Undergraduate Majors (B.A.)
- Mathematics (p. 1)
- Mathematics-Statistics/Actuarial Science (p. 2)
- Mathematics-Teaching (p. 3)

### Minors
- Mathematics (p. 3)
- Mathematics-Teaching (p. 4)
- Mathematics (K-8)-Teaching (p. 5)
- Statistics and Actuarial Science (p. 5)

### Graduate Majors (M.A.)
- Mathematics (p. 5):
  - Mathematics
  - Secondary Teaching
  - Community College Teaching
- Mathematics for the Elementary and Middle Grades (K-8) (p. 7)

### Graduate Majors (P.S.M.)
- Industrial Mathematics (p. 7)
(p. 8/Program Certificate
- Statistical Computing (p. 8)

### Notes:
1. A student majoring or minoring in mathematics, who has a grade point average of less than 2.25 in all departmental courses used for that major or minor may not apply a departmental course in which a grade of less than C- is earned to her/his major or minor.
2. Undergraduate students who have been admitted to the university provisionally because of non-satisfaction of the high school mathematics requirements may not enroll in any mathematics credit course before this requirement has been met.
3. Students who complete the requirements for more than one program (major or minor) within mathematics may have that noted on their transcripts.

### Bachelor of Arts Degree Programs

#### Mathematics Major
The Mathematics major requires a minimum of 120 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours. Students are encouraged to discuss Undergraduate Research (MATH 4990) with their adviser.

#### Common core: 15
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060)</td>
<td>Calculus I *</td>
</tr>
<tr>
<td>MATH 1421 (800:061)</td>
<td>Calculus II</td>
</tr>
<tr>
<td>MATH 2422 (800:062)</td>
<td>Calculus III</td>
</tr>
<tr>
<td>MATH 2500 (800:076)</td>
<td>Linear Algebra for Applications</td>
</tr>
</tbody>
</table>

#### Mathematics core: 16
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 2900</td>
<td>Discrete and Argumentative Mathematics</td>
</tr>
<tr>
<td>MATH 4420/5420 (800:140g)</td>
<td>Advanced Calculus I</td>
</tr>
<tr>
<td>MATH 4421/5421 (800:141g)</td>
<td>Advanced Calculus II</td>
</tr>
<tr>
<td>MATH 4500/5500 (800:160g)</td>
<td>Modern Algebra I</td>
</tr>
<tr>
<td>MATH 4501/5501 (800:162g)</td>
<td>Modern Algebra II</td>
</tr>
<tr>
<td>MATH 4900 (800:194)</td>
<td>Senior Mathematics Seminar</td>
</tr>
</tbody>
</table>

#### Probability/Statistics: select one of the following.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH/STAT 3751</td>
<td>Probability and Statistics</td>
</tr>
<tr>
<td>STAT 1772 (800:072)</td>
<td>Introduction to Statistical Methods</td>
</tr>
<tr>
<td>MATH/STAT 3752/5752 (800:152g)</td>
<td>cannot be used if used for the Probability/Statistics requirement. Other junior/senior level mathematics courses may be substituted with approval of advisor and Department Head.</td>
</tr>
</tbody>
</table>

#### Electives: Select two of the following.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 3410/5410 (800:142g)</td>
<td>Dynamical Systems: Chaos Theory and Fractals</td>
</tr>
<tr>
<td>MATH 3425/5425 (800:149g)</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>MATH 3440/5440 (800:176g)</td>
<td>Numerical Analysis *</td>
</tr>
<tr>
<td>MATH 3530/5530 (800:143g)</td>
<td>Combinatorics</td>
</tr>
<tr>
<td>MATH 3600/5600 (800:166g)</td>
<td>Euclidean Geometry</td>
</tr>
<tr>
<td>MATH 3610/5610 (800:165g)</td>
<td>Modern Geometries</td>
</tr>
<tr>
<td>MATH 3630/5630 (800:155g)</td>
<td>Differential Geometry</td>
</tr>
</tbody>
</table>
**Department of Mathematics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 3640/5640</td>
<td>History of Mathematics</td>
</tr>
<tr>
<td>MATH/STAT 3752</td>
<td>Introduction to Probability</td>
</tr>
<tr>
<td>MATH/ACT SCI 3780</td>
<td>Mathematics of Finance</td>
</tr>
<tr>
<td>MATH 4460/5460 (800:156g)</td>
<td>Introduction to Complex Analysis</td>
</tr>
<tr>
<td>MATH 4510/5510 (800:144g)</td>
<td>Elementary Number Theory</td>
</tr>
<tr>
<td>MATH 4641/5641 (800:167g)</td>
<td>Topology I</td>
</tr>
<tr>
<td>MATH 4900 (800:194) or MATH 4990 (800:195)</td>
<td>Senior Mathematics Seminar Undergraduate Research in Mathematics</td>
</tr>
</tbody>
</table>

Total Hours: 40-43

* These courses have additional prerequisites as follows: MATH 1420 (800:060) has prerequisite of a satisfactory score on a mathematics placement exam, or subsequent remediation. MATH 3440/5440 (800:176g) has prerequisite of CS 1130 (810:030), CS 1160 (810:036), or CS 1510 (810:051).

---

**Mathematics Major-Statistics/Actuarial Science**

The Mathematics-Statistics/Actuarial Science major requires a minimum of 120 total hours to graduate. This total includes Liberal Arts Core requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

The major is available in two emphases, the Statistics emphasis and the Actuarial Science emphasis. Each emphasis requires completion of the common core, the seminar/research requirement, the core for the chosen emphasis (Statistics or Actuarial Science), and 6 hours of electives that do not duplicate course work chosen to meet the chosen emphasis (Statistics or Actuarial Science) core requirement.

### Required

#### Mathematics:
- **Common core:**
  - MATH 1420 (800:060) Calculus I *  
  - MATH 1421 (800:061) Calculus II  
  - MATH 2422 (800:062) Calculus III  
  - MATH 2500 (800:076) Linear Algebra for Applications

#### Statistics/Actuarial Science core:
- STAT 1772 (800:072) Introduction to Statistical Methods  
- STAT 3775/5775 (800:174g) Introduction to Mathematical Statistics  
- MATH/STAT 3752 Introduction to Probability

#### Computer Programming:
- Select one of the following:
  - CS 1130 (810:030) Visual BASIC Programming  
  - CS 1160 (810:036) C/C++ Programming  
  - CS 1510 (810:051) Introduction to Computing  
  - STAT 4772/5772 (800:122g) Statistical Computing I

#### Seminar/research:
- Select and complete ONE of the following Emphasis Core:  
  - Mathematics of Finance  
  - Actuarial Mathematics  
  - Applied Statistical Methods for Research  
  - Regression Analysis  
  - Design and Analysis of Experiments  
  - Applied Multivariate Statistical Analysis

#### Electives:
- Select two electives from the following list. The same course cannot be used to satisfy both the emphasis core and elective requirement.

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 ví dụ: STAT 3771/5771 (800:121g) Applied Statistical Methods for Research
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT SCI 4788/5788</td>
<td>Loss Models</td>
</tr>
<tr>
<td>MATH 3440/5440</td>
<td>Numerical Analysis</td>
</tr>
<tr>
<td>MATH 3780/5780</td>
<td>Mathematics of Finance</td>
</tr>
</tbody>
</table>

Total Hours: 43-46

* MATH 1420 (800:060) has prerequisite of satisfactory score on mathematics placement exam or subsequent remediation.

** ACT SCI 3731 (800:146) may be repeated for credit for preparation for different exams, however only 3 hours will count toward the Statistics/Actuarial Science major.

Mathematics Major-Teaching

The Mathematics-Teaching major requires a minimum of 122-123 total hours to graduate.

This total includes Liberal Arts Core requirements, the Professional Education Requirements, and the following specified major requirements to complete the minimum of 122-123 hours.

Required

Mathematics:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common core:</td>
<td></td>
</tr>
<tr>
<td>MATH 1420 (800:060)</td>
<td>Calculus I *</td>
</tr>
<tr>
<td>MATH 1421 (800:061)</td>
<td>Calculus II</td>
</tr>
<tr>
<td>MATH 2422 (800:062)</td>
<td>Calculus III</td>
</tr>
<tr>
<td>MATH 2500 (800:076)</td>
<td>Linear Algebra for Applications</td>
</tr>
</tbody>
</table>

Teaching core:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1310 (800:096)</td>
<td>Technology for Secondary Mathematics Teachers</td>
</tr>
<tr>
<td>MATH 2303</td>
<td>Introduction to Teaching Secondary Mathematics</td>
</tr>
<tr>
<td>MATH 2900</td>
<td>Discrete and Argumentative Mathematics</td>
</tr>
<tr>
<td>MATH 3302</td>
<td>Field Experience in Teaching Secondary Mathematics</td>
</tr>
<tr>
<td>MATH 3304 (800:190)</td>
<td>The Teaching of Secondary Mathematics</td>
</tr>
<tr>
<td>MATH 3305 (800:183)</td>
<td>Connections: University Mathematics and the Secondary Curriculum</td>
</tr>
<tr>
<td>or MATH 3640/5640 (800:180g)</td>
<td>History of Mathematics</td>
</tr>
<tr>
<td>MATH 3313</td>
<td>Topics in Secondary Mathematics</td>
</tr>
<tr>
<td>MATH 3600/5600 (800:166g)</td>
<td>Euclidean Geometry</td>
</tr>
<tr>
<td>MATH 4500/5500 (800:160g)</td>
<td>Modern Algebra I</td>
</tr>
</tbody>
</table>

Total Hours: 11

Probability and Statistics:

Select one of the following. MATH 3751 (800:173) / STAT 3751 will not satisfy this requirement if a student has credit for STAT 1772 (800:072).

Select two of the following: 6

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 3530/5530</td>
<td>Combinatorics</td>
</tr>
<tr>
<td>MATH 3610/5610</td>
<td>Modern Geometries</td>
</tr>
<tr>
<td>MATH 4420/5420</td>
<td>Advanced Calculus I</td>
</tr>
<tr>
<td>MATH 4501/5501</td>
<td>Modern Algebra II</td>
</tr>
<tr>
<td>MATH 4510/5510</td>
<td>Elementary Number Theory</td>
</tr>
<tr>
<td>MATH 4615/5615</td>
<td>Geometric Transformations</td>
</tr>
</tbody>
</table>

Computer Science: 3-4

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1120 (810:056)</td>
<td>Media Computation</td>
</tr>
<tr>
<td>CS 1130 (810:030)</td>
<td>Visual BASIC Programming</td>
</tr>
<tr>
<td>CS 1140</td>
<td>Programming Environments for Secondary Education</td>
</tr>
<tr>
<td>CS 1160 (810:036)</td>
<td>C/C++ Programming</td>
</tr>
<tr>
<td>CS 1510 (810:051)</td>
<td>Introduction to Computing</td>
</tr>
</tbody>
</table>

Total Hours: 52-56

* MATH 1420 (800:060) has prerequisite of satisfactory score on mathematics placement exam or subsequent remediation.

Notes: For departmental approval to student teach, a student in the program must satisfy the University requirements to student teach and the following specific departmental requirements:

1) Must earn a C– or better in: MATH 1420 (800:060), MATH 1421 (800:061), MATH 2500 (800:076), MATH 2900, MATH 3302, MATH 3600/5600 (800:166g), MATH 4500/5500 (800:160g), and courses taken to satisfy the Probability and Statistics and Computer Science requirements. MATH 3302 is offered credit/no credit only effective Fall 2019 and beyond, and student must pass this course.

2) Must earn a grade of C or higher in: MATH 2303 and MATH 3304 (800:190).

3) Must complete all of the courses in the major with a major grade point average of 2.50 or higher

Minors

Mathematics Minor

Required

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1420 (800:060)</td>
<td>Calculus I *</td>
</tr>
<tr>
<td>MATH 1421 (800:061)</td>
<td>Calculus II</td>
</tr>
</tbody>
</table>
### Department of Mathematics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 2500 (800:076)</td>
<td>Linear Algebra for Applications</td>
<td></td>
</tr>
<tr>
<td><strong>Electives</strong></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Mathematics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT SCI 4739/5739 (800:158g)</td>
<td>Topics in Actuarial Science: Long-Term Actuarial Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 2422 (800:062)</td>
<td>Calculus III</td>
<td></td>
</tr>
<tr>
<td>MATH 2900</td>
<td>Discrete and Argumentative Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 3410/5410 (800:142g)</td>
<td>Dynamical Systems: Chaos Theory and Fractals</td>
<td></td>
</tr>
<tr>
<td>MATH 3425/5425 (800:149g)</td>
<td>Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 3430/5430 (800:150g)</td>
<td>Partial Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 3440/5440 (800:176g)</td>
<td>Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 3530/5530 (800:143g)</td>
<td>Combinatorics</td>
<td></td>
</tr>
<tr>
<td>MATH 3600/5600 (800:166g)</td>
<td>Euclidean Geometry</td>
<td></td>
</tr>
<tr>
<td>MATH 3610/5610 (800:165g)</td>
<td>Modern Geometries</td>
<td></td>
</tr>
<tr>
<td>MATH 3630/5630 (800:155g)</td>
<td>Differential Geometry</td>
<td></td>
</tr>
<tr>
<td>MATH 3640/5640 (800:180g)</td>
<td>History of Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 3751 (800:173)</td>
<td>Probability and Statistics</td>
<td></td>
</tr>
<tr>
<td>MATH/STAT 3752</td>
<td>Introduction to Probability</td>
<td></td>
</tr>
<tr>
<td>MATH 4420/5420 (800:140g)</td>
<td>Advanced Calculus I</td>
<td></td>
</tr>
<tr>
<td>MATH 4421/5421 (800:141g)</td>
<td>Advanced Calculus II</td>
<td></td>
</tr>
<tr>
<td>MATH 4460/5460 (800:156g)</td>
<td>Introduction to Complex Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 4500/5500 (800:160g)</td>
<td>Modern Algebra I</td>
<td></td>
</tr>
<tr>
<td>MATH 4501/5501 (800:162g)</td>
<td>Modern Algebra II</td>
<td></td>
</tr>
<tr>
<td>MATH 4510/5510 (800:144g)</td>
<td>Elementary Number Theory</td>
<td></td>
</tr>
<tr>
<td>MATH 4615/5615 (800:189g)</td>
<td>Geometric Transformations</td>
<td></td>
</tr>
<tr>
<td>MATH 4641/5641 (800:167g)</td>
<td>Topology I</td>
<td></td>
</tr>
<tr>
<td>STAT 3775/5775 (800:174g)</td>
<td>Introduction to Mathematical Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 3776/5776 (800:175g)</td>
<td>Regression Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 4777/5777 (800:157g)</td>
<td>Statistical Quality Assurance Methods</td>
<td></td>
</tr>
<tr>
<td><strong>STAT 4779/5779 (800:190g)</strong></td>
<td>Applied Multivariate Statistical Analysis</td>
<td></td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

* MATH 1420 (800:060) has prerequisite of satisfactory score on mathematics placement exam or subsequent remediation.

### Mathematics Minor-Teaching

#### Required

**Mathematics:**
- MATH 1420 (800:060) Calculus I * 4
- MATH 1421 (800:061) Calculus II 4

Select one of the following:
- STAT 1772 (800:072) Introduction to Statistical Methods 3
- STAT 1774 (800:064) Introductory Statistics for Life Sciences 3
- MATH 3751 (800:173) Probability and Statistics 3
- MATH 2303 Introduction to Teaching Secondary Mathematics 3
- MATH 2500 (800:076) Linear Algebra for Applications 3
- MATH 2900 Discrete and Argumentative Mathematics 3
- MATH 3600/5600 (800:166g) Euclidean Geometry 3
- MATH 3610/5610 (800:165g) Modern Geometries 3
- MATH 3630/5630 (800:155g) Differential Geometry 3
- MATH 3640/5640 (800:180g) History of Mathematics 3
- MATH 3751 (800:173) Probability and Statistics 3
- MATH/STAT 3752 Introduction to Probability 3
- MATH 4420/5420 (800:140g) Advanced Calculus I 3
- MATH 4421/5421 (800:141g) Advanced Calculus II 3
- MATH 4460/5460 (800:156g) Introduction to Complex Analysis 3
- MATH 4500/5500 (800:160g) Modern Algebra I 3
- MATH 4501/5501 (800:162g) Modern Algebra II 3
- MATH 4510/5510 (800:144g) Elementary Number Theory 3
- MATH 4615/5615 (800:189g) Geometric Transformations 3
- MATH 4641/5641 (800:167g) Topology I 3
- STAT 3775/5775 (800:174g) Introduction to Mathematical Statistics 3
- STAT 3776/5776 (800:175g) Regression Analysis 3
- STAT 4777/5777 (800:157g) Statistical Quality Assurance Methods 3

**Computer Science:**
- Select one of the following: 3-4
  - CS 1120 (810:056) Media Computation
  - CS 1130 (810:030) Visual BASIC Programming
  - CS 1140 Programming Environments for Secondary Education
  - CS 1160 (810:036) C/C++ Programming
  - CS 1510 (810:051) Introduction to Computing

**Total Hours** 33-34

* MATH 1420 (800:060) has prerequisite of satisfactory score on mathematics placement exam or subsequent remediation.

**Notes:** For departmental approval to student teach, a student in the program must satisfy the University requirements to student teach and the following specific departmental requirements:

1) Must earn a C– or better in MATH 1420, MATH 1421, MATH 2500, MATH 2900, MATH 3302, MATH 3600, MATH 4500, and STAT 1772 or STAT 1774 or MATH 3751. MATH 3302 is offered credit/no credit only effective Fall 2019 and beyond, and student must pass this course.

2) Must earn a grade of C or higher in MATH 2303 and MATH 3304.
3) Must complete all of the courses in the minor with a minor grade point average of 2.50 or higher

**Mathematics Minor (K-8)-Teaching**

**Required**

**Mathematics:**
- MATH 1204 Mathematical Reasoning for Elementary Teachers I 3
- MATH 2204 Mathematical Reasoning for Elementary Teachers II 3
- MATH 3204 Mathematical Reasoning for Elementary Teachers III 3
- MATH 3211 (800:111g) Introduction to Algebraic Thinking for Elementary Teachers 3
- MATH 3212/5212 (800:112g) Introduction to Geometry and Measurement for Elementary Teachers 3
- MATH 3213/5213 (800:113g) Topics in Mathematics for Grades K-8 3
- MATH 3214/5214 (800:114g) Problem Solving in Mathematics for Elementary Teachers 3

**Computer Science:**
- CS 1150 Programming Environments for Elementary Education 3

**Total Hours** 24

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**Statistics and Actuarial Science Minor**

Complete one of the following emphases

**Actuarial Science emphasis:**
- MATH 1420 (800:060) Calculus I * 4
- MATH 1421 (800:061) Calculus II 4
- ACT SCI/MATH 3780 Mathematics of Finance 3
- MATH/STAT 3752 Introduction to Probability 3

**Statistics emphasis**
- STAT 1772 (800:072) Introduction to Statistical Methods 3
- STAT 3771/5771 (800:121g) Applied Statistical Methods for Research 3
- STAT 4772/5772 (800:122g) Statistical Computing I 3
- STAT 4782/5782 Statistical Computing II 3

**Electives**
Select three courses from the following or from the emphasis not chosen:
- ACT SCI 3731 (800:146) Actuarial Examination Preparation 3
- ACT SCI 4785/5785 (800:197g) Introduction to Financial Engineering 3
- ACT SCI 4735/5735 (800:153g) Actuarial Mathematics 3
- ACT SCI 4788/5788 (800:170g) Loss Models 3
- MATH 2422 (800:062) Calculus III 4
- MATH 2500 (800:076) Linear Algebra for Applications 3

**Total Hours** 21-24

* MATH 1420 (800:060) has a prerequisite of satisfactory score on mathematics placement exam or subsequent remediation.

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**Master of Arts Degree Programs**

**Major in Mathematics**

The major in Mathematics is available in three emphases: Mathematics, Secondary Teaching, and Community College Teaching.

Only graduate courses (course numbers 5000 or above) will apply to a graduate degree, even if the undergraduate course number (4999 or less) is listed. No exceptions will be made.

The Mathematics emphasis is available on the **thesis** and **non-thesis** options. A **minimum of 36 hours** is required for the **thesis** option, including 6 hours of MATH 6299 (800:299) and a **minimum of 15 additional hours of 200/6000-level course work**. A **minimum of 33 hours** is required for the **non-thesis** option, including a minimum of 3 hours of MATH 6299 (800:299) and a **minimum of 15 additional hours of 200/6000-level course work**.

The Secondary Teaching emphasis is offered on a **non-thesis** option only; a **minimum of 30 hours**, including a **minimum of 18 hours of 200/6000-level course work** is required.

The Community College Teaching emphasis is offered on a **non-thesis** option only; a **minimum of 30 hours**, including a **minimum of 15 hours of 200/6000-level course work** is required.

Students interested in this program must submit a completed Application for Admission to Graduate Study and should refer to their MyUNIverse Student Center To-Do list or contact the Department of Mathematics for other application requirements. Graduate information and application for graduate admission can be found at www.grad.uni.edu/admission.

The Graduate Record Examination (General Test) is **not** required for admission to the program.

Courses taken to satisfy B.A. requirements may not be repeated to count toward the graduate program.

Successful completion of a final written comprehensive examination is required for the **non-thesis option on the Mathematics emphasis only**.

**Mathematics Emphasis**

**Required**

**Mathematics:**
MATH 3630/5630 (800:155g) or MATH 4615/5615 (800:189g) 
Differential Geometry or Geometric Transformations 
3
MATH 6420 (800:201) 
Mathematical Analysis I 
3
MATH 6460 (800:203) 
Complex Analysis I 
3
MATH 6500 (800:240) 
Abstract Algebra I 
3
Select at least two of the following: 
6
MATH 6421 (800:202) 
Mathematical Analysis II 
MATH 6461 (800:204) 
Complex Analysis II 
MATH 6501 (800:241) 
Abstract Algebra II 

Research: 
3 or 6
MATH 6299 (800:299) 
Research 
Thesis option (6 hours) 
Non-thesis option (3 hours)
Electives 
12
Mathematics: 
Select 12 hours from any of the courses listed above that were not used for the requirements there or from among the following:
ACT SCI 4739/5739 (800:158g) 
Topics in Actuarial Science, Topics in Actuarial Science: Long-Term Actuarial Mathematics 
MATH 3425/5425 (800:149g) 
Differential Equations 
MATH 3430/5430 (800:150g) 
Partial Differential Equations 
MATH 3440/5440 (800:176g) 
Numerical Analysis 
MATH 3530/5530 (800:143g) 
Combinatorics 
MATH 3640/5640 (800:180g) 
History of Mathematics 
MATH/STAT 3752 
Introduction to Probability 
MATH 4421/5421 (800:141g) 
Advanced Calculus II 
MATH 4460/5460 (800:156g) 
Introduction to Complex Analysis 
MATH 4501/5501 (800:162g) 
Modern Algebra II 
MATH 4641/5641 (800:167g) 
Topology I 
MATH 6510 (800:210) 
Theory of Numbers 
MATH 6640 (800:246) 
Topics in the History of Mathematics 
MATH 6650 (800:263) 
Topics in Mathematical Logic and Set Theory 
MATH 6779 (800:273) 
Topics in Probability and Statistics 
STAT 3775/5775 (800:174g) 
Introduction to Mathematical Statistics 
STAT 3776/5776 (800:175g) 
Regression Analysis 
STAT 4777/5777 (800:157g) 
Statistical Quality Assurance Methods 
STAT 4779/5779 (800:196g) 
Applied Multivariate Statistical Analysis 
Total hours thesis option 
36
Total hours non-thesis option 
33

Secondary Teaching Emphasis
The Secondary Teaching emphasis is designed for secondary school mathematics teachers interested in developing a deeper background in mathematics and pedagogy to enhance teaching and increase student learning.

Required
Mathematics Education:
MATH 6201 (800:220) 
Foundations of Mathematics Education 
3
MATH 6381 (800:281) 
Current Research in Mathematics Education 
3
MATH 6209 
Mathematics Curriculum and Assessment 
3
MATH 6225 
Teaching and Learning Mathematics 
3
MATH 6236 
Equity and Mathematics Education 
3
Mathematics:
MATH 6371 (800:271) 
Probability and Statistical Inference 
3
MATH 6370 (800:270) 
Applied Linear Statistical Methods 
3
Select one course from the following:
MATH 6212 (800:211) 
Foundations of Algebraic Reasoning 
3
or MATH 6504 
Advanced Linear Algebra
Select One Course from the Following:
MATH 6215 
Foundations of Geometric Reasoning 
3
or MATH 6670 (800:267) 
Non-Euclidean Geometry 
3
Select One Course from the Following:
MATH 6410 
Foundations of Calculus 
3
or MATH 6205 (800:215) 
Teaching Rational Numbers and Proportionality 
3
Total Hours 
30

Community College Teaching Emphasis
The Community College Teaching emphasis is designed to serve those seeking to prepare for a career in community college teaching or working professionals in the field who are seeking career advancement.

Required:
Mathematics Education:
MATH 6201 (800:220) 
Foundations of Mathematics Education 
3
MATH 6381 (800:281) 
Current Research in Mathematics Education 
3
MATH 6225 
Teaching and Learning Mathematics 
3
MATH 6236  Equity and Mathematics Education  3
MATH 6209  Mathematics Curriculum and Assessment  3

Mathematics:
MATH 6504  Advanced Linear Algebra  3
MATH 6370 (800:270)  Applied Linear Statistical Methods  3
MATH 6371 (800:271)  Probability and Statistical Inference  3
MATH 6410  Foundations of Calculus  3
MATH 6670 (800:267)  Non-Euclidean Geometry  3

Total Hours  30

Major in Mathematics for the Elementary and Middle Grades (K-8)

This major is intended for teachers interested in mathematics for the elementary and middle grades (K-8) and for mathematics specialists and supervisors. Teacher licensure is a prerequisite for completing the program approval process for this major. Normally, candidates will have at least 2 years teaching experience.

Students interested in this program must submit a completed Application for Admission to Graduate Study and should refer to their MyUNIverse Student Center To-Do list or contact the Department of Mathematics for other application requirements. Graduate information and application for graduate admission can be found at www.grad.uni.edu/admission.

The Graduate Record Examination (General Test) is not required for admission to the program.

Only graduate courses (course numbers 5000 or above) will apply to a graduate degree, even if the undergraduate course number (4999 or less) is listed. No exceptions will be made.

This major is available on the non-thesis option only; a minimum of 30 hours is required.

A minimum of 15 hours of 200/600-level course work is required.

Requirements for admission to the program include the completion of a bachelor’s degree with a GPA of 3.00 or higher and successful completion of the following university-level courses:

Prerequisite Courses:  
MATH 1420 (800:060)  Calculus I  4  
MATH 1421 (800:061)  Calculus II  4  
MATH 2422 (800:062)  Calculus III  4  
MATH 2500 (800:076)  Linear Algebra for Applications  3  
STAT 1772 (800:072)  Introduction to Statistical Methods  3  

One course in computer programming (or equivalent):  
CS 1130 (810:030)  Visual BASIC Programming  3  
CS 1160 (810:036)  C/C++ Programming  3  
CS 1510 (810:051)  Introduction to Computing  4  

This major requires completion of 9 hours of the PSM Industrial Mathematics core, and 21 hours of electives.

Prerequisite Courses:  
MATH 6745 (800:250)  Deterministic Operations Research  3  
MATH 6747 (800:252)  Discrete-Event System Simulation  3  
MATH 6796  PSM Capstone Project  3  

Total Hours  30

Professional Science Master’s Degree Program

Major in Industrial Mathematics

The Professional Science Master’s Degree in Industrial Mathematics is designed to prepare students for a career in industry. The curriculum combines a business and experiential component with advanced course work.

Students interested in this program must submit a completed Application for Admission to Graduate Study and should refer to their MyUNIverse Student Center To-Do list or contact the Department of Mathematics for any other application requirements. Graduate information and application for graduate admission can be found at www.grad.uni.edu/admission.

The Graduate Record Examination (General Test) is not required for admission to the program.

Only graduate courses (course numbers 5000 or above) will apply to a graduate degree, even if the undergraduate course number (4999 or less) is listed. No exceptions will be made.

This major is a non-thesis program. A minimum of 30 hours is required. A minimum of 12 hours of 6000-level course work is required.

No comprehensive examination is required for this non-thesis option.

Requirements for admission to the program include the completion of a bachelor’s degree with a GPA of 3.00 or higher and successful completion of the following university-level courses:

Required Core:  
MATH 6745 (800:250)  Deterministic Operations Research  3  
MATH 6747 (800:252)  Discrete-Event System Simulation  3  
MATH 6796  PSM Capstone Project  3  

Total Hours  30

Department of Mathematics
## Electives from the following:

### Marketing:
- MKTG 4170/5170 (130:191g) Marketing Strategy
- MKTG 6170 (130:263) Marketing Management

### Management:
- MGMT 6250 (150:250) Strategic Planning and Organization Analysis
- MGMT 6262 (150:272) Cross-Functional Operations

### Finance:
- FIN 3130/5130 (160:151g) Corporate Finance
- FIN 3160/5160 (160:152g) Principles of Investments
- FIN 6266 (160:266) Financial Management and Markets

### Technology:
- TECH 3024/5024 (330:122g) Advanced CAD and Modeling
- TECH 3147 (330:147) Computer Aided Manufacturing

### Mathematics:
- ACT SCI/MATH 3780 Mathematics of Finance
- ACT SCI 4735/5735 (800:153g) Actuarial Mathematics
- ACT SCI 4739/5739 (800:158g) Topics in Actuarial Science, Topics in Actuarial Science: Long-Term Actuarial Mathematics
- ACT SCI 4785/5785 (800:197g) Introduction to Financial Engineering
- ACT SCI 4788/5788 (800:170g) Loss Models
- MATH 3425/5425 (800:149g) Differential Equations
- MATH 3430/5430 (800:150g) Partial Differential Equations
- MATH 3440/5440 (800:176g) Numerical Analysis
- MATH 3530/5530 (800:143g) Combinatorics
- MATH 3630/5630 (800:155g) Differential Geometry
- MATH/STAT 3752 Introduction to Probability
- MATH 4460/5460 (800:156g) Introduction to Complex Analysis
- MATH 6746 (800:251) Probabilistic Operations Research
- MATH 6748 (800:253) Modeling Industrial Systems Using Queueing Networks
- MATH 6779 (800:273) Topics in Probability and Statistics
- STAT 3771/5771 (800:121g) Applied Statistical Methods for Research
- STAT 3775/5775 (800:174g) Introduction to Mathematical Statistics

### Total Hours: 21

### Program Certificates

The University of Northern Iowa makes available, in addition to traditional programs, the opportunity for students to earn program certificates. Program certificates provide an alternative to programs leading to a degree, a major, or a minor; they certify that an individual has completed a program approved by the university. For information on the following certificates, contact the Department of Mathematics or the Office of the Registrar, which serves as the centralized registry.

#### Statistical Computing Certificate

**Required:**
- STAT 3771/5771 (800:121g) Applied Statistical Methods for Research
- STAT 4772/5772 (800:122g) Statistical Computing I
- STAT 4782/5782 Statistical Computing II
- Electives: 6 hours from the following 6

**Total Hours:** 15

**Course Requirements:**
- STAT 3776/5776 (800:175g) Regression Analysis
- STAT 3778/5778 (800:171g) Spatial Data Analysis
- STAT 4772/5772 (800:122g) Statistical Computing I
- STAT 4773/5773 (800:123g) Design and Analysis of Experiments
- STAT 4777/5777 (800:157g) Statistical Quality Assurance Methods
- STAT 4779/5779 (800:196g) Applied Multivariate Statistical Analysis
- STAT 4782/5782 Statistical Computing II
- STAT 6772 (800:272) Advanced Statistical Methods
- Computer Science:
  - CS 3470/5470 (810:147g) Networking
  - CS 6400 (810:240) Computer Systems
- Physics:
  - PHYSICS 6100 (880:205) Modeling and Simulation of Physical Systems

**Total Hours:** 30