# MATHEMATICS, BACHELOR OF SCIENCE

## Requirements

### Courses Required (Core Curriculum)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 1950</td>
<td>CALCULUS I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 1960</td>
<td>CALCULUS II</td>
<td>5</td>
</tr>
<tr>
<td>MATH 1970</td>
<td>CALCULUS III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2050</td>
<td>APPLIED LINEAR ALGEBRA</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2230</td>
<td>INTRODUCTION TO ABSTRACT MATH</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2350</td>
<td>DIFFERENTIAL EQUATIONS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3230</td>
<td>INTRODUCTION TO ANALYSIS</td>
<td>3</td>
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</table>

Select two of the following:  

- CIST 1400 | INTRODUCTION TO COMPUTER SCIENCE I | 6
- CSCI 1620 | INTRODUCTION TO COMPUTER SCIENCE II
- MATH 2200 | MATHEMATICAL COMPUTING I
- MATH 3200 | MATHEMATICAL COMPUTING II

### Additional Coursework: Concentration or No Concentration Option

An additional 15 credits of approved upper-level MATH/STAT courses which must include at least 9 credits at the 4000 level.

### Suggested Upper Division Specialty Areas:

- Applied Mathematics
- Computer Science
- Data Science
- Education
- Operations Research
- Statistics
- Traditional Mathematics

### B.S. Degree Additional Requirement

18 credits in cognate courses outside the Department of Mathematics and approved by the Math Department Curriculum Committee as a cohesive group of courses, normally with at least 9 credits 3000 or 4000 level.

### Total Credits

47

1 May not include both CIST 1400 and MATH 2200.

### Additional Requirements

- Exit Interview.

### Data Science Concentration

This concentration is recommended for students interested in a career as a data science professional or pursuing graduate study in disciplines with a strong data analysis component. Data science is the art and science of transforming raw data into deliverable data products in order to help businesses or government agencies make more informed decisions.

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<tr>
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<td>INTRODUCTION TO PROBABILITY AND STATISTICS I</td>
<td>3</td>
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<tr>
<td>MATH 4750</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS II</td>
<td>3</td>
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</table>

### B.S. Degree Additional Requirement

- Cognate Area: at least 18 credits
- Choose one of the following:
  - Minor in Business Administration for Non-Business Majors
  - Minor in Management Information Systems
  - 18 credits of an approved Cognate Area outside the Math Department

### Mathematics Education Concentration

This concentration is recommended for students interested in pursuing a career in Secondary Education. In some cases it is possible to earn a B.S. or a B.A. in Math and a B.S. in Secondary Education.

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<tr>
<td>MATH/CSCI 3100</td>
<td>APPLIED COMBINATORICS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3640</td>
<td>MODERN GEOMETRY</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3850</td>
<td>HISTORY OF MATHEMATICS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4030</td>
<td>MODERN ALGEBRA</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4740</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS I</td>
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### Total Credits

15

### Second Computing Course

This concentration also requires the following course, which counts as the Math major’s second computing course.

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### Additional Requirement

Students must include the following Educator Preparation Program Requirements:

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<tr>
<td>TED 2300</td>
<td>HUMAN GROWTH AND LEARNING</td>
<td>3</td>
</tr>
<tr>
<td>TED 2100</td>
<td>EDUCATIONAL FOUNDATIONS</td>
<td>3</td>
</tr>
<tr>
<td>TED 2200</td>
<td>HUMAN RELATIONS FOR BIAS-FREE CLASSROOMS</td>
<td>3</td>
</tr>
<tr>
<td>SPED 3800</td>
<td>DIFFERENTIATION AND INCLUSIVE PRACTICES</td>
<td>3</td>
</tr>
<tr>
<td>TES 2400</td>
<td>PLANNING FOR EFFECTIVE TEACHING</td>
<td>6</td>
</tr>
<tr>
<td>TES 3550</td>
<td>SECONDARY CLASSROOM MANAGEMENT</td>
<td>3</td>
</tr>
<tr>
<td>TES 3690</td>
<td>LITERACY AND LEARNING</td>
<td>3</td>
</tr>
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the optimal distribution of bicycles in a bike sharing system. Operations research is the application of advanced analytical methods to help make better decisions in a variety of settings. For example, (1) determining the route a delivery truck should take in order to make all deliveries while traveling the fewest number of miles; (2) determining the best location for a new facility such as a fire station; (3) scheduling airline flights and crew; and (4) determining the optimal distribution of bicycles in a bike sharing system. Operations research enables better decision making. A plethora of problems may be solved using operations research, including experience using appropriate software tools.

This concentration is recommended for students interested in a career as an actuary or in pursuing a graduate degree in operations research or a related field.

Pre-Actuarial Math Concentration

This concentration is recommended for students interested in a career as an actuary and who plan on taking the actuarial exams. An actuary evaluates the financial impact of risk by evaluating the likelihood of future events, designing creative ways to reduce the likelihood of undesirable events, and decreasing the impact of undesirable events that do occur.

Actuaries work for insurance companies, government, and consulting firms. In the actuarial profession you can earn while you learn. Many students receive on-the-job training while enrolled in the examination process. Employers are generally supportive and may give students study time during working hours, pay exam fees, and award raises for each exam passed. However, most employers prefer to hire people who have started the series of examinations on their own and have already passed at least two or three.

The 15 credits of upper-level courses must include:

- MATH 3400 THEORY OF INTEREST
- MATH 4740 INTRODUCTION TO PROBABILITY AND STATISTICS I
- MATH 4750 INTRODUCTION TO PROBABILITY AND STATISTICS II
- STAT 4440 TIME SERIES ANALYSIS
- MATH/CSCI 4310 PROBABILISTIC OPERATIONS RESEARCH MODELS
- or STAT 4430 LINEAR MODELS

Total Credits 15

B.S. Degree Additional Requirement

Cognate Area: 18 hours of courses outside the Math Department that relate to operations research, to be planned with an advisor and subject to approval by the Math Department Curriculum Committee.

Research Experience Concentration

This concentration is recommended for students interested in independent work and for students planning to pursue graduate work in mathematics. The research includes problem-solving methods such as deterministic and stochastic optimization, machine learning, and simulation.

The 15 hours of upper-level courses must include:

- MATH/CSCI 4300 DETERMINISTIC OPERATIONS RESEARCH MODELS
- MATH/CSCI 4310 PROBABILISTIC OPERATIONS RESEARCH MODELS
- MATH 4320 COMPUTATIONAL OPERATIONS RESEARCH
- MATH 4740 INTRODUCTION TO PROBABILITY AND STATISTICS I
- or STAT 3800 APPLIED ENGINEERING PROBABILITY AND STATISTICS

Select one of the following:

- MATH/CSCI 4150 GRAPH THEORY & APPLICATIONS
- MATH 4750 INTRODUCTION TO PROBABILITY AND STATISTICS II
- MATH 4900 INDEPENDENT STUDIES
- STAT 4410 INTRODUCTION TO DATA SCIENCE
- STAT 4420 EXPLORATORY DATA VISUALIZATION AND QUANTIFICATION
- STAT 4430 LINEAR MODELS
- STAT 4440 TIME SERIES ANALYSIS
- MATH/STAT 4450 INTRODUCTION TO MACHINE LEARNING AND DATA MINING

Total Credits 15

B.S. Degree Additional Requirement

Cognate Area: 18 hours of courses outside the Math Department that relate to operations research, to be planned with an advisor and subject to approval by the Math Department Curriculum Committee.

Approved Research Experience

A variety of options exist for meeting this requirement. They include 1) research experiences such as an REU or FUSE that lead to a project paper, or 2) senior honors thesis leading to graduation with distinction. To satisfy this concentration, students must complete a Research Experience contract that is approved by the Math Department Curriculum Committee and submit the thesis or research paper required by the contract. Visit with the chair of the Math Department for more information.

B.S. Degree Additional Requirement

Cognate Area: The Cognate Area must be a minor in another department or program (any department/program), or be a Cognate Area designed for
the research experience with the Research Mentor and then approved by the Math Department Curriculum Committee.

**Statistics Concentration**

This concentration is recommended for students interested in the theoretical and practical aspects of statistics, particularly those students who are interested in pursuing graduate study in statistics or biostatistics.

Statistics, the study of data, is of growing importance. Students who have the skills to properly collect, analyze, interpret, and present data are in high demand around the country.

The objectives of this concentration are: (1) to gain an understanding of the mathematical underpinnings of statistics; (2) to use appropriate statistical modeling to solve practical problems; (3) to develop an understanding of how to use statistical software; (4) to communicate statistical results to non-statisticians.

Statistics is used in many fields, including biology, sociology, psychology, medicine, economics, quality control, and sports. This diversity, along with the growing need for people with statistical knowledge makes it an attractive choice for mathematics students.

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<td>MATH 4750</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS II</td>
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Select three of the following, with at least two from group A:

- STAT 4420 EXPLORATORY DATA VISUALIZATION AND QUANTIFICATION
- STAT 4430 LINEAR MODELS
- STAT 4440 TIME SERIES ANALYSIS

Group B:

- MATH/CSCI 3100 APPLIED COMBINATORICS
- MATH/CSCI 4310 PROBABILISTIC OPERATIONS RESEARCH MODELS
- MATH 4900 INDEPENDENT STUDIES
- STAT 4410 INTRODUCTION TO DATA SCIENCE
- MATH/STAT 4450 INTRODUCTION TO MACHINE LEARNING AND DATA MINING

**Total Credits** 15

1 Independent Study must be related to computational mathematics, developed and supervised by the advisor.

**B.S. Degree Additional Requirement**

**Cognate Area:** 18 hours of courses outside the Math Department to be planned with the advisor and subject to approval by the Math Department Curriculum Committee.

**Computational Mathematics Concentration**

This concentration is recommended for students interested in computational science, particularly those students who are interested in pursuing graduate study in applied and computational mathematics at the graduate level.

A concentration in computational mathematics may be useful in a wide range of areas including science, engineering, government, health care, business, and information technology. The specialization in computational mathematics is designed for students with a strong interest in mathematics and in mathematical applications to areas of science and engineering. By choosing elective courses carefully, students completing this specialization will be prepared for a career in a variety of computing and/or engineering areas. Students will also be prepared to continue on to a graduate program in applied mathematics.

**The 15 credits of upper-level courses must include:**

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<tr>
<td>MATH/CSCI 3300</td>
<td>NUMERICAL METHODS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4330</td>
<td>INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4900</td>
<td>INDEPENDENT STUDIES ¹</td>
<td>3</td>
</tr>
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</table>

Select two of the following:

- MATH 4050 LINEAR ALGEBRA
- MATH 4230 MATHEMATICAL ANALYSIS I
- MATH 4240 MATHEMATICAL ANALYSIS II
- MATH 4350 ORDINARY DIFFERENTIAL EQUATIONS
- MATH 4400 FINITE ELEMENT METHODS FOR SOLVING ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
- STAT 3800 APPLIED ENGINEERING PROBABILITY AND STATISTICS

**Total Credits** 15

1 Independent Study must be related to computational mathematics, developed and supervised by the advisor.