

# Mathematics (MTH)

## Division of Science and Mathematics

- **BBA, General Track: 45 credit hours**
- **BA, Secondary Education Track: 40 credit hours**
- **BS, Financial and Actuarial Sciences Track: 54-59 credit hours**
- **BS, General Track: Minimum of 60 credit hours**
- **Minor: 18 credit hours**
- **Major/Minor GPA required for graduation: 2.25**
- **All courses for the major/minor must be completed with a grade of a D or better**

### PROGRAM REQUIREMENTS:

- **Complete mathematics core requirements**
- **Capstone: Seminar in Mathematics (MTH 490) or Internship in Mathematics (MTH 470)**

**Description of Major:** Mathematics is the science of quantity, change, structure, and space. While solving problems culled from a broad body of knowledge, mathematics majors will develop rigorous analytical abilities and sharpen their oral and written communication skills.

### Student Learning Outcomes

*Students will:*

- Use standard mathematical techniques to solve problems.
- Apply standard proof techniques in the verification of mathematical truth.
- Gain proficiency in using analytical software.
- Effectively communicate mathematics in both oral and written forms.

**Preparation:** The mathematics degree prepares students for a wide variety of careers, including careers in teaching, private industry, government agencies, actuarial science, and law. Students interested in attending graduate school in mathematics or statistics should seek advice from the full-time mathematicians. In addition, upon finishing the financial and actuarial sciences track, a graduate should be prepared to immediately seek employment with a variety of companies and/or to take the first two actuarial exams.

To major in mathematics, students must complete the core requirements, plus additional requirements listed under one of the following tracks: general, secondary education, financial and actuarial sciences.

### MATHEMATICS

MAJOR CORE REQUIREMENTS		28 crs.
MTH 210	CALCULUS I	4
MTH 211	CALCULUS II	4
MTH 212	CALCULUS III	4
MTH 300	TRANSITION TO ADVANCED MATHEMATICS	3
MTH 340	PROBABILITY	3
MTH 341	APPLIED STATISTICS	4
MTH 360	LINEAR ALGEBRA	3
MTH 490	SEMINAR IN MATHEMATICS	3

### BACHELOR OF ARTS: GENERAL TRACK 45 crs.

*Complete the core requirements, plus the following:*

MTH 392	INTRODUCTION TO ANALYSIS	3
MTH 393	MODERN ALGEBRA I	3
CSI 131	COMPUTATIONAL THINKING	2
CSI 132	INTRODUCTION TO PROGRAMMING	3

**TWO COURSES FROM THE FOLLOWING**

<b>MTH 301 COLLEGE GEOMETRY</b>	<b>3</b>
<b>MTH 320 FINANCIAL MATHEMATICS</b>	<b>3</b>
<b>MTH 366 NUMERICAL ANALYSIS</b>	<b>3</b>
<b>MTH 370 DIFFERENTIAL EQUATIONS AND MODELING</b>	<b>3</b>
<b>MTH 375 DISCRETE MODELS</b>	<b>3</b>
<b>MTH 376 GRAPH THEORY</b>	<b>3</b>
<b>MTH 394 MODERN ALGEBRA II</b>	<b>3</b>

**RECOMMENDED ELECTIVES**

<b>ENG 360 INTERDISCIPLINARY PROFESSIONAL AND TECHNICAL WRITING (W)</b>	<b>3</b>
<b>PHI 204 LOGIC</b>	<b>3</b>

**BACHELOR OF SCIENCE:  
GENERAL TRACK 54-58 crs.**

Same as above for Bachelor of Arts in addition to one of the following two options:

1. Four science courses.
2. Four business courses (except BUS 310).

**BACHELOR OF ARTS:  
SECONDARY EDUCATION TRACK 40 crs.**

Complete the core requirements, plus the following:

<b>MTH 301 COLLEGE GEOMETRY</b>	<b>3</b>
<b>MTH 375 DISCRETE MODELS</b>	<b>3</b>
<b>MTH 392 INTRODUCTION TO ANALYSIS</b>	<b>3</b>
<b>MTH 393 MODERN ALGEBRA I</b>	<b>3</b>

**BACHELOR OF SCIENCE:  
SECONDARY EDUCATION TRACK 46-50 crs.**

Same as above for Bachelor of Arts in addition to one of the following two options:

1. Four science courses.
2. Four business courses (except BUS 310).

For a list of professional education program requirements, see the secondary education section under "School of Education."

**BACHELOR OF SCIENCE: FINANCIAL  
AND ACTUARIAL SCIENCES TRACK 54-59 crs.**

Complete the core requirements, plus the following:

<b>MTH 320 FINANCIAL MATHEMATICS</b>	<b>3</b>
<b>MTH 375 DISCRETE MODELS</b>	<b>3</b>
<b>MTH 470 INTERNSHIP IN MATHEMATICS</b>	<b>3-8</b>
<i>or</i>	
<b>MTH 490 SEMINAR IN MATHEMATICS</b>	<b>3</b>
<b>CSI 131 COMPUTATIONAL THINKING</b>	<b>2</b>
<b>CSI 132 INTRODUCTION TO PROGRAMMING</b>	<b>3</b>
<b>ACC 205 PRINCIPLES OF FINANCIAL ACCOUNTING</b>	<b>3</b>
<b>ECO 211 PRINCIPLES OF MICROECONOMICS</b>	<b>3</b>
<b>ECO 212 PRINCIPLES OF MACROECONOMICS</b>	<b>3</b>
<b>FIN 308 PRINCIPLES OF BUSINESS FINANCE</b>	<b>3</b>
<b>MGT 204 PRINCIPLES OF MANAGEMENT</b>	<b>3</b>

**RECOMMENDED ELECTIVES**

<b>BUS 324 BUSINESS ETHICS AND CORPORATE SOCIAL RESPONSIBILITY (W)</b>	<b>3</b>
<b>CSI 230 INTRODUCTION TO COMPUTING</b>	<b>5</b>
<b>CSI 260 EVENT DRIVEN PROGRAMMING</b>	<b>3</b>
<b>ENG 360 INTERDISCIPLINARY PROFESSIONAL AND TECHNICAL WRITING (W)</b>	<b>3</b>

**MATHEMATICS MINOR REQUIREMENTS 18 crs.**

<b>MTH 210 CALCULUS I</b>	<b>4</b>
<b>MTH 211 CALCULUS II</b>	<b>4</b>
<b>MTH 212 CALCULUS III</b>	<b>4</b>
<b>TWO ADDITIONAL UPPER-LEVEL MATHEMATICS COURSES</b>	<b>6</b>

## Mathematics (MTH)

<p><b>MTH 105</b> <span style="float: right;"><b>3</b></span>  <b>INTERMEDIATE ALGEBRA</b>            This course is for students who have had no more than one year of high school algebra or who have not had mathematics for some time. The course consists of a review of elementary algebra and additional work in linear and quadratic equations, factoring, exponents, polynomials, graphing, and linear systems.</p>	<p><b>MTH 210</b> <span style="float: right;"><b>4</b></span>  <b>CALCULUS I</b>            The calculus of single-variable algebraic, exponential, logarithmic, and trigonometric functions culminating in the Fundamental Theorem of Calculus. Prerequisite: MTH 133, high school precalculus with a C or better, or instructor consent.</p>
<p><b>MTH 123</b> <span style="float: right;"><b>3</b></span>  <b>ALGEBRA FOR EDUCATORS</b>            This course explores equations, inequalities, and functions of the following type: absolute value, linear, polynomial, rational, exponential, and logarithmic. The sum, difference, product, quotient, and composition of two functions, along with their domains, will also be covered. Additional topics include counting methods and conic sections. Prerequisite: MTH 105 or equivalent or instructor consent.</p>	<p><b>MTH 211</b> <span style="float: right;"><b>4</b></span>  <b>CALCULUS II</b>            Techniques of integration, applications of integration, parametric equations, polar coordinates, and infinite sequences and series. Prerequisite: MTH 210.</p>
<p><b>MTH 131</b> <span style="float: right;"><b>3</b></span>  <b>COLLEGE ALGEBRA</b>            A study of algebraic concepts including topics related to the real numbers, systems of linear equations, radicals, quadratic equations, inequalities, inverse functions, exponentials, and logarithms as well as other topics included at the discretion of the instructor. This course does not fulfill the mathematics general education requirement.</p>	<p><b>MTH 212</b> <span style="float: right;"><b>4</b></span>  <b>CALCULUS III</b>            The calculus of vector functions and functions of several variables. Prerequisite: MTH 211.</p>
<p><b>MTH 133</b> <span style="float: right;"><b>3</b></span>  <b>PRECALCULUS</b>            The study of linear, quadratic, exponential, logarithmic, trigonometric, and inverse trigonometric functions and applications of such functions. These functions will be studied from a numerical, graphical, and analytical approach. A brief general study of functions will also be included. Prerequisite: MTH 105 or equivalent.</p>	<p><b>MTH 280-289</b> <span style="float: right;"><b>1-3</b></span>  <b>SPECIAL TOPICS IN MATHEMATICS</b></p>
<p><b>MTH 150</b> <span style="float: right;"><b>3</b></span>  <b>QUANTITATIVE LITERACY</b>            In this course, students are introduced to problem solving and analysis. Topics include representing and analyzing data, using logic and logical statements in arguments, estimating and approximating to judge the reasonableness of an answer, and appropriate tools and approaches to real-world problems in areas such as business and finance.</p>	<p><b>MTH 300</b> <span style="float: right;"><b>3</b></span>  <b>TRANSITION TO ADVANCED MATHEMATICS</b>            Introduction to the methods of proof through the study of sets, logic, relations, mappings, cardinality, and elementary structures. Prerequisite: MTH 210 or instructor consent.</p>
<p><b>MTH 170</b> <span style="float: right;"><b>3</b></span>  <b>STATISTICS</b>            This is an introductory course in descriptive and inferential statistics, approached through intuition, algebra, and problem solving. Understanding of central concepts and methods is stressed. Practical applications in the fields of social and physical sciences are studied. Real-world problems are solved through use of statistical computer packages such as SPSS, SAS, or MINITAB. Prerequisites: MTH 105 and computer literacy.</p>	<p><b>MTH 301</b> <span style="float: right;"><b>3</b></span>  <b>COLLEGE GEOMETRY</b>            The study of geometry including a review of elementary geometry, Euclidean, non-Euclidean, and transformational geometries. Prerequisite: MTH 210.</p>
	<p><b>MTH 320</b> <span style="float: right;"><b>3</b></span>  <b>FINANCIAL MATHEMATICS</b>            Interest rate measurement, annuities, loan repayment, bond valuation, measuring rate of return of investment, term structure of interest rates, cash flow duration and immunization, and other topics as found on Actuarial Exam FM/2. Prerequisite: MTH 211.</p>
	<p><b>MTH 340</b> <span style="float: right;"><b>3</b></span>  <b>PROBABILITY</b>            Probability axioms, random variables, commonly used discrete and continuous distributions, expectation, moment generating functions, transformations, and multivariate distributions. Prerequisite: MTH 211 or instructor consent.</p>
	<p><b>MTH 341</b> <span style="float: right;"><b>4</b></span>  <b>APPLIED STATISTICS</b>            The concepts of sampling distributions with random sampling and statistical inference. The main methods of estimation and the properties of estimators: matching moments, percentile matching, and maximum likelihood. The construction of confidence intervals for the mean, differences of two means, variances, and proportions. Hypothesis testing for the mean, variance, contingency tables, goodness of fit, and regression models. Prerequisite: MTH 211 or instructor consent.</p>

## Mathematics (MTH)

<p><b>MTH 344</b>  <b>STATISTICAL LEARNING</b>            Multiple regression, classification and resampling methods. Linear model selection, tree-based methods, and unsupervised learning. Prerequisite: MTH 341 or instructor consent.</p> <p><b>MTH 360</b>  <b>LINEAR ALGEBRA</b>            An introduction to the techniques of linear algebra. Topics include vector spaces, linear independence, basis, dimension, linear transformations, eigenvalues, and eigenvectors. Prerequisite MTH 300 or instructor consent.</p> <p><b>MTH 366</b>  <b>NUMERICAL ANALYSIS</b>            An introductory course in numerical methods, including computational techniques for locating roots of equations, interpolation, differentiation, integration, approximation, and systems of linear equations; to include detection, prediction, and control of computational errors. Problem solving using mathematical computer programs and computer programming of algorithms is stressed. Prerequisite: MTH 212 and CSI 230. Same as CSI 366.</p> <p><b>MTH 370</b>  <b>DIFFERENTIAL EQUATIONS AND MODELING</b>            An introductory course in the solutions of elementary differential equations and their applications in a variety of real-world contexts. A general study of mathematical modeling is included. Prerequisite: MTH 211 or instructor consent.</p> <p><b>MTH 375</b>  <b>DISCRETE MODELS</b>            An introduction to the methods of discrete mathematics. Topics include linear and non-linear models. With a focus on recurrence relations, long term behavior, and the use of technology to model real-world phenomena. Prerequisite: MTH 210 or instructor consent.</p> <p><b>MTH 376</b>  <b>GRAPH THEORY</b>            Introductory concepts and definitions, trees, planar graphs, chromatic numbers, matchings, and Ramsey theory. Prerequisite: MTH 211.</p>	<p>4</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p>	<p><b>MTH 380-389</b>  <b>SPECIAL TOPICS IN MATHEMATICS</b></p> <p><b>MTH 392</b>  <b>INTRODUCTION TO ANALYSIS</b>            Introduction to analysis on the real line with emphasis on careful development of limits, continuity, and differentiation. Prerequisites: MTH 211, 300.</p> <p><b>MTH 393</b>  <b>MODERN ALGEBRA I</b>            With MTH 394 an introduction to the basic notions of modern algebra. Topics covered include the integers, groups, rings, fields, homomorphisms, and related notions. Prerequisite: MTH 300.</p> <p><b>MTH 394</b>  <b>MODERN ALGEBRA II</b>            A continuation of MTH 393. Prerequisite: MTH 393.</p> <p><b>MTH 470</b>  <b>INTERNSHIP IN MATHEMATICS</b></p> <p><b>MTH 480</b>  <b>INDEPENDENT STUDY IN MATHEMATICS</b></p> <p><b>MTH 485</b>  <b>DATA ANALYTICS CAPSTONE</b>            Topics drawn from a variety of advanced topics in data analytics. Prerequisite: MTH 344 or instructor consent.</p> <p><b>MTH 490</b>  <b>SEMINAR IN MATHEMATICS</b>            Topics drawn from a variety of advanced topics in mathematics. Prerequisite: Instructor consent.</p>	<p>1-3</p> <p>3</p> <p>3</p> <p>3</p> <p>3-8</p> <p>1-4</p> <p>3</p> <p>3</p>
--	--	--	---