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# LaGrange College

## Course Catalog - Mathematics

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### A.S. in Mathematics - A.S. in Mathematics

**Type:**Major

The curriculum for the Associate of Science Degree in Mathematics includes a minimum of 60 hours. These hours are to consist of the general education program as well as additional mathematics courses which are generally necessary in engineering programs as follows:

**General Education courses (approx. 46 hours):**

Specifically including:

[MATH 2221](#) and [MATH 1114](#) in Programmatic Goal 1

[CHEM 1101/1102](#) or [PHYS 2121/2122](#) in Programmatic Goal 2

Each of the general education courses in PG2 should be scheduled in consultation with the Engineering Coordinator, as different courses are required for various engineering schools and programs, including the courses in the following areas:

- Diverse Cultures, Human Behavior, and Human Relationships
- Laboratory Science and the Natural World
- World Civilization and Humanities
- Artistic Expression

**Additional mathematics courses (14 hours):**

[MATH 2222](#) (4 hours)

[MATH 2223](#) (4 hours)

Two of:

[MATH 3000](#) (3 hours)

[MATH 3316](#) (3 hours)

[MATH 3335](#) (3 hours)

### Collegiate Enrichment:

Students pursuing the A.S. in Mathematics will be required to complete 20 Collegiate Enrichment Credits.

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## B.A. in Mathematics - B.A. in Mathematics

### Type:Major

The Bachelor of Arts degree is the liberal studies degree in Mathematics. Students who pursue the Bachelor of Arts degree have more options in selecting their courses, and are likely to seek careers as teachers or enter graduate programs in Mathematics Education.

In addition to the general education requirements, students completing the B.A. degree in Mathematics must also complete a minimum of 43 semester hours in Mathematics courses, as follows:

[MATH 1114](#) Introduction to Statistics (3)

[MATH 2221](#) Analytic Geometry and Calculus I (4)

[MATH 2222](#) Analytic Geometry and Calculus II (4)

[MATH 2223](#) Analytic Geometry and Calculus III (4)

[MATH 2241](#) Programming for the Sciences (4)

[MATH 3000](#) Differential Equations (3)

[MATH 3316](#) Probability Theory (3)

[MATH 3335](#) Linear Algebra (3)

\*[MATH 3380](#) Discrete Mathematics (3) OR [MATH 3382](#) Combinatorial Design Theory (3)

\*\*[MATH 4333](#) Modern Algebra I (3) OR [MATH 4343](#) Analysis I (3)

[MATH 4350](#) Senior Capstone (3)

*\* One (1) of these courses must be taken.*

*The other may be used to satisfy one of the additional courses in the next listing.*

*\*\* One (1) of these courses must be taken.*

*The other may be used to satisfy one of the additional courses in the next listing.*

PLUS two (2) additional courses selected from:

[MATH 3092](#) Data Science (3)

[MATH 3185](#) Mathematical Modeling (3)

[MATH 3225](#) Partial Differential Equations and Boundary Value Problems (3)

[MATH 3306](#) College Geometry (3)

[MATH 3317](#) Mathematical Statistics (3)

[MATH 3340](#) History of Mathematics (3)

[MATH 3380](#) Discrete Mathematics (3)

[MATH 3382](#) Combinatorial Design Theory (3)

[MATH 4323](#) Complex Variables (3)

[MATH 4333](#) Modern Algebra I (3)

[MATH 4334](#) Modern Algebra II (3)  
[MATH 4343](#) Analysis I (3)  
[MATH 4344](#) Analysis II (3)  
[MATH 4410](#) Numerical Methods I (3)  
[MATH 4411](#) Numerical Methods II (3)  
[MATH 4495](#) Independent Study (3)  
[MATH 4496](#) Independent Study (3)  
[MATH 4499](#) Special Topics in Mathematics (3)

## Combined B.A. and M.A.T. Program of Study

Undergraduate students who meet the admission requirements for the Master of Arts in Teaching [M.A.T] (passing GACE Basic Skills or a combined SAT score of more than 1000) and those who have a GPA of 3.0 or higher in their undergraduate studies are eligible to participate in a combined B.A. and M.A.T. program of study after the completion of 90 semester hours. Once accepted, candidates may take entering cohort graduate courses the Summer semester following their junior year of study. Upon gaining senior status, candidates may take one (1) three-credit graduate course during the Fall, Interim, and Spring semesters only if enrolled with twelve (12) undergraduate credits.

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## B.S. in Mathematics - B.S. in Mathematics

**Type:**Major

The Bachelor of Science degree is designed for those students who plan to enroll in graduate programs in pure or applied mathematics or pursue industrial positions.

In addition to the general education requirements, students completing the B.S. degree in Mathematics must also complete a minimum of 49 semester hours in Mathematics courses, as follows:

[MATH 1114](#) Introduction to Statistics (3)  
[MATH 2221](#) Analytic Geometry and Calculus I (4)  
[MATH 2222](#) Analytic Geometry and Calculus II (4)  
[MATH 2223](#) Analytic Geometry and Calculus III (4)  
[MATH 2241](#) Programming for the Sciences (4)  
[MATH 3000](#) Differential Equations (3)  
[MATH 3316](#) Probability Theory (3)  
[MATH 3335](#) Linear Algebra (3)  
[MATH 3380](#) Discrete Mathematics (3)\* OR [MATH 3382](#) Combinatorial Design Theory (3)\*  
[MATH 4323](#) Complex Variables (3)  
[MATH 4333](#) Modern Algebra I (3)  
[MATH 4343](#) Analysis I (3)  
[MATH 4350](#) Senior Capstone (3)

*\*One (1) of these courses must be taken.*

*The other may be used to satisfy one (1) of the additional courses in the next listing.*

PLUS two (2) additional courses selected from:

[MATH 3092](#) Data Science (3)

[MATH 3185](#) Mathematical Modeling (3)

[MATH 3225](#) Partial Differential Equations and Boundary Value Problems (3)

[MATH 3306](#) College Geometry (3)

[MATH 3317](#) Mathematical Statistics (3)

[MATH 3340](#) History of Mathematics (3)

[MATH 4334](#) Modern Algebra II (3)

[MATH 4344](#) Analysis II (3)

[MATH 4410](#) Numerical Methods I (3)

[MATH 4411](#) Numerical Methods II (3)

[MATH 4495](#) Independent Study (3)

[MATH 4496](#) Independent Study (3)

[MATH 4499](#) Special Topics in Mathematics (3)

In addition, [PHYS 2121](#) and [2122](#) are recommended.

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## **Minor in Data Science - Minor in Data Science**

**Type:**Minor

The Data Science minor gives students not majoring in Mathematics the opportunity to explore tools and techniques that might enhance their quantitative research endeavors. In short, the minor should allow students from areas outside Mathematics and Computer Science to be able to effectively collect and analyze data in their respective fields. Courses required for the minor are

- [MATH 2221](#) Calculus I (4)
- [MATH 2241](#) Programming for the Sciences (4)
- [MATH 3092](#) Data Science (3)
- [MATH 3185](#) Mathematical Modeling (3)
- [MATH 1114](#) or an additional MATH course ([MATH 2222](#) or above). (3)

Total: 17 semester hours

Students seeking the minor are encouraged to seek a Summer or Interim-term internship position in programs related to their majors that utilizes computational techniques. Students who are interested in graduate school could alternately consider attending a computational Research Experience for Undergraduates (REU), which is a National Science Foundation program offered at institutions throughout the country in a variety of science fields. Alternatively, these students may wish to engage in an undergraduate research project focused on computational applications in their field of interest, which may be jointly supervised by a research advisor from the student's field and by a faculty member of the Department of Mathematics.

Students who earn the minor are ineligible to simultaneously earn the minor in Mathematics.

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## **Minor in Mathematics - Minor in Mathematics**

**Type:**Minor

A minor in Mathematics consists of the following courses:

- [MATH 2221](#), plus four (4) additional courses selected from
- [MATH 2222](#), [2223](#), [2241](#), [3000](#), [3092](#), [3185](#), [3225](#), [3306](#), [3316](#), [3317](#), [3335](#), [3342](#), [3380](#), [3382](#), [4333](#), [4334](#), [4343](#), [4344](#), [4350](#), [4410](#), [4411](#), [4495](#), [4496](#), and [4499](#).

At least two (2) of the five (5) courses must be at the 3000 or 4000 level.

Total: ranges from 16 to 19 semester hours, depending on courses selected

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## **DATA 3000 - Data Science in the Real World with Applications**

An advanced course in data science with real-world applications. Topics will include data management, statistical analyses of data, machine-learning algorithms, estimation of model parameters to collected data, and visualization of data and related findings. Students will employ computational tools and report findings. Cross-listed with MATH 3092.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 1114](#) - Introduction to Statistics
- 

## **MATH 0100 - Elementary Algebra for College Students**

An introduction to algebra. Topics include instruction in real numbers, graphs, algebraic expressions, equations, and polynomials.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Offered in Fall and Spring terms.
-

## **MATH 1101 - College Algebra**

A study of sets, real numbers, operations, order, inequalities, polynomial factoring, functions, graphs, exponents, first- and second-degree equations, and systems of equations.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Students may be placed into this course.
  - Offered in Fall and Spring terms.
- 

## **MATH 1114 - Introduction to Statistics**

An introduction to probability and statistics. Topics include descriptive statistics, probability, normal probability, confidence intervals, hypothesis testing, and linear regression. Students need choose only one of the three prerequisites listed below.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 1101](#) - College Algebra
- [MATH 1221](#) - Precalculus
- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered in Fall and Spring terms.
- 

## **MATH 1115 - Finite Mathematics**

An introduction to finite mathematics, which is a collection of mathematical topics that are highly applicable in the real world, but do not involve the infinite processes of calculus. Topics include matrices and solutions to linear equations (including linear programming problems), elementary probability and applications, and applications to personal finance. Students need choose only one of the three prerequisites listed below.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 1101](#) - College Algebra
- [MATH 1221](#) - Precalculus
- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered as needed
- 

## **MATH 1120 - Problem Solving**

Individual and small-group problem solving geared toward real-life situations and nontraditional problems. The course focuses on a number of problem-solving strategies, such as drawing a diagram, eliminating possibilities, making a systematic list, looking for a pattern, guessing and checking, solving an easier related problem and sub-problems, using manipulatives, working backward, acting it out, unit analysis, using algebra and finite differences, and others. Divergent thinking and technical communication skills of writing and oral presentation are emphasized. Students need choose only one of the three prerequisites listed below.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 1101](#) - College Algebra
- [MATH 1221](#) - Precalculus
- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered in Fall and Spring terms, as needed.
- 

## **MATH 1221 - Precalculus**

A study of calculus-oriented algebra and trigonometry. Topics include simplifying algebraic expressions, solving equations, exponential and logarithmic functions, applications of functions, graphs, and the trigonometric functions.

**Grade Basis:** ALP

**Credit hours:** 4.0

**Lecture hours:** 4.0

**Prerequisites:**

- [MATH 1101](#) - College Algebra

**Restrictions:**



- Satisfactory Mathematics testing placement may also enable a student to take this course.
  - Offered in Fall and Spring terms.
- 

## **MATH 2221 - Analytic Geometry and Calculus I**

An introduction to differentiation and integral calculus. Topics include limits, differentiation and applications, integration, and the calculus of exponential and logarithmic functions.

**Grade Basis:** AL

**Credit hours:** 4.0

**Lecture hours:** 4.0

**Prerequisites:**

- [MATH 1221](#) - Precalculus

**Restrictions:**

- A grade of C- or better in MATH 1221 or satisfactory Mathematics placement recommendation.
  - Offered in Fall and Spring terms.
- 

## **MATH 2222 - Analytic Geometry and Calculus II**

A continuation of MATH 2221. Topics include the applications of integration, the calculus of inverse trigonometric functions, techniques of integration, indeterminate forms, improper integrals, sequence and series, and the parametric equations, and the polar coordinates.

**Grade Basis:** AL

**Credit hours:** 4.0

**Lecture hours:** 4.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- A grade of C- or better in MATH 2221 or appropriate AP credit for MATH 2221.
  - Offered in Fall and Spring terms.
-

## **MATH 2223 - Analytic Geometry and Calculus III**

A continuation of MATH 2222. Topics include vectors and vector-valued functions of several variables, multiple integration, and vector analysis.

**Grade Basis:** AL

**Credit hours:** 4.0

**Lecture hours:** 4.0

**Prerequisites:**

- [MATH 2222](#) - Analytic Geometry and Calculus II

**Restrictions:**

- C- or better in MATH 2222
  - Appropriate AP credit for MATH 2221 and 2222.
  - Offered in Spring terms.
- 

## **MATH 2230 - Programming for the Sciences**

A first course in programming in MATLAB, including basic programming concepts such as: data types, control structures, arrays, files, and the mechanics of running and debugging code. There are additionally some applications involving mathematical concepts.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered in Fall semesters of odd years, as needed.
- 

## **MATH 2231 - Technical Writing for Science**

A course in the understanding and learning of a typesetting system (LaTeX) for producing technical and scientific documentation.

**Grade Basis:** L

**Credit hours:** 1.0

**Lecture hours:** 1.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered as needed.
- 

**MATH 2301 - Introduction to Mathematical Proof**

An introduction to types of mathematical proof, with a focus on written communication skills. Topics include logical reasoning, direct proofs, proof by contradiction, mathematical induction, recursion, set theory, functions, and relations.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered annually.
- 

**MATH 3000 - Differential Equations**

An introduction to differential equations. Topics include the study of first and second-order differential equations, first-order systems, linear systems, Laplace transforms, and numerical methods.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2223](#) - Analytic Geometry and Calculus III
- [MATH 2230](#) - Programming for the Sciences

**Restrictions:**

- MATH 2223, 2230 can be either prerequisites or corequisites.
  - Students can be added by permission of instructor.
  - Offered in Fall terms.
- 

**MATH 3092 - Data Science**

An introduction to the discipline of data science. Topics include data management, statistical analyses of data, estimation of model parameters to collected data,

machine learning algorithms, and visualizations. Students will implement or employ computational tools to analyze real-world problems, draw meaningful conclusions, and report their findings.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I
- [MATH 2230](#) - Programming for the Sciences

**Restrictions:**

- Offered in Spring semesters of even years, as needed.
- 

## **MATH 3185 - Mathematical Modeling**

A thorough introduction to mathematical modeling techniques. Topics include the quantification of physical processes, model predictions and natural systems, and model comparisons and results.

**Grade Basis:** ALP

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I
- [MATH 2230](#) - Programming for the Sciences

**Restrictions:**

- Offered in Spring semesters of odd years, as needed.
- 

## **MATH 3225 - Introduction to Partial Differential Equations and Boundary Value Problems**

Topics include Fourier Series, the Wave Equation, the Heat Equation, Laplace's Equation, Dirichlet Problems, Sturm-Liouville Theory, the Fourier Transform, and Finite Difference Numerical Methods.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 3000](#) - Differential Equations

**Restrictions:**

- Offered as needed.
- 

**MATH 3306 - College Geometry**

A study of the concepts of plane Euclidean geometry, with an introduction to coordinate geometry and non-Euclidean geometries. Offered on demand.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered as needed.
- 

**MATH 3316 - Probability Theory**

An Introduction to probability theory. Topics include random variables, method of enumeration, conditional probability, Baye's theorem, discrete distributions (binomial distribution, and Poisson distribution), continuous distributions (uniform distribution, exponential distribution, gamma distribution, chi-square distribution, and normal distributions), Multivariate distributions.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2222](#) - Analytic Geometry and Calculus II

**Restrictions:**

- Offered in Spring semesters of even years, as needed.
- 

**MATH 3317 - Mathematical Statistics**

An introduction to the mathematical theory of statistics. Topics include estimation and maximum likelihood estimates, sampling distributions, confidence intervals, and hypothesis testing.

**Grade Basis:** AL

**Credit hours:** 3.0  
**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 3316](#) - Probability Theory

**Restrictions:**

- Offered as needed.
- 

## **MATH 3335 - Linear Algebra**

An introduction to linear algebra and matrix theory. Topics include vectors, systems of linear equations, matrices, eigenvalues, eigenvectors, and orthogonality.

**Grade Basis:** AL  
**Credit hours:** 3.0  
**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I
- [MATH 2230](#) - Programming for the Sciences

**Restrictions:**

- Permission of instructor may grant access if the student does not meet one/both prerequisites.
  - Offered in Spring terms, as needed.
- 

## **MATH 3340 - History of Mathematics**

An historical development of mathematical concepts.

**Grade Basis:** AL  
**Credit hours:** 3.0  
**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered as needed.
-

## **MATH 3380 - Discrete Mathematics**

An introduction to discrete mathematics. Topics include set theory, combinatorics, recurrence relations, linear programming, and graph theory.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Offered in Fall semesters of even years, as needed.
- 

## **MATH 3382 - Combinatorial Design Theory**

A study of techniques used for constructing combinatorial designs. Basic designs include triple systems, Latin squares, and affine and projective planes.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2221](#) - Analytic Geometry and Calculus I

**Restrictions:**

- Offered in Fall terms of odd years, as needed.
- 

## **MATH 4323 - Complex Variables**

An introduction to complex variables. Topics include complex numbers, analytic functions, elementary functions, complex integration, series representations for analytic functions, residue theory, and conformal mapping.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2223](#) - Analytic Geometry and Calculus III

**Restrictions:**

- Offered in Spring terms of odd years, as needed.
-

## **MATH 4333 - Modern Algebra I**

An introduction to modern abstract algebra.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2222](#) - Analytic Geometry and Calculus II

**Restrictions:**

- Offered in Fall semesters of odd years, as needed.
- 

## **MATH 4334 - Modern Algebra II**

A continuation of Modern Algebra I.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 4333](#) - Modern Algebra I

**Restrictions:**

- Offered as needed.
- 

## **MATH 4343 - Analysis I**

An introduction to Analysis.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2223](#) - Analytic Geometry and Calculus III

**Restrictions:**

- Offered in Fall semesters of even years, as needed.
-



## **MATH 4344 - Analysis II**

A continuation of Analysis I.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 4343](#) - Analysis I

**Restrictions:**

- Offered as needed.
- 

## **MATH 4350 - Senior Capstone**

A study of problem-solving techniques selected from the spectrum of Mathematics coursework required to complete a Mathematics major at LaGrange College. Topics come from a variety of areas, including algebra, trigonometry, geometry, calculus, discrete mathematics, probability and statistics, and mathematical reasoning and modeling.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Senior standing
  - Permission of instructor
  - Offered in Spring terms, as needed.
- 

## **MATH 4410 - Numerical Methods I**

An introduction to numerical analysis with computer solutions. Topics include Taylor series, finite difference, calculus, roots of equations, solutions of linear systems of equations, and least- squares. Offered on demand.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 2222](#) - Analytic Geometry and Calculus II

**Restrictions:**

- Offered as needed.
- 

## **MATH 4411 - Numerical Methods II**

A second course in numerical analysis with computational solutions. Topics include solutions to ordinary and partial differential equations, higher-order quadratures, curve-fitting, and parameter estimation.

**Grade Basis:** AL

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Prerequisites:**

- [MATH 4410](#) - Numerical Methods I

**Restrictions:**

- Offered as needed.
- 

## **MATH 4460 - Internship**

Internship.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Requires faculty supervisor.
  - As needed
- 

## **MATH 4495 - Independent Study in Mathematics I**

This course allows students to pursue a special problem or topic beyond those encountered in any formal course. Course may be offered for variable credit.

**Grade Basis:** LP

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Prerequisites will be determined by the instructor, based on the material to be studied.
  - Offered as needed.
-

## **MATH 4496 - Independent Study in Mathematics II**

This course allows students to pursue a second special problem or topic beyond those encountered in any formal course. This course may be taken for variable credit.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Prerequisites will be determined by the instructor, based on the material to be studied.
  - Offered as needed.
- 

## **MATH 4499 - Special Topics in Mathematics**

Special topics in Mathematics.

**Grade Basis:** L

**Credit hours:** 3.0

**Lecture hours:** 3.0

**Restrictions:**

- Prerequisites will be determined by the instructor, based on the material to be studied.
  - Offered as needed.
- 

Last updated: 02/10/2023

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