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LaGrange College

Course Catalog - Mathematics

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 2241 - Programming for the Sciences

A first course in mathematical programming in MATLAB that ranges from basic programming to the implementation of higher-level mathematics. Additional topics include learning a typesetting system (LaTeX) for producing technical and scientific documentation.

Grade Basis: AL

Credit hours: 4.0

Lecture hours: 4.0

Prerequisites:

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

Restrictions:

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

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 2241](#) - Programming for the Sciences

Restrictions:

- MATH 2223, 2241 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 2241](#) - 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 2241](#) - 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 2241](#) - 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.
-

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LaGrange College

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