MATHEMATICS (MATH)

MATH 10200 - Aviation Mathematics (4)
This course provides a review of fundamental mathematics required for successful completion of other courses in the aviation curriculum, including algebraic equations, graphs, exponential and elementary trigonometry. 60 contact hours (60 lecture). Meets requirements of 14 CFR 147.

MATH 10300 - Elementary Mathematics (3)
The major topics of the course include addition, subtraction, multiplication, and division of common and mixed fractions and decimals, exponents and square roots, ratios, proportions; the arithmetic of signed numbers, and geometric concepts. Also included is an introduction to algebraic notation and linear equations, as well as, word problem applications.

MATH 10400 - Intermediate Algebra (3)
The major topics of the course include basic terms and real numbers, linear equations and inequalities, exponents and polynomials, rational expressions, roots and radicals. Quadratic equations and inequalities, linear equations and inequalities in two variables, systems of linear equations and inequalities, matrices, and radical expressions and logarithms are also covered.

MATH 10500 - Introductory Statistics (4)
This course is an introduction to statistics and probability. Major topics include introductory statistics, basic descriptive statistics including frequency distribution, mode, mean and standard deviation, permutations, combinations, probability rules and Bayes' Theorem, as well as binomial and normal distributions. Basic inferential statistics including sampling theory, confidence intervals for means and proportions, and test of hypotheses, and chi-square distribution will also be reviewed. Correlation and regression are also included.
Attributes: Mathematics General Education
Illinois Articulation Initiative (IAI): M1 902.

MATH 10700 - Mathematics for Culinary Arts (3)
This course covers common mathematics requirements for the culinary arts. This course is designed to introduce the culinary art student to kitchen calculations, conversions and recipe costing. It also includes a review of basic operations, fractions, decimals, percent, ratios, and proportions. The International System of Measurements (Metric System), apothecary and household systems, construction and reading graphs are also included.

MATH 11500 - Introduction to Mathematical Thinking (3)
This study of basic problem solving introduces the following topics: set theory, mathematical logic, basic counting techniques, probability, and descriptive statistics.
Attributes: Mathematics General Education

MATH 11600 - Win Lose or Draw (3)
Why do people play games? Whatever the reason, games are a big piece of life. The world has played games for a long, long time - every time period, every culture. Students in this course will study games and gaming in our culture as well as those in other cultures. To better understand games, the students will study probability theory and its application to gaming. Applications include casino games, lotteries, racing, wagering systems, as well as other games. Some analytical tools that will arise during the course are counting methods, expected values, combinatorics, probability, statistics, tress, gambler's ruin, and distributions.
Attributes: Mathematics General Education

MATH 11700 - Storytelling with Data (3)
This data analytics course is presented in the service of a project which will offer students an intensive hands-on experience in the quantitative research process. Students will develop skills in generating testable hypotheses, understanding large data sets, formatting and managing data, conducting descriptive and inferential statistical analyses, and presenting results for expert and novice audiences. This course is designed for students who are interested in developing skills that are useful for working with data and using statistical tools to analyze them. No prior experience with data or statistics is required.
Attributes: Experiential Learning Gen Ed, Mathematics General Education

MATH 11900 - College Algebra (3)
This course provides a preparation for further study in mathematics and related fields in which fluent skills in algebra are necessary for successful use of mathematical analysis. Topics include simplifying algebraic, rational, radical, exponential, and logarithmic expressions; solving quadratic, rational, radical, exponential, logarithmic, and absolute value equations; solving compound and absolute value inequalities, and graphing functions.
Attributes: Mathematics General Education

MATH 12300 - Modeling our World with Mathematics (3)
This course will provide students with an overview of how mathematics can be used to model behavior and phenomena in a variety of fields including the natural sciences, social sciences, and business. It introduces students to the basics of mathematical modeling and the importance of how the modeling process can be used to draw conclusions and make predictions about systems. Some examples discussed will include how to model the spread of infectious disease, the dynamics of predators and prey, gerrymandering, and the spread of information on social media. This course will also discuss how to use mathematical modeling and their results to make decisions and advocate change. Additionally, students will learn how to use computer software at an introductory level to develop and simulate models.
Attributes: Civic Engagement Gen Ed, Mathematics General Education

MATH 13100 - Algebra and Number Concepts for Educators (3)
Provides a foundation in algebra and number concepts appropriate for elementary and middle school teachers. Topics include numeration systems, number theory rational numbers, and integers. Emphasis is placed on conceptual understanding, problem solving, mental arithmetic, and computational estimation. A graphing calculator is required; the model is specified by the instructor.

MATH 14100 - Geometry and Measurement Concepts for Educators (3)
Provides a foundation in geometry and measurement concepts appropriate for elementary and middle school teachers. This course explores the fundamental ideas of planar and spatial geometry. Content includes the analysis and classification of geometric figures; the study of geometric transformations; the concepts of tessellation, symmetry, congruence, and similarity; and an overview of measurement. The course includes an introduction to the use of Geometer's Sketchpad in the teaching and learning of informal geometry. A graphing calculator is required; the model is specified by the instructor.
Attributes: Mathematics General Education

MATH 17000 - Finite Mathematics (3)
This course covers mathematical procedures for business problems and applications; set theory; functions; graphics of functions; permutations and combinations; probability distributions; linear equations; solutions by matrices; computer and/or simplex solutions to linear programming models; and the mathematics of finance.
Attributes: Mathematics General Education

MATH 19900 - Precalculus (4)
This course provides an analysis of the real number system, functions, graphing, exponential and logarithmic functions, trigonometric functions and topics in analytic geometry.
Prerequisite: MATH 11900
Attributes: Mathematics General Education

MATH 20200 - Business Calculus (3)
This course covers concepts in applied calculus. We will explore functions and linear models, derivatives, techniques of differentiation, logarithm functions, the integral, functions of several variables, and trigonometric models. The main goal of this course is to make calculus relevant and interesting to the business student applying real data/cases with interesting examples and exercises.
Attributes: Mathematics General Education

MATH 20400 - Calculus for the Life Sciences (4)
This course presents the tools of calculus using applications and models germane to the life sciences.
Prerequisite: MATH 12000 (may be taken concurrently) or MATH 19900 (may be taken concurrently)
Attributes: Mathematics General Education

MATH 20600 - Applied Calculus (4)
This course provides a study of the concepts in differential and integral calculus, including sequences and series, continuity, limits, differentiation, and integration, with a focus on scientific and engineering applications Students use mathematical software packages such as Maple or MATLAB for solving Calculus-based problems.
Prerequisite: MATH 12000 (may be taken concurrently) or MATH 19900 (may be taken concurrently)
Attributes: Mathematics General Education

MATH 20900 - Calculus 1 (4)
This course provides a study of the concepts in differential calculus, graphs, continuity, differentiation, and applications for algebraic and trigonometric functions. Antiderivatives and definite integrals are introduced at the end of the course.
Prerequisite: MATH 12000 (may be taken concurrently) or MATH 19900 (may be taken concurrently)
Attributes: Mathematics General Education
Illinois Articulation Initiative (IAI): M1900-1.

MATH 21000 - Discrete Mathematics (4)
An introduction to discrete structures, this course covers such topics as basic logic, sets, basic proof techniques, relations, functions, the basics of counting and probability, graphs and trees.
Attributes: Mathematics General Education

MATH 21500 - Probability and Statistics Concepts for Educators (3)
This course covers concepts of statistics and probability appropriate for elementary and middle school teachers. This course is an introduction to the fundamental principles and procedures of statistical methods
Attributes: Mathematics General Education

MATH 22000 - Applied Probability and Statistics (3)
This course introduces the concepts of statistics and probability, including measures of center and spread, correlation coefficients, regression, random variables, discrete and continuous distributions, confidence intervals, and hypothesis testing. Students will also learn to use technology to complete statistical analyses.
Prerequisite: MATH 20000 (may be taken concurrently) or MATH 20900 (may be taken concurrently) or MATH 20600 (may be taken concurrently) or MATH 24000 (may be taken concurrently)
Attributes: Mathematics General Education

MATH 23500 - Calculus 2 (4)
This course provides a study of the concepts of integral calculus. Applications of the definite integral, exponential and logarithmic functions and methods of integration are studied in detail. Sequences, infinite series, and power series are presented at the end of the course.
Prerequisite: MATH 20000 (may be taken concurrently) or MATH 24000 (may be taken concurrently) or MATH 21100 (may be taken concurrently) or MATH 20900 (may be taken concurrently) or MATH 20600 (may be taken concurrently) or MATH 20400 (may be taken concurrently)

MATH 25000 - Calculus 3 (4)
This course provides a study of Euclidean vector spaces, conic sections, other coordinate systems, parameterized curves and functions of several variables. Differential and integral calculus for functions involving vectors, along with their applications, is presented.
Prerequisite: MATH 20100 (may be taken concurrently) or MATH 23500 (may be taken concurrently)

MATH 27000 - History of Mathematics (3)
This course surveys the historical development of mathematics spanning from the pre-Greek period to modern times. Biographical information on mathematicians and historical analysis of each era are included, with an emphasis on famous results and theorems.
Prerequisite: MATH 21000 (may be taken concurrently) and (MATH 20200 (may be taken concurrently) or MATH 20400 (may be taken concurrently) or MATH 20600 (may be taken concurrently) or MATH 20900 (may be taken concurrently))

MATH 30000 - Differential Equations (3)
This course focuses on ordinary differential equations. It includes variable separable equations, equations with homogeneous coefficients, exact equations, first order linear equations, applications, homogeneous linear equations with constant coefficients, undetermined coefficients, variation of parameters, power series solutions, linear systems of equations and Laplace transforms.
Prerequisite: MATH 20100 (may be taken concurrently) or MATH 23500 (may be taken concurrently)

MATH 30500 - Linear Algebra (3)
The study of matrices and matrix algebra, systems of linear equations, matrix inverse and elementary matrices, properties of determinants, vector spaces, especially Rⁿ vectors, linear independence, basis sets, inner products and orthogonality.
Prerequisite: MATH 31000 (may be taken concurrently) or MATH 21000 (may be taken concurrently) or MATH 24000 (may be taken concurrently) or MATH 20600 (may be taken concurrently) or MATH 20000 (may be taken concurrently) or MATH 20900 (may be taken concurrently)
Attributes: Experiential Learning Gen Ed

MATH 30600 - Advanced Linear Algebra (3)
This course begins with the Gram-Schmidt process. Other topics of study are Eigenvalues and Eigenvectors, change of basis, linear transformations, diagonalization, symmetrical and similar matrices. Applications of these concepts include quadratic forms and linear programming.
Prerequisite: MATH 30500 (may be taken concurrently) or MATH 30700 (may be taken concurrently)

MATH 31500 - Probability Theory (3)
This course is a continuation of the probability concepts learned in MATH 31400. It covers key concepts related to discrete and continuous univariate random variables and multivariate random variables and their applications. Topics include probability density functions, cumulative distribution functions, expectation, variance, covariance, jointly distributed random variables, moment generating functions, and conditional distributions. This course addresses topics on actuarial Exam P.
Prerequisite: MATH 31400 (may be taken concurrently) and MATH 25000 (may be taken concurrently)

MATH 31600 - Advanced Statistics (3)
This course is a continuation of the statistical methods introduced in MATH 31400. Students will perform nonparametric hypothesis tests and hypothesis tests on categorical data, compute statistical power and significance, perform multiple regression analysis, complete a one-way analysis of variance, apply percentile matching and maximum likelihood, and perform likelihood ratio tests. Students will also use statistical software to solve complex problems.
Prerequisite: MATH 22000 (may be taken concurrently)

MATH 32000 - Theories of Geometry (3)
The study of Euclid geometry, its strengths and weaknesses, famous and advanced theorems and its impact on the development of geometry. This latter includes axiomatic systems and proofs, the parallel axiom and the analysis of constructions and transformation geometry.
Prerequisite: MATH 21000 (may be taken concurrently) or MATH 31000 (may be taken concurrently)

MATH 32500 - Foundations of Advanced Mathematics (3)
This course provides a gateway into the more abstract and theoretical expectations of upper-level mathematics courses. The course includes a more in-depth study of set theory, propositional logic, predicate logic, and relations especially as they apply to proof. The course also continues the experience of reading, writing, and analyzing mathematical proof. Furthermore, this course introduces technology that is used to solve complex mathematical problems.
Prerequisite: MATH 31000 (may be taken concurrently) or MATH 21000 (may be taken concurrently)

MATH 32700 - Introduction to Number Theory (3)
Number theory is the study of the integers. Topics include divisibility, primes, congruences, number theoretic functions, quadratic residues, and primitive roots, with additional topics selected from among Diophantine equations, Pythagorean triples, Fermat's Last Theorem, sums of squares, continued fractions, cryptography, primality testing, and Pell's equation.
Prerequisite: MATH 20000 (may be taken concurrently) or MATH 24000 (may be taken concurrently)

MATH 35000 - Numerical Analysis (3)
Students examine floating point arithmetic, polynomial interpolation, numerical methods of integration, numerical solution of non-linear equations and numerical linear algebra.
Prerequisite: (MATH 20600 (may be taken concurrently) or MATH 20900 (may be taken concurrently)) and (CPSC 20000 (may be taken concurrently) or CPSC 21000 (may be taken concurrently) or CPSC 31500 (may be taken concurrently) or DATA 20000 (may be taken concurrently))

MATH 35500 - Financial Mathematics (3)
This course will provide students with an understanding of the fundamental concepts of financial mathematics and how those concepts are applied in calculating present and accumulated values for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows. These are all topics covered on the financial mathematics actuarial exam (Exam FM).
Prerequisite: MATH 23500 and MATH 22000 or MATH 21000

MATH 36500 - Mathematical Modeling (3)
This course studies the process of creating models for real world applications from a wide variety of areas such as physics, chemistry, biology, economics and social sciences. It introduces the students to the basics of mathematical modeling with a focus on model construction, fitting and optimization, analysis, evaluation, and application. This course will make use of computer software in developing models.
Prerequisite: MATH 20100 (may be taken concurrently) or MATH 24000 (may be taken concurrently) or MATH 23500 (may be taken concurrently) or MATH 20600 (may be taken concurrently)

MATH 37500 - Complex Analysis (3)
A study of complex numbers, analytic functions, integration, power series and calculus of residues is presented.
Prerequisite: MATH 32500 (may be taken concurrently) or MATH 30000 (may be taken concurrently)

MATH 39601 - ST: Graph Theoretical Design Strategies for Modeling Self-Assembling DNA (2)

MATH 39602 - ST: Mathematics Exam Prep (1)

MATH 39603 - ST: Applied Combinatorics and Graph Theory (3)

MATH 43000 - Complex Analysis (3)
A study of complex numbers, analytic functions, integration, power series and calculus of residues is presented.
Prerequisite: MATH 32500 (may be taken concurrently)

MATH 44000 - Abstract Algebra I (3)
This course focuses on binary operations, groups, subgroups, permutations, cyclic groups, cosets, and group homomorphisms.
Prerequisite: MATH 32500 (may be taken concurrently) and MATH 25000 (may be taken concurrently)

MATH 44100 - Abstract Algebra 2 (3)
A continuation of MATH 44000, this course studies rings, fields, Fermat Theorem, matrices ideals, ring homomorphisms polynomial rings, vector spaces and linear transformations.
Prerequisite: MATH 44000 (may be taken concurrently)

MATH 45000 - Real Analysis 1 (3)
This course provides a formal presentation of the real number system and Euclidean vector spaces (inner products, norms and distance functions), compactness and connectedness, continuity, differentiation, and integration.
Prerequisite: MATH 32500 (may be taken concurrently) and MATH 25000 (may be taken concurrently)

MATH 45100 - Real Analysis 2 (3)
A continuation of MATH 36000, this course studies uniform convergence, sequences and series of functions, differential and integral calculus for functions of several variables, the Implicit Function Theorem and the Inverse Function Theorem.
Prerequisite: MATH 36000 (may be taken concurrently) or MATH 45000 (may be taken concurrently)

MATH 47500 - Mathematics Research (1-6)
Students work under faculty supervision on a research project in mathematics, statistics, or a related area chosen in consultation with the faculty member. This course may be repeated multiple times for credit.
Attributes: Experiential Learning Gen Ed

MATH 48000 - Senior Seminar (2-3)
This course fulfills the advanced writing requirement for the mathematics major. In this course the student will study a topic related to the algebra, analysis, or statistics sequence required by the mathematics major. The student will complete a written report and an oral presentation based on his/her study.
Prerequisite: MATH 31500 (may be taken concurrently) or MATH 36000 (may be taken concurrently) or MATH 44000 (may be taken concurrently)
Attributes: Advanced Writing, Experiential Learning Gen Ed

MATH 49800 - Mathematics Internship (3)
Students can acquire practical related experience through placement in selected settings. Students submit an internship proposal in advance for approval, maintain a daily task log and submit a five-page written summary report at the conclusion of the internship. A minimum of 210 clock hours and an interview with the on-site supervisor are required.
Program Restrictions: Must be enrolled in the following Program: Mathematics .
Class Restrictions: Must be enrolled in one of the following Classes: Junior or Senior.

MATH 49900 - Independent Study in Mathematics (1-4)
This course is designed to meet the needs of mathematics majors wishing to study an advanced topic not found in the curriculum.
Class Restrictions: Must be enrolled in one of the following Classes: Junior or Senior.