MATHEMATICS (MAT)

MAT 100 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

MAT 108 Basic Probability and Statistics for the Liberal Arts I (4 Credits)
Arts & Sciences
An introductory statistics course designed to cover the basics of descriptive and inferential statistics, including: sampling and experimental design, descriptive statistics and plots, confidence intervals, significance tests, and the basics of linear regression. Only available to students registered in the Online Associate in Arts or Bachelors of Professional Studies degree programs.

MAT 109 Basic Probability and Statistics for the Liberal Arts II (4 Credits)
Arts & Sciences
The second of two introductory statistics courses designed to cover the basics of descriptive and inferential statistics, including: sampling and experimental design, descriptive statistics and plots, confidence intervals, significance tests, and the basics of linear regression. Only available to students registered in the Online Associate in Arts or Bachelors of Professional Studies degree programs.
Advisory recommendation Prereq: MAT 108

MAT 112 Algebraic Operations and Functions (3 Credits)
Arts & Sciences
Algebraic operations. Linear and quadratic equations, applications. Exponents and logarithms. Credit not given for MAT 112 after receiving a C or better in MAT 183 or above.

MAT 117 Foundational Mathematics via Problem Solving I (3 Credits)
Arts & Sciences
One course in three-course sequence. Number concepts and relationships (including concepts of numeration, operations, number theory). Emphasizing learning through problem solving.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 118 Foundational Mathematics via Problem Solving II (3 Credits)
Arts & Sciences
One course in a three-course sequence. Rational numbers, real numbers, patterns, and functions. Emphasizing learning through problem solving.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 119 Foundational Mathematics via Problem Solving III (3 Credits)
Arts & Sciences
One course in a three-course sequence. Probability, statistics, geometric and measurement concepts. Emphasizing learning through problem solving.

MAT 120 Supplemental Basic Mathematics (1 Credit)
Arts & Sciences
ls as needed for further coursework. Does not satisfy any part of the quantitative skills requirement.
Coreq: MAT 121 or 122 or 183 or 194

MAT 121 Probability and Statistics for the Liberal Arts I (4 Credits)
Arts & Sciences
First in a two-course sequence. Teaches probability and statistics by focusing on data and reasoning. Topics include displaying data, numerical measures of data, elementary probability, discrete distributions, normal distributions, confidence intervals. NOTE: A student cannot receive credit for MAT 121 after completing STT 101 or any MAT course numbered above 180 with a grade of C or better.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 122 Probability and Statistics for the Liberal Arts II (4 Credits)
Arts & Sciences
Second in a two-course sequence. Teaches probability and statistics focusing on data and reasoning. Topics include hypothesis testing, linear correlation, linear regression, nonparametric methods, statistical process control, solving liner equations, matrices, Markov chains. NOTE: A student cannot receive credit for MAT 122 after completing any MAT course numbered above 180 with a grade of C or better.
Prereq: MAT 121
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 180 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable 1 times for 999.99 credits maximum

MAT 183 Elements of Modern Mathematics (4 Credits)
Arts & Sciences
Linear equations, matrices, and linear programming. Introduction to mathematics of finance. Discrete probability theory. For students interested in management, finance, economics, or related areas.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 190 Independent Study (1-6 Credits)
Arts & Sciences
In-depth exploration of a problem or problems. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor or instructors and the department.
Repeatable 1 times for 999.99 credits maximum

MAT 193 Algebra-Infused Precalculus (4 Credits)
Arts & Sciences
Polynomial, rational, exponential, and logarithmic functions. Analytical trigonometry and trigonometric functions. Emphasis on algebra throughout the course. A student cannot receive credit for MAT 193 after receiving a grade of C or better in any calculus course. Credit cannot be given for both MAT 193 and MAT 194.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/)

MAT 194 Precalculus (4 Credits)
Arts & Sciences
Polynomial, rational, exponential, and logarithmic functions. Analytical trigonometry and trigonometric functions. A student cannot receive credit for MAT 194 after receiving a grade of C or better in any calculus course. Credit cannot be given for both MAT 193 and MAT 194.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/)

MAT 200 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

MAT 221 Elementary Probability and Statistics I (4 Credits)
Arts & Sciences
First of a two-course sequence. For students in fields that emphasize quantitative methods. Probability, design of experiments, sampling theory, introduction of computers for data management, evaluation of models, and estimation of parameters.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 222 Elementary Probability and Statistics II (3 Credits)
Arts & Sciences
Continuation of MAT 221. Further methods of statistical analysis emphasizing statistical reasoning and data analysis using statistical software. Basic concepts of hypothesis testing, estimation and confidence intervals, t-tests and chi-square tests, linear regression, analysis of variance.
Prereq: MAT 221
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 270 Experience Credit (1-6 Credits)
Arts & Sciences
Repeatable 1 times for 6 credits maximum

MAT 280 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the SU academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable 2 times for 12 credits maximum

MAT 284 Business Calculus (4 Credits)
Arts & Sciences
One-variable differential and integral calculus. Applications to business and economics. MAT 284 may not be taken for credit after obtaining a grade of C or higher in MAT 285 or MAT 295.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 285 Life Sciences Calculus I (3 Credits)
Arts & Sciences
Functions and their graphs, derivatives and their applications, differentiation techniques, the exponential and logarithmic functions, integration. MAT 285 may not be taken for credit after obtaining a grade of C or higher in MAT 284 or MAT 295.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 286 Life Sciences Calculus II (3 Credits)
Arts & Sciences
Integration methods and applications, first order differential equations with applications, multivariable differential calculus including optimization. Cannot be taken for credit after obtaining a grade of C or higher in MAT 296.
Prereq: MAT 285 or MAT 295
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 290 Independent Study (1-6 Credits)
Arts & Sciences
In-depth exploration of a problem or problems. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor or instructors and the department.
Repeatable

MAT 291 Calculus I Plus (1 Credit)
Arts & Sciences
Delve more deeply into the material in MAT 295. Solve more challenging problems. For prospective mathematics majors and others with strong background and interest in mathematics.
Coreq: MAT 295

MAT 292 Calculus II Plus (1 Credit)
Arts & Sciences
Delve more deeply into the material in MAT 296. Solve more challenging problems. For prospective mathematics majors and others with strong background and interest in mathematics.
Coreq: MAT 296

MAT 295 Calculus I (4 Credits)
Arts & Sciences
Limits, continuity, derivatives, related rates, maxima and minima of functions, optimization problems, L'Hospital's Rule, integration, the Fundamental Theorem of Calculus, integration by substitution. For science majors.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 296 Calculus II (2-4 Credits)
Arts & Sciences
Applications of the definite integral, integration by parts, partial fractions, trigonometric substitutions, improper integrals, series, power series, parametric equations, polar coordinates.
Prereq: MAT 295 with minimum grade C-
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 300 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

MAT 331 First Course in Linear Algebra (3 Credits)
Arts & Sciences
Linear equations, n-dimensional euclidean space, linear independence, bases, linear transformations, matrices and determinants, eigenvalues and eigenvectors. Geometric aspects.
Prereq: MAT 286 or 296
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 375 Introduction to Abstract Mathematics (3 Credits)
Arts & Sciences
Principles of symbolic logic, set theory, basic function theory, relations, and cardinality. Emphasis on developing proof-writing skills, including mathematical induction. Credit cannot be given for both MAT 375 and CIS 375.
Prereq: MAT 295
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 380 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

MAT 390 Independent Study (1-6 Credits)
Arts & Sciences
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

MAT 391 Calculus III Plus (1 Credit)
Arts & Sciences
Delve more deeply into the material in MAT 397. Solve more challenging problems. For prospective mathematics majors and others with strong background and interest in mathematics.
Coreq: MAT 397

MAT 397 Calculus III (4 Credits)
Arts & Sciences
Vectors and geometry of space, vector functions, functions of more than one variable, partial derivatives, multiple integrals, line and surface integrals, Green¿s, Stokes¿, and Divergence Theorems.
Prereq: MAT 296 with minimum grade C-
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 400 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

MAT 412 Introduction to Real Analysis I (3 Credits)
Arts & Sciences
Introduction to the foundations of calculus covering topics from the following: the real number system, functions, limits, sequences, infinite series, continuity, and uniform continuity. Enrollment limited to mathematics majors.
Prereq: (MAT 375 or CIS 375) and MAT 397
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 414 Introduction to Ordinary Differential Equations (3 Credits)
Arts & Sciences
First order differential equations. Second order linear differential equations. Power series solutions. Bessel¿s equations, Laplace transforms. Systems of first order differential equations. Applications.
Prereq: MAT 397 Coreq: MAT 331 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 421 Applied Probability and Statistics (3 Credits)
Arts & Sciences
Sample spaces, counting, random variables and their distributions, expected value, central limit theorem. Estimation and confidence intervals, hypothesis tests, analysis of variance and regression. MAT 421 does not count towards the Mathematics or Applied Mathematics major or minor. Cannot be taken for credit after successfully completing MAT 521.
Prereq: MAT 286 or 296

MAT 422 Statistical Computing (3 Credits)
Arts & Sciences
Characteristics of data, data preparation and reformatting, accessing data from various sources, programming principles for statistical computing, data summary and visualization, statistical study design aspects of sampling and randomization, introduction to statistical simulation.
Prereq: MAT 222 or permission of instructor
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

MAT 470 Experience Credit (1-6 Credits)
Arts & Sciences
Participation in a discipline or subject related experience. Student must be evaluated by written or oral reports or an examination. Permission in advance with the consent of the department chairperson, instructor, and dean. Limited to those in good academic standing.
Repeatable

MAT 480 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

MAT 485 Differential Equations and Matrix Algebra for Engineers (3 Credits)
Arts & Sciences
Solution of ordinary differential equations, including series methods. Vector spaces, matrix algebra, rank, linear systems, eigenvalues and eigenvectors. MAT 485 may not be taken for credit after receiving a grade of C or higher in both MAT 331 and MAT 414. Does not count toward mathematics major.
Prereq: MAT 397
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 490 Independent Study (1-6 Credits)
Arts & Sciences
In-depth exploration of a problem or problems. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor or instructors and the department.
Repeatable

MAT 495 Fundamentals of Data Science (3 Credits)
Arts & Sciences
Double-numbered with MAT 695
Fundamental methods for data science, such as regression, linear discriminant analysis, k-nearest neighbors, support vector machine, k-means, principal component analysis, and nonlinear dimension reduction. Performance evaluation and model selection. Additional work required of graduate students.
Prereq: (MAT 331 and MAT 521) or (MAT 503 and MAT 523)
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 499 Honors Capstone Project (1-3 Credits)
Arts & Sciences
Completion of an Honors Capstone Project under the supervision of a faculty member.
Repeatable 3 times for 3 credits maximum

MAT 500 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

MAT 503 Matrix Methods for Data Science (3 Credits)
Arts & Sciences
Matrix methods required for data analysis with an emphasis on applications and using software. Matrix norms, orthogonality, eigendecomposition, SVD, LS, QRD, LDA, PCA. Not for math majors or minors. Additional work required of graduate students.
Prereq: MAT 397

MAT 511 Advanced Calculus (3 Credits)
Arts & Sciences
Partial derivatives, implicit functions, integration in several variables, line and surface integrals.
Prereq: (MAT 331 and 397) or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 512 Introduction to Real Analysis II (3 Credits)
Arts & Sciences
Real-number system, set theory and elementary topological properties of the real line, continuity and differentiability, sequences and series, uniform convergence, Riemann integration, and improper integrals.
Prereq: MAT 412 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 513 Introduction to Complex Analysis (3 Credits)
Arts & Sciences
Complex number system and its arithmetic, geometric representation. Linear transformations. Analytic functions and the Cauchy-Riemann equations. Integration and Cauchy's theorem, Taylor and Laurent series, singularities, poles, and residues. Applications.
Prereq: MAT 412 or 511 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 517 Partial Differential Equations and Fourier Series (3 Credits)
Arts & Sciences
Partial differential equations, boundary-value problems, Fourier series and orthogonal expansions, Bessel functions, and Legendre polynomials.
Prereq: MAT 485 or 414 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 518 Fourier Series, Transforms and Wavelets (3 Credits)
Arts & Sciences
Orthogonal functions, Fourier series, Fourier transforms-continuous and discrete, Haar wavelets and multiresolution analysis, applications to signal processing. Additional work required of graduate students.
Prereq: MAT 331 or MAT 485 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 521 Introduction to Probability (3 Credits)
Arts & Sciences
Algebra of sets. Probability in finite sample spaces. Binomial and multinomial coefficients. Random variables. Expected value and standard deviation. Density functions. Statistical applications.
Prereq: MAT 397 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 523 Statistical Methods for Data Science (3 Credits)
Arts & Sciences
Statistical methods (such as hypothesis testing, parameter estimation, regression, ANOVA, sampling, experimental design) required for data science. Emphasis on applications and using software. Additional work required for graduate students.
Prereq: MAT 397 and (MAT 222 or CIS 321 or MAT 421 or MAT 521)

MAT 524 Regression Analysis (3 Credits)
Arts & Sciences
Concept, theory, methods, and applications of simple linear regression, multiple linear regression, and logistic regression models; Parameter estimation and testing, Prediction, Regression diagnostics and model adequacy checking, Variable selection and model building.
Prereq: MAT 331 AND (MAT 222 or MAT 421 or MAT 525)
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 525 Mathematical Statistics (3 Credits)
Arts & Sciences
Estimation and confidence intervals. Normal distribution and central limit theorem. Testing hypotheses, chi-square, t, and F distributions. Least squares, regression, and correlation.
Prereq: MAT 521 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 526 Introduction to Stochastic Processes (3 Credits)
Arts & Sciences
Discrete time Markov chains, Poisson process, continuous time Markov chains and other selected stochastic processes.
Prereq: MAT 521 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 527 Analysis of Variance and Experimental Design (3 Credits)
Arts & Sciences
One-way, two-way, and multi-way analysis of variance, analysis of covariance, random/mixed effect models, repeated measure analysis, and special designs such as a randomized block design, an incomplete block design, Latin square, and a nested design.
Advisory recommendation Prereq: MAT 222 or MAT 421 or MAT 525
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 528 Probability Models for Actuarial Science (3 Credits)
Arts & Sciences
Applied probability focusing on distributions for actuarial applications. Conditional expectation. Moment generating functions. Limit theorems. Loss and Survival models. Parametric and Non-Parametric estimation. Model assessment. Benefit reserves and risk measures. Additional work required of graduate students.
Prereq: MAT 521

MAT 529 Introduction to Bayesian Statistics (3 Credits)
Arts & Sciences
Concepts of prior and posterior, Bayesian inference for binomial and Poisson distributions, Monte Carlo approximation, Bayesian inference for normal distribution, Gibbs sampling, hierarchical models, multivariate normal distribution, Metropolis-Hastings algorithms, linear regression models.
Advisory recommendation Prereq: MAT 296, MAT 331, MAT 422, and MAT 525

MAT 531 Second Course in Linear Algebra (3 Credits)
Arts & Sciences
Abstract vector spaces and inner product spaces, linear transformations and linear operators, eigenvalues and diagonalization. Primarily for mathematics majors.
Prereq: ((MAT 375 or CIS 375) and MAT 331) or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 532 Applied Linear Algebra (3 Credits)
Arts & Sciences
Factorization of matrices, eigenvalues and eigenvectors, orthogonality. Applications of matrices to such topics as least-squares approximation, fast Fourier transform, difference and differential equations, linear programming, networks, game theory.
Prereq: MAT 331 or 485 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 534 Introduction to Abstract Algebra (3 Credits)
Arts & Sciences
Theory of groups, rings, and fields, including the integers and polynomial rings.
Prereq: MAT 531 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 541 Introduction to Number Theory (3 Credits)
Arts & Sciences
Prime numbers, greatest common divisors, congruences. Euler's function, Fermat's theorem, primitive roots, indices, quadratic residues, Legendre and Jacobi symbols, and the quadratic reciprocity law.
Prereq: ((MAT 375 or CIS 375) and MAT 331) or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 545 Introduction to Combinatorics (3 Credits)
Arts & Sciences
Cross-listed with CIS 545
Permutations, combinations, recurrence relations, generating functions, inclusion-exclusion and applications, introductory graph theory.
Prereq: MAT 375 or CIS 375 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 551 Fundamental Concepts of Geometry (3 Credits)
Arts & Sciences
Synthetic projective geometries. Coordinate systems for projective spaces. Algebraic representation of projective transformations; euclidean, non-euclidean, and affine geometries as real cases of projective geometry.
Prereq: ((MAT 375 or CIS 375) and MAT 331) or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 554 Differential Geometry (3 Credits)
Arts & Sciences
Theory of curves in three-dimensional space, including Frenet's formula, Gaussian and mean curvature, geodesics, developable surfaces, special conformal mappings.
Prereq: MAT 412 or 511 or graduate standing in mathematical sciences
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 562 Elementary Topology (3 Credits)
Arts & Sciences
Metrics and metric spaces, topologies and topological spaces, separation properties, compactness, connectedness, and continuity.
Prereq: ((MAT 375 or CIS 275) and MAT 412) or graduate standing in mathematical sciences
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/)

MAT 580 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

MAT 581 Numerical Methods with Programming (3 Credits)
Arts & Sciences
Approximation methods for solution of nonlinear equations. Interpolation problems. Numerical integration. Solution of ordinary differential equations. Error analysis and writing computer programs. Primarily for mathematics and engineering students.
Prereq: MAT 397 or graduate standing in mathematical sciences
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

MAT 590 Independent Study (1-6 Credits)
Arts & Sciences
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

MAT 593 History of Mathematics (3 Credits)
Arts & Sciences
Mathematical concepts in their historical perspective. Character and contributions of the great mathematicians and relation of mathematics to other sciences.
Prereq: (MAT 397 and at least two 500-level math courses) or graduate standing in mathematical sciences
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/)

MAT 598 Statistics Seminar (3 Credits)
Arts & Sciences
In-depth investigation of one or more statistical topics, applications of statistical methods and tools, real-world data analysis project using software, comprehensive presentation of project findings.
Advisory recommendation Prereq: MAT 422, MAT 524, MAT 525, and MAT 527

MAT 599 Senior Seminar in Mathematics (3 Credits)
Arts & Sciences
Topic Chosen by the instructor. Permission of department.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/)