Mathematics

Courses

MATH 0005 Intermediate Algebra: 3 semester hours
Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. Preparatory material for college level mathematics courses. Covers systems of linear equations and inequalities, polynomials, rational expressions, exponents, quadratic equations, graphing linear and quadratic functions. This course carries no credit towards any baccalaureate degree.

MATH 1020 Contemporary Mathematics: 3 semester hours
Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. Presents methods of problem solving, centering on problems and questions which arise naturally in everyday life. May include aspects of algebra and geometry, the mathematics of finance, probability and statistics, exponential growth, and other topics chosen from traditional and contemporary mathematics which do not employ the calculus. May be taken to meet the mathematical proficiency requirement, but may not be used as a prerequisite for other mathematics courses. Designed for students who do not plan to take calculus. Credit will not be granted for MATH 1020 if credit has been granted for MATH 1310, MATH 1800, MATH 1100, MATH 1102, or MATH 1105. Concurrent enrollment in MATH 1020 and any of these courses is not permitted.

MATH 1021 Choice and Chance: 3 semester hours
Same as PHIL 1021. Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. This course provides an introduction to inductive logic and the theory of probability in an organized and systematic way, so as to give students tools for more effective decision-making. We will introduce the probability calculus, basic concepts of utility theory, decision theory and different approaches to understanding probability. This course is designed to be accessible to students of all levels. Satisfies mathematics proficiency.

MATH 1025 Geometry in the Real World: 3 semester hours
Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. Presents topics in geometry designed to enrich the student's understanding of mathematics. Geometry as it applies to the physical world and such fields as art, music, nature, motion, architecture and city planning will be examined. This course is designed to be accessible to students of all levels. Satisfies mathematics proficiency.

MATH 1030 College Algebra: 3 semester hours
Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course, or approval of the department. Topics in algebra and probability, polynomial functions, the binomial theorem, logarithms, exponentials, and solutions to systems of equations.

MATH 1035 Trigonometry: 2 semester hours
Prerequisite: MATH 1030 or MATH 1040, or concurrent registration in either of these two courses, or a satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. A study of the trigonometric and inverse trigonometric functions with emphasis on trigonometric identities and equations.

MATH 1040 College Algebra for Science and Engineering: 4 semester hours
Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. Topics in this course include factoring, simplifying rational functions, functions and their graphs, solving linear and nonlinear equations, polynomial functions, inverse functions, the binomial theorem, logarithms, exponentials, solutions to systems of equations using matrices, solutions to nonlinear systems of equations, and sequences.

MATH 1045 PreCalculus: 5 semester hours
Prerequisites: A satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. Topics in this course include factoring, simplifying rational functions, functions and their graphs, solving linear and nonlinear equations, polynomial functions, inverse functions, the binomial theorem, logarithms, exponentials, solutions to systems of equations using matrices, solutions to nonlinear systems of equations, and sequences. Students will also study trigonometric and inverse trigonometric functions with emphasis on trigonometric identities and equations.

MATH 1100 Basic Calculus: 3 semester hours
Prerequisite: MATH 1030 or MATH 1040 or a satisfactory score on the UMSL ALEKS Placement Examination, obtained at most one year prior to enrollment in this course. Introduction to plane analytic geometry and basic differential and integral calculus with applications to various areas. No credit for Mathematics majors. Credit not granted for both MATH 1800 and MATH 1100.

MATH 1102 Finite Mathematics: 3 semester hours
Prerequisites: MATH 1030 or MATH 1040 or a satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. Introductory logic and set theory, partitions and counting problems, elementary probability theory, stochastic processes, Markov chains, vectors and matrices, linear programming, and game theory.

MATH 1105 Basic Probability And Statistics: 3 semester hours
Prerequisites: MATH 1030 or MATH 1040 or a satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. An introduction to probability and statistics. Topics include the concept of probability and its properties, descriptive statistics, discrete and continuous random variables, expected value, distribution functions, the central limit theorem, random sampling and sampling distributions. Credit not granted for more than one of MATH 1310, MATH 1320, and MATH 1105.

MATH 1150 Structure Of Mathematical Systems I: 3 semester hours
Prerequisites: 45 hours of college credit and a satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course OR successful completion of MATH 1030 no more than 2 years prior to enrollment in this course. A study of sets, relations, functions, whole numbers; the integers and their properties, and the rational and real number systems.

MATH 1310 Elementary Statistical Methods: 3 semester hours
Prerequisite: MATH 1030 or MATH 1040 or a satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course. An introduction to the basic tools and elementary methods of statistics, such as testing of hypotheses, analysis of variance, method of least squares, and time series. A student may not receive credit for more than one of MATH 1310, MATH 1320, and MATH 1105.
MATH 1320 Applied Statistics I: 3 semester hours
Prerequisites: MATH 1800 or MATH 1100. This is the first course of a one-year sequence in introductory probability and statistics. It provides a comprehensive introduction to those models and methods which are most likely to be encountered by students in their careers in applied mathematics and the sciences. Topics include descriptive statistics, basics of probability theory, random variables and their distributions, sampling distributions, confidence intervals, and hypothesis testing for population means and population proportions. A student may not receive credit for more than one of MATH 1310, MATH 1320 and MATH 1105.

MATH 1800 Analytic Geometry And Calculus I: 5 semester hours
Prerequisites: MATH 1030 and MATH 1035, or MATH 1040 and MATH 1035, or a satisfactory score on the UMSL ALEKS Math Placement Examination, obtained at most one year prior to enrollment in this course, or approval of the department. This course provides an introduction to differential and integral calculus. Topics include limits, derivatives, related rates, Newton's method, the Mean-Value Theorem, Max-Min problems, the integral, the Fundamental Theorem of Integral Calculus, areas, volumes, and average values.

MATH 1900 Analytic Geometry And Calculus II: 5 semester hours
Prerequisite: MATH 1800. Topics include conic sections, rotation of axes, polar coordinates, exponential and logarithmic functions, inverse (trigonometric) functions, integration techniques, applications of the integral (including mass, moments, arc length, and hydrostatic pressure), parametric equations, infinite series, power and Taylor series.

MATH 2000 Analytic Geometry And Calculus III: 5 semester hours
Prerequisite: MATH 1900. Topics include vectors, cylindrical and spherical coordinates, vector-valued functions, arc length and curvature, functions of several variables, partial and directional derivatives, gradients, extrema, Lagrange multipliers, multiple integrals, change of variables, surface area, vector fields, Stokes' Theorem.

MATH 2020 Introduction To Differential Equations: 3 semester hours
Prerequisite: MATH 2000. Topics will be chosen from: linear differential equations, equations with constant coefficients, laplace transforms, power series solutions, systems of ordinary differential equations.

MATH 2450 Elementary Linear Algebra: 3 semester hours
Prerequisite: MATH 1100 or MATH 1900. An introduction to linear algebra. Topics will include complex numbers, geometric vectors in two and three dimensions and their linear transformations, the algebra of matrices, determinants, solutions of systems of equations, eigenvalues and eigenvectors.

MATH 2510 Structure Of Mathematical Systems II: 3 semester hours
Prerequisites: MATH 1900 or MATH 1100, and MATH 1320 or LOG OM 3300 (or equivalents). An introduction to the theory of interest, annuities (certain), annuities with differing pay periods, amortization schedules and sinking funds.

MATH 3000 Discrete Structures: 3 semester hours
Prerequisites: MATH 1900 or MATH 1100, and CMP SCI 1250 or equivalent. Treats fundamental ideas in discrete structures and serves as a foundation for subsequent courses in both Mathematics and Computer Science. Provides an introduction to techniques of mathematical reasoning with examples derived from computer science. Topics include logic, set algebra, equivalence relations and partitions, functions, mathematical induction, elementary number theory, cardinality, recurrence relations, basic combinatorial methods, trees and graphs. Credit not granted for more than one of CMP SCI 3000, and MATH 3000.

MATH 3100 Problem Solving In Mathematics: 1 semester hour
Prerequisite: MATH 2000. Course will train students to solve and write solutions to challenging mathematical problems, like those found in competitive exams like the Putnam Exam.

MATH 3520 Structure Of Mathematical Systems III: 3 semester hours
Prerequisite: MATH 2510 Together with MATH 1150 and MATH 2510, this course teaches the mathematics necessary for middle school mathematics certification. Topics from MATH 1150 and MATH 2510 are continued. Other topics include geometric constructions, similarity, coordinate geometry, normal distribution, combinatorics, and trigonometry.

MATH 4010 Financial Mathematics I: 3 semester hours
Prerequisites: MATH 1900 or MATH 1100, and MATH 1320 or LOG OM 3300 (or equivalents). An introduction to the theory of interest, annuities (certain), annuities with differing pay periods, amortization schedules and sinking funds.

MATH 4020 Financial Mathematics II: 3 semester hours
Prerequisites: MATH 4010. Premium-discount formula for bonds, bond amortization, term structure of interest rates and pricing theory for options.

MATH 4030 Applied Mathematics I: 3 semester hours
Prerequisites: MATH 2020 and MATH 2450. Topics chosen from Fourier series, special functions, partial differential equations, and boundary value problems.

MATH 4060 Applied Differential Equations: 3 semester hours
Prerequisites: MATH 2020 and MATH 2450. The study of ordinary differential equations and partial differential equations is continued with applications in such areas as physics, engineering and biology.

MATH 4100 Real Analysis I: 3 semester hours
Prerequisites: MATH 2000 and MATH 3000. Introduction to real analysis in one variable. Topics include the real number system, limits, continuity, differentiability, and sequences and series of functions.

MATH 4160 Complex Analysis I: 3 semester hours
Prerequisites: MATH 2020 or both MATH 3000 and MATH 2000. Complex numbers and their geometrical representation, point sets, analytic functions of a complex variable, complex integration, Taylor and Laurent series, residue theorem, conformal mapping.

MATH 4200 Mathematical Statistics I: 3 semester hours
Prerequisites: MATH 1320 and MATH 2000. Introduction to the theory of probability and statistics using concepts and methods of calculus.

MATH 4210 Mathematical Statistics II: 3 semester hours
Prerequisites: MATH 4200. Continuation of MATH 4200. Sampling distributions, estimation theory, properties of estimators, hypothesis testing, NeymanPearson Theorem, likelihood ratio tests, introduction of analysis of variance and linear models. Basics of some nonparametric procedures.

MATH 4230 Numerical Analysis I: 3 semester hours
Prerequisites: MATH 2020, MATH 2450, and the ability to program in an upper-level language. Solutions of equations, interpolation and approximation numerical differentiation and integration, and numerical solutions of initial value problems in ordinary differential equations. Selected algorithms will be programmed for solution on computers.

MATH 4260 Introduction To Stochastic Processes: 3 semester hours
Prerequisites: MATH 4200. Basic theory and applications of stochastic processes. Markov chains, recurrent and transient states, stationary distributions, ergodic theorem, renewal processes, discrete martigales and stationary processes.
MATH 4350 Theory Of Numbers: 3 semester hours
Prerequisites: MATH 3000 and MATH 2000, or consent of instructor. Properties of integers, multiplicative functions, congruences, primitive roots, and quadratic residues.

MATH 4390 Topics In Probability And Statistics: 3 semester hours
Prerequisites: Consent of Instructor. A seminar on special topics in probability and statistics to be determined by the interests of the instructor. May be repeated for credit provided different topics are studied.

MATH 4400 Introduction To Abstract Algebra I: 3 semester hours
Prerequisites: MATH 3000 and MATH 2000, or consent of the department. Introduction to groups, rings, and fields, with emphasis on groups and rings.

MATH 4450 Linear Algebra: 3 semester hours
Prerequisites: MATH 3000, MATH 2000 and MATH 2450. Topics selected from vector spaces, bases, linear transformations, matrices, canonical forms, eigenvalues, hermitian and unitary matrices, inner product spaces, and quadratic forms.

MATH 4500 Special Readings: 1-10 semester hours
Prerequisites: MATH 3000, MATH 2000 and consent of instructor.

MATH 4550 Combinatorics: 3 semester hours
Prerequisites: MATH 3000, MATH 2000 and consent of instructor. Generating functions, recurrence relations, and applications.

MATH 4660 Foundations Of Geometry: 3 semester hours
Prerequisites: MATH 3000 and MATH 2000, or consent of the department. A development of portions of Euclidean geometry from a selected set of axioms, including a discussion of consistency, independence, categoricity, and completeness of the axioms.

MATH 4670 Introduction To Non-Euclidean Geometry: 3 semester hours
Prerequisites: MATH 3000 and MATH 2000, or consent of the department. A summary of the history of the non-Euclidean geometries and a study of hyperbolic plane geometry.

MATH 4800 Introduction To Topology: 3 semester hours
Prerequisites: MATH 3000 and MATH 2000, or consent of the department. A study of topological spaces, including the concepts of limit, continuity, connectedness, compactness, etc. Special emphasis placed on, and examples taken from, the space of real numbers.

MATH 4890 Topics In Mathematics: 3 semester hours
Prerequisite: Consent of Instructor. The course will cover various advanced topics in computation, and can be taken more than once for credit. Examples of such topics are: computer graphics, computer architecture, theories of language, analysis of operating systems, numerical geometry and computer aided design, etc.

MATH 5110 Differentiable Manifolds: 3 semester hours
Prerequisites: MATH 4100, MATH 4450, and MATH 4800. An introduction to smooth manifolds and maps. Topics will include the Implicit Function Theorem, Sard's Theorem, transversality, intersection and degree theory, differential forms and integration on manifolds.

MATH 5140 Set Theory And Metric Spaces: 3 semester hours
Prerequisites: MATH 4100 or consent of instructor. Naive set theory, cardinal arithmetic, ordinal numbers, the axiom of choice and equivalents, metric spaces, convergence, continuity, compactness, contraction principles and applications. Construction of completions and examples like real numbers and p-adic numbers. Other topics could include the Stone-Weierstrass theorem and metrizability theorems.

MATH 5160 Complex Analysis II: 3 semester hours
Prerequisites: MATH 4160 and either MATH 4100 or MATH 4800. A second course in complex analysis, emphasizing the theory of analytic functions, and including various topics like the Riemann mapping theorem, normal families, analytic continuation, representations of analytic functions, and elliptic functions.

MATH 5200 Topics In Advanced Math For The Teacher: 3 semester hours
Prerequisite: Consent of Instructor. This course will look at various topics in Algebra, Analysis, and Geometry that will deepen a teacher's understanding of the Mathematics of the precollegiate curriculum. It can be taken more than once for credit.

MATH 5500 Directed Readings: 1-6 semester hours
Prerequisite: Consent of instructor. Independent readings at an advanced level.

MATH 5550 Topics In Advanced Math For The Teacher: 3 semester hours
Prerequisite: Consent of instructor. The course studies classical and recently developed statistical procedures selected from areas including analysis of variance, multivariate analysis, nonparametric or semi-parametric methods and generalized linear models. Emphasis is on application of procedures, including the rationale underlying choice of procedures.

MATH 5600 Topics In Computation: 3 semester hours
Prerequisite: consent of instructor. The course will cover various advanced topics in computation, and can be taken more than once for credit. Examples of such topics are: fast transforms, digital filters, etc.

MATH 5700 Topics In Applied Mathematics: 3 semester hours
Prerequisites: MATH 5100 or consent of instructor. Topics selected from the areas of Fourier analysis, harmonic analysis, functional analysis, special functions, generalized functions, and partial differential equations. May be taken more than once for credit with consent of department.

MATH 5820 Topics In Algebra: 3 semester hours
Prerequisite: Consent of instructor. Topics selected from the theory of groups, rings, fields, algebras and other algebraic systems. May be taken more than once for credit with consent of department.

MATH 5900 Masters Thesis: 1-6 semester hours
Prerequisite: Consent of instructor. Thesis work under the supervision of a faculty member. The course is designed for those students intending to present a thesis as part of their M.A. program. Students who do not write a thesis cannot apply MATH 6900 to a degree.
MATH 7990 Ph.D. Dissertation Research: 1-9 semester hours
Prerequisites: Completion of Comprehensive. May be taken for no more than nine hours.