Mathematics (MATH)

Courses

MATH 1103 Contemporary College Algebra: 3 semester hours.
Data Collection, Variable Representation, Function, Linear Function, Prediction, Systems of linear equations, Linear Programming, Applications, Modeling across the discipline, Quadratic and other fundamental functions, Probability, Sampling Spaces, Expectations, Models, Consumer Mathematics, Simple and compound interests, finance charges, new balance and monthly payments, annual percentage rate (APR), annuity and amortization. Cannot receive credit for both MATH 1103 and MATH 1113. This course is designed for Non-Stem (Science, Technology, Engineering and Mathematics Majors. (Prerequisite: Student must have TSIA math score of 350. In the case the student has a TSIA math score of 347-349, he/she must enroll in MATH 0300, as corequisite.

MATH 1113 College Algebra: 3 semester hours.
Linear and quadratic equations, inequalities, functions (quadratic, polynomials, and rational) and graphs of functions, exponential and logarithmic functions, systems of linear equations. Cannot receive credit for both MATH 1103 and MATH 1113. **(MATH 1314)** Transfer equivalent from Texas Community/Junior Colleges. (Prerequisite: Student must have TSIA math score of 350. In the case the student has a TSIA math score of 347-349, he/she must enroll in MATH 0300, as corequisite.

MATH 1115 College Algebra and Trigonometry: 5 semester hours.
A basic course in mathematics for students needing additional pre-calculus skills, including college algebra and trigonometry. Topics included are linear, quadratic, and higher degree polynomial functions and identities, determinants and systems of linear equations, inverse trigonometric functions, and trigonometric equations.

MATH 1123 Trigonometry: 3 semester hours.
Trigonometric functions, radian, logarithms, functions of composite angles, and identities, and trigonometric equations. Prerequisites: MATH 1113.

MATH 1124 Calculus with Analytic Geometry I: 4 semester hours.
Functions and graphs, limits and continuity, derivatives of functions, Mean Value Theorem, applications of derivatives. Fundamental Theorem of Calculus and applications of integrals. Prerequisites: (MATH 1113 and MATH 1123) or MATH 1115.

MATH 1153 Finite Mathematics: 3 semester hours.
Linear equations and applications, linear forms and system of equations, matrix algebra and applications, linear programming (linear and simplex method), probability and applications, statistics. Prerequisites: MATH 1113 or MATH 1103.

MATH 2003 Elementary Statistics: 3 semester hours.
An introduction to the concepts and methods of statistics, topics including probability, random variables, binomial and normal distributions, random sampling, statistical inference, estimation, testing hypothesis, linear regressions and correlation, problem solving, chi-square test and categorical data, and analysis of variance. Prerequisites: MATH 1113 or MATH 1103.

MATH 2053 Discrete Mathematics: 3 semester hours.
Designed to provide a bridge between computational mathematics and theoretical mathematics. Topics include induction and recursion, combinatorics, graph theory functions, proofs and logic. Prerequisites: MATH 1124.

MATH 2153 Calculus-Business, Life and Social Sciences: 3 semester hours.
Derivatives, Curving, Sketching, and optimization techniques for differentiation. Logarithms and Exponential Functions with applications, Integral Techniques and application of integrals, Techniques and application of integrals, Multivariate Calculus. Prerequisites: MATH 1153.
MATH 2163 Structure of Number System: 3 semester hours.
A logical approach to elementary mathematics, with emphasis on the powers and techniques of the axiomatic approach in mathematics. Topics include sets, logic, number theory, equivalence relations and mathematical proofs in developing the characteristics of number systems. Prerequisites: MATH 1113 or MATH 1103.

MATH 2183 Informal Geometry: 3 semester hours.
A brief development of finite geometric systems from an advanced standpoint, with attention given to intuition and didactics. Topics include deductive reasoning, metric and non-metric geometry, transformational geometry, topological notions, graphs, and networks. Prerequisites: MATH 1113 or MATH 1103.

MATH 3003 Mathematics in Elementary Schools: 3 semester hours.
A conceptual approach to introducing mathematics concepts and the integrating of content, pedagogy and assessment which include treatments of the nature of selective pre-algebra and discrete topics and the use of EC-4/4-8 TEKS Standards V-VI. Prerequisites: MATH 2163.

MATH 3013 Modern Algebra: 3 semester hours.
Number theory, groups, rings, integral domains, and fields. Prerequisites: MATH 2053.

MATH 3014 Calculus III: 4 semester hours.
Calculus of functions of several variables, calculus of vector valued functions, partial differentiation, multiple integrals. Prerequisites: MATH 2024.

MATH 3023 Probability and Statistics: 3 semester hours.
Counting problems, probability theory infinite sample spaces, random numbers and their usage, random variables, expectations, means, variances, binomial and normal distributions, random walk problems, point estimation, confidence limits, hypothesis testing, applications of Bayes’ Theorem, sums of independent random variables, law of large numbers, and central limit theorem. Prerequisites: MATH 2024.

MATH 3023 Principles of Statistics I: 3 semester hours.
An introduction to probability distributions, sampling and descriptive measures, inference and hypotheses testing, linear regression, and analysis of variance. Prerequisites: MATH 3023.

MATH 3043 Principles of Statistics II: 3 semester hours.
Design of experiments, model building, multiple regression, nonparametric techniques, and contingency tables, introduction to decision theory and time series data. Prerequisites: MATH 3023 or MATH 3033.

MATH 3073 Linear Algebra: 3 semester hours.
Systems of linear equations, matrices, real vector spaces, linear transformations, change of bases, determinants, eigenvalues and eigenvectors, diagonalization and inner product spaces. Prerequisites: MATH 2024.

MATH 3103 History of Mathematics: 3 semester hours.
The development of mathematical thought from ancient time to the present. Contributions by the great Greek, Roman, and German mathematicians, as well as by others. Prerequisites: MATH 1124 or MATH 2153.

MATH 3106 Introduction to Cooperative Education: 6 semester hours.
Introduces the student to professional experiences and applications of mathematics in the workplace. Attention is given to the role of personality attributes in success on the job; and to the role of the applied mathematician in the industrial and professional settings. Prerequisites: MATH 1124.

MATH 3163 Intro Biostatistics: 3 semester hours.
Descriptive statistics, data presentation, counting techniques, probability theory concepts, application of Bayes' theorem, random numbers, random variables, discrete and continuous random variables, binomial distribution, Poisson distribution, multinomial distribution, normal distribution, exponential distribution, lognormal distribution, the central limit theorem, covariance, correlation, point and internal estimation, hypothesis testing, p-values, simple linear regression, analysis of categorical data, applications in biology and biomedicine. Prerequisites: MATH 1124.
**Mathematics (MATH)**

**MATH 3685 Math for Engineers:** 5 semester hours.
Prerequisites: MATH 2043 (http://catalog.pvamu.edu/search/?P=MATH%202043).

**MATH 3933 Geometry:** 3 semester hours.
An in-depth study of the Euclidean geometry of the plane from an advanced standpoint. A brief development of different types of geometries by the use of transformations.
Prerequisites: MATH 1124 (http://catalog.pvamu.edu/search/?P=MATH%201124) or MATH 2153 (http://catalog.pvamu.edu/search/?P=MATH%202153).

**MATH 3995 Independent Study:** 1-5 semester hour.
Reading, research, and or field work on selected topics.

**MATH 4001 Mathematics Colloquium:** 1 semester hour.
Detailed reports on selected topics in both theoretical and applied mathematics. Mathematics majors are required to report individually on at least one topic of a moderate degree of difficulty as a demonstration of their resourcefulness, ability, and achievement in the field of mathematics.

**MATH 4003 Mathematics Modeling and Applications:** 3 semester hours.
Models for teaching and learning mathematics, which includes an integration of content, problem solving strategies, real world applications and use of technology.
Prerequisites: MATH 1123 (http://catalog.pvamu.edu/search/?P=MATH%201123).

**MATH 4043 Mathematical Statistics:** 3 semester hours.
Distribution of statistics; expectations; limiting distribution; point estimation; confidence intervals and sufficient statistics.
Prerequisites: MATH 3023 (http://catalog.pvamu.edu/search/?P=MATH%203023).

**MATH 4053 Mathematics Teaching Capstone Course:** 3 semester hours.
The course summarizes, evaluates and integrates college mathematics experiences and provides reviews of mathematical skills. Students must demonstrate that they have mastered their academic program goals.

**MATH 4063 Numerical Analysis:** 3 semester hours.
Linear and nonlinear systems, matrix inversions and eigenvalues, polynomial approximations, quadrature interpolation, least square, finite differences, including analyses of algorithms and solutions utilizing numerical methods.
Prerequisites: MATH 3073 (http://catalog.pvamu.edu/search/?P=MATH%203073) and COMP 1013 (http://catalog.pvamu.edu/search/?P=COMP%201013).

**MATH 4073 Introduction to Linear Models:** 3 semester hours.
An introduction to the formulation of linear models and the estimation of the parameters of such models, with primary emphasis on least squares. Application to multiple regression and curve fitting.
Prerequisites: MATH 3073 (http://catalog.pvamu.edu/search/?P=MATH%203073) and MATH 3023 (http://catalog.pvamu.edu/search/?P=MATH%203023).

**MATH 4083 Advanced Calculus I:** 3 semester hours.
Number sequences, limits, sequential functions, properties of continuous functions, and mean value theorem and Riemann Integral.
Prerequisites: MATH 2043 (http://catalog.pvamu.edu/search/?P=MATH%202043) and MATH 3014 (http://catalog.pvamu.edu/search/?P=MATH%203014).

**MATH 4093 Advanced Calculus II:** 3 semester hours.
Properties of the Reimann-Stieljes integral; and the theorems of Stokes and Green.
Prerequisites: MATH 4083 (http://catalog.pvamu.edu/search/?P=MATH%204083).

**MATH 4113 Differential Equations II:** 3 semester hours.
Prerequisites: MATH 2043 (http://catalog.pvamu.edu/search/?P=MATH%202043) and MATH 3073 (http://catalog.pvamu.edu/search/?P=MATH%203073).

**MATH 4123 Introduction to Topology:** 3 semester hours.
An introduction to topology, including sets, functions, metric spaces, compactness, connectedness, convergences, and continuity.
Prerequisites: MATH 3013 (http://catalog.pvamu.edu/search/?P=MATH%203013).

**MATH 4133 Fourier Series and Wavelets:** 3 semester hours.
Fourier series, Fast Fourier Transform; continuous and discrete filters, orthogonality and orthogonal subspaces; Haar wavelets; multi-resolution analysis; Daubechies wavelets; non-orthogonal wavelets; applications such as data compression and image processing.
Prerequisites: (MATH 2024 (http://catalog.pvamu.edu/search/?P=MATH%202024) may be taken concurrently) or MATH 3685 (http://catalog.pvamu.edu/search/?P=MATH%203685)) and MATH 3073 (http://catalog.pvamu.edu/search/?P=MATH%203073).
MATH 4173 Advanced Math for Engineers: 3 semester hours.
Matrices and determinants, vector spaces, systems of linear equations, eigenvalues and eigenvectors; power series, Laplace transforms, Fourier series and orthogonal functions, numerical solutions to ordinary differential equations.

MATH 4203 Introduction to Operations Research: 3 semester hours.
Operations Research with emphasis on the fundamental methods including linear programming, dynamic programming, deterministic models for inventory and production control, and applications to queuing theory.

MATH 4213 Introduction to Analysis: 3 semester hours.
Metric spaces, compactness, completeness, connectedness, sequences and series of functions, theorems of Baire, Weierstrass, and Arzela-Ascoli, and Lebesque integration.
Prerequisites: MATH 4083 (http://catalog.pvamu.edu/search/?P=MATH%204083).

MATH 4223 Introduction to Complex Analysis: 3 semester hours.
The algebra of complex numbers and their geometric representation; analytic functions; and Cauchy-Riemann equations, elementary functions, complex integration, power series, calculus of residues, conformal mapping, and application.
Prerequisites: MATH 3014 (http://catalog.pvamu.edu/search/?P=MATH%203014).

MATH 4233 Special Topics: 3 semester hours.
This course is designed to ascertain that faculty with different expertise have the opportunity to relay those to the mathematics majors. Topics are to be chosen from those other than what are in the existing courses in the catalog, such as number theory, stochastic processes, partial differential equations and methods of teaching mathematics to teachers of mathematics.

MATH 4603 Intro Bayesian Stat: 3 semester hours.
Logic, probability and uncertainty, Bayesian inference for discrete random variables, Bayesian inference for continuous random variables, comparison of Bayesian and classical inferences for proportion and mean, Bayesian inference for the difference between two means, Bayesian methods for simple linear regression and robust Bayesian methods.
Prerequisites: MATH 3023 (http://catalog.pvamu.edu/search/?P=MATH%203023).

MATH 4893 Mathematics Capstone Course: 3 semester hours.
This course is designed to ascertain that the mathematics major is proficient in the majority of the major requirements such as the Calculus sequence. Differential Equations, Linear Algebra, Abstract/Modern Algebra, Advanced Calculus, Probability, Statistics, and Numerical Analysis. Students will participate in class discussion, write summaries of readings, do group solving, give oral presentations, submit mini projects and complete a major project. This course will provide an integrated experience of the student's program. Its intensity will enhance the student's chances of success in the required major field test.

MATH 4995 Independent Study: 1-5 semester hour.
Reading, research, and/or field work on selected topics.

MATH 5013 Introduction to Point-Set Theory: 3 semester hours.
Basic set theory; cardinal and ordinal numbers, countable and well-ordered sets; and the study of the basic properties of metric spaces with an introduction to completeness, separability and compactness.
Prerequisites: MATH 4123 (http://catalog.pvamu.edu/search/?P=MATH%204123).

MATH 5023 Complex Analysis I: 3 semester hours.
Holomorphic functions, complex integration, residue theorem. Taylor series, Laurent series, conformal mapping, and harmonic functions.
Prerequisites: MATH 4223 (http://catalog.pvamu.edu/search/?P=MATH%204223).

MATH 5033 Complex Analysis II: 3 semester hours.
Infinite products, Weierstrass factorization theorem, Mittag-Leffler's theorems, normal families, Picard's theorem, and Riemann mapping theorem.
Prerequisites: MATH 5023 (http://catalog.pvamu.edu/search/?P=MATH%205023).

MATH 5103 Special Problems: 3 semester hours.
Reading and discussion of articles appearing in various mathematical journals; and statistics patterns and techniques of mathematical research; modern techniques and trends in the field of advanced mathematics. Trends in the field of elementary mathematics and statistics.

MATH 5123 General Topology I: 3 semester hours.
Topological spaces including continuous functions, compactness, separation properties, connectedness and metric spaces.
Prerequisites: MATH 5013 (http://catalog.pvamu.edu/search/?P=MATH%205013).

MATH 5203 Calculus for High School Teachers: 3 semester hours.
Concise treatment of certain fundamental ideas in the mathematics of the calculus with the intention of extending, illuminating, and clarifying the teacher's past knowledge.

MATH 5233 Selected Topics in Mathematics: 3 semester hours.
MATH 5273 Mathematical Modeling: 3 semester hours.
Fundamentals and Classifications of Mathematical Models; Construction of Models applicable to a variety of disciplines; Methods of qualitative analysis of Formulated Mathematical Model; Understanding and interpreting of obtained results; Inferences and Predications about the system behavior; and Computer investigations and simulation.
Prerequisites: MATH 4063 (http://catalog.pvamu.edu/search/?P=MATH%204063).

MATH 5283 Number Theory I: 3 semester hours.
Prime Numbers; Unique Factorization; Congruencies with Application; Diophantine Equations; Reciprocity Laws; Quadratic Forms; Continued Fractions; Algebraic Number Fields; and Geometry of Numbers, possible application coding, and cryptography.
Prerequisites: MATH 3013 (http://catalog.pvamu.edu/search/?P=MATH%203013).

MATH 5293 Mathematical Logic: 3 semester hours.
The Propositional Calculus; the Predicate Calculus; Proof Systems for Propositional and Predicate Calculus; Extensions of the Predicate Calculus Theories; Definability; and Interpretability.

MATH 5303 Modern Techniques in Secondary Mathematics: 3 semester hours.
Teaching strategies; instructional packages composed of modules of various areas and topics of mathematics; performance-based teaching methods; effective use of audiovisual equipment and materials; and small group methods.

MATH 5343 Boundary Value Problems: 3 semester hours.
Fourier Series and integrals, application of partial differential equations to problems, including heat flow, fluid flow, electric fields, mechanical vibration, and similar problems arising in chemistry, physics, radiotherapy and engineering.
Prerequisites: MATH 2043 (http://catalog.pvamu.edu/search/?P=MATH%202043).

MATH 5413 Seminar: 3 semester hours.
Seminar in mathematics lectures, demonstrations, and reports on current trends in the field of mathematics and statistics.

MATH 5443 Statistics for High School Teachers: 3 semester hours.
Processes of statistical methods, with reference to applications in various fields and with special application to analysis of school data.
Prerequisites: MATH 3023 (http://catalog.pvamu.edu/search/?P=MATH%203023).

MATH 5473 Probability: 3 semester hours.
Laws of Large Numbers, Central Limit Theorems, Random Walks, Martingales, Markov Chains, Ergodic Theorems and Brownian Motion.
Prerequisites: MATH 3023 (http://catalog.pvamu.edu/search/?P=MATH%203023).

MATH 5543 Foundations of Geometry: 3 semester hours.
Euclidean and Non-Euclidean Geometries by an axiomatic approach to incidence; Neural Euclidean and Non-Euclidean Plane Geometry. Various Models such as Euclidean; hyperbolic, spherical and projective taxicab planes will be considered throughout the course. Discussion of implementation strategies for teaching geometry and proof techniques for high school students.
Prerequisites: MATH 3933 (http://catalog.pvamu.edu/search/?P=MATH%203933) and MATH 3013 (http://catalog.pvamu.edu/search/?P=MATH%203013).

MATH 5613 Theory of Matrices: 3 semester hours.
Definitions in matrix algebra; inverse of a matrix, transposition of a matrix, rank of a matrix, linear transformations; differentiation and integration of matrices; and application of matrices to systems of linear equations; quadratic forms, bilinear forms, and systems of differential equations.
Prerequisites: MATH 3073 (http://catalog.pvamu.edu/search/?P=MATH%203073).

MATH 5723 Partial Differential Equations: 3 semester hours.
Existence theorems, uniqueness theorems, and vector and matrix treatment of linear and non-linear systems of ordinary differential equations.
Prerequisites: MATH 5733 (http://catalog.pvamu.edu/search/?P=MATH%205733) and MATH 5023 (http://catalog.pvamu.edu/search/?P=MATH%205023).
**MATH 5833 Biomathematics: 3 semester hours.**
Introduce a variety of Mathematical Models for biological systems and provide the necessary theory and techniques to analyze these models. These models include but are not limited to classical population models, the Nicholson Baily model and the Leslie Matrix model. Examples from Cell Biology, population genetics and Physiology will be provided as well. The models in this course are deterministic mathematical models formulated by Difference Equations or Ordinary Differential Equations.
Prerequisites: MATH 4113 and MATH 3613.

**MATH 5893 Thesis Research, A-D: 3 semester hours.**
Research for thesis. Course may be repeated for credit, at most two times.

**MATH 5903 Modern Algebra: 3 semester hours.**
Fundamental concepts of algebra; integral domain, fields, and introduction to such concepts as groups, vector spaces, and lattices.
Prerequisites: MATH 3013.

**MATH 5993 Independent Study: 3 semester hours.**
Course description will vary according to course chosen for independent study.