Undergraduate Mathematics Courses

MATH 0001. NCBO Math. 0 Credit Hours (Lecture: 0 Hours, Lab: 0 Hours).

MATH 1314. College Algebra. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
In-depth study and applications of polynomial, rational, radical, exponential and logarithmic functions, and systems of equations using matrices.

MATH 1316. Plane Trigonometry. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
In-depth study and applications of trigonometry including definitions, identities, inverse functions, solutions of equations, graphing, and solving triangles. Additional topics such as vectors, polar coordinates, and parametric equations may be included. Prerequisite: MATH 1314 or in accordance with the Department of Mathematics initial enrollment placement policy.

MATH 1324. Math for Business & Social Sciences I (Finite Mathematics). 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
The application of common algebraic functions, including polynomial, exponential, logarithmic, and rational, to problems in business, economics, and the social sciences. The applications include mathematics of finance, including simple and compound interest and annuities; systems of linear equations; matrices; linear programming; and probability, including expected value. Prerequisites: Enrollment in the course will be in accordance with the Mathematics Placement and Continuing Enrollment Rules.

MATH 1325. Math for Business & Social Sciences II (Business Calculus). 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course is the basic study of limits and continuity, differentiation, optimization and graphing, and integration of elementary functions, with emphasis on applications in business, economics, and social sciences. This course is not a substitute for MATH 2413 (Calculus I). This course cannot be counted on a degree program for a mathematics major. Prerequisite: MATH 1314 or MATH 1324.

MATH 1332. Contemporary Mathematics I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Elementary mathematical applications to problems of finance, probability, statistics, and geometry, and the development of reasoning skills. This course cannot be counted on a degree program for a mathematics major. Prerequisites: Enrollment in this course will be in accordance with the Mathematics Placement and Continuing Enrollment Rules.

MATH 1342. Elementary Statistical Methods. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Collection, analysis, presentation and interpretation of data, and probability. Analysis includes descriptive statistics, correlation and regression, confidence intervals and hypothesis testing. Technology will be incorporated where appropriate. Prerequisites: Enrollment in this course will be in accordance with the Mathematics Placement and Continuing Enrollment Rules.

MATH 1352. Math Applications for Construction Sci. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Concepts from algebra, geometry, measurement, and trigonometry that provide the foundation for the quantitative skills and numerical proficiencies needed for construction science. Enrollment in this course is restricted to students majoring in Construction Science.

MATH 2412. Precalculus Math. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).
Continuation of the study of algebra with the addition of trigonometry and other topics for calculus readiness. Prerequisites: MATH 1314 or in accordance with the Department of Mathematics initial enrollment placement policy. Lab fee: $2.

MATH 2413. Calculus I. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).
Limits and continuity; the Fundamental Theorem of Calculus; definition of the derivative of a function and techniques of differentiation; applications of the derivative to maximizing or minimizing a function; the chain rule, mean value theorem, and rate of change problems; curve sketching; definite and indefinite integration of algebraic, trigonometric, and transcendental functions, with an application to calculation of areas. Use of computer technology and laboratory assignments will be required in this course. Prerequisite: MATH 1316 or MATH 2412. Lab fee: $2.

MATH 2414. Calculus II. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).
Applications of integration, integration techniques, improper integrals, sequences and infinite series, power series, parametric and polar curves. Use of computer technology and laboratory assignments will be required in this course. Prerequisite: MATH 2413. Lab fee: $5.

MATH 3301. Number Theory. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
The study of congruence relations, rational integers, diophantine equations, quadratic reciprocity law, linear forms, integral domains, and related topics. Prerequisite: 6 hours of Mathematics including MATH 2413.

MATH 3302. Principles of Geometry. 3 Credit Hours (Lecture: 2 Hours, Lab: 3 Hours).
Introduction to Euclidean geometry. Topics will include an introduction to logic, properties of parallel lines, triangles, quadrilaterals, and measurement. Similarity and proportionality will also be addressed. Credit for both MATH 3302 and MATH 4302 will not be awarded. Prerequisite: MATH 2413. Lab fee: $2.

MATH 3303. Concepts of Elementary Mathematics I. 3 Credit Hours (Lecture: 2 Hours, Lab: 3 Hours).
This course is designed to develop and extend the mathematical content knowledge of prospective elementary and middle school teachers. Topics will include problem solving, sets, functions, mathematical reasoning, numerical fluency, operations and properties of whole numbers, integers, rational numbers, and real numbers. Prerequisites: minimum of 45 hours complete and a C or better in MATH 1314 Lab fee: $2.

MATH 3305. Concepts of Elementary Mathematics II. 3 Credit Hours (Lecture: 2 Hours, Lab: 3 Hours).
This course is designed to develop and extend the mathematical content knowledge of prospective elementary and middle school teachers. Topics will include geometry, measurement, probability, data collection, and statistics. Prerequisite: C or better in MATH 3303 Lab fee: $2.

MATH 3306. Differential Equations. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Solutions and applications of homogeneous and nonhomogeneous ordinary differential equations, including first-order equations and higher-order linear equations. Qualitative properties of solutions are investigated, as well as exact methods for solving differential equations and initial value problems including series, Laplace transform, separation of variables, variation of parameters, and undetermined coefficients. Prerequisite: MATH 2414.

MATH 3310. Discrete Mathematics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Introduces students to the techniques and tools of reasoning, decision making and combinational problem solving. Topics include sets and logic, combinations, probability, relations, functions and graphs, symbolic logic, finite state and Turing machines. Prerequisite: MATH 2413 or concurent enrollment.

MATH 3311. Probability and Statistics I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Topics will include probability axioms and properties; conditional probability and independence; counting techniques; and discrete, continuous, univariate, and multivariate random variables. Prerequisite: MATH 2414.

MATH 3312. Probability & Statistics II. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Topics will include normal distributions; sampling distributions; the central limit theorem; descriptive statistics; and the theory of statistical estimation and testing, with applications to proportions, means, contingency tables, univariate linear regression, and analysis of variance. Prerequisite: MATH 3311.

MATH 3318. Linear Algebra. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Introduces and provides models for application of the concepts of vector algebra. Topics include finite dimensional vector spaces and their geometric significance; representing and solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion; matrices; determinants; linear transformations; eigenvalues and eigenvectors; inner products; orthogonality; and applications in science and engineering. Prerequisite: MATH 2414.

MATH 3320. Foundations of Mathematics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course introduces students to concepts and forms of proof found in advanced mathematics courses. Topics include logic, set theory, mathematical induction, relations, functions, and cardinality. Prerequisite: MATH 2413.

MATH 3360. Numerical Analysis. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
An introduction to numerical analysis. Topics will be selected from error analysis, solving algebraic equations, interpolation, numerical differentiation and integration, methods for solving systems of equations, approximation theory, and initial value problems of ordinary differential equations. Prerequisites: MATH 2414 and 3 hours of COSC.

MATH 3364. Data Analysis I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Mathematical foundations of data analysis techniques. Applications of Lagrangians to support vector machines, gradient descent methods for artificial neural networks, and conditional probabilities for Bayesian classifiers. Additional topics will be selected from: the class imbalance problem, cost sensitive learning, bootstrapping, kernel methods, impurity measures, distance metrics, topological data analysis, anomaly detection and convergence theorems for various methods. Prerequisites: MATH 2318, MATH 3433, COSC 1436 and one course from (MATH 1342, STAT 2301, STAT 3312, or MATH 3450).

MATH 3433. Calculus III. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).
The calculus of two dimensional vectors, parametric equations, cylindrical and spherical coordinates, multivariable differential calculus, directional derivatives and their applications, multiple integration, vector analysis, line and surface integrals, Green's Theorem, Stokes's Theorem. Use of computer technology and laboratory assignments will be required in this course. Prerequisite: MATH 2414. Lab fee: $5.

MATH 3450. Principles of Bio-Statistics. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).
An introduction to statistical methods that are applied in biology and agriculture. Use of technology and hands-on laboratory assignments will be required in this course. This course cannot be counted on a degree program for a mathematics major. Credit cannot be awarded for both MATH 1342 and 3450. Prerequisite: MATH 1314 or MATH 1316 or MATH 2412 or MATH 2413. Lab fee: $2.

MATH 4086. Mathematics Problems. 1-4 Credit Hours (Lecture: 0 Hours, Lab: 1-4 Hours).
Special problems in mathematics. Not covered by any course in the curriculum. Work may be either theory or laboratory. May be repeated with approval of the department head for additional credit. Prerequisite: Approval of department head.

MATH 4088. Undergraduate Research Project. 1-3 Credit Hours (Lecture: 1-3 Hours, Lab: 0 Hours).
Methods of research in the mathematical sciences or in mathematics education through a research project directed by a departmental faculty member. The student is required to prepare a final report and presentation. No credit is earned until the student has enrolled in at least 3 credit hours and the final report and presentation are certified as completed by the faculty member directing the project, at which time the student will receive 3 credit hours. Prerequisites: Mathematics major, junior standing, 24 semester hours MATH and department head approval.

MATH 4185. Career Pathways Seminar in Mathematics and Statistics. 1 Credit Hour (Lecture: 1 Hour, Lab: 0 Hours).
In this course, students will have the opportunity to explore career opportunities in mathematics and statistics. The course will focus on resume building, mock interviews and job searches. Prerequisite: MATH or STAT major.

MATH 4302. College Geometry. 3 Credit Hours (Lecture: 2 Hours, Lab: 3 Hours).
Topics will include logic, properties of circles and transformations, projective and non-Euclidean geometry. Technology will be included when appropriate. Credit for both MATH 3302 and MATH 4302 will not be awarded. Prerequisite: MATH 2413 Lab fee: $2.

MATH 4304. Survey of Mathematical Ideas I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course is designed to bring together and supplement the technical material of other mathematics courses to communicate mathematics effectively. Topics in number & operations, number theory, algebra, statistics, and probability will be explored. Technology will be used where appropriate. Prerequisites: MATH 2413 and (MATH 3302 or MATH 4302).

MATH 4305. Concepts of Elementary Mathematics III. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course is designed to develop and extend the mathematical content knowledge of prospective elementary and middle school teachers. Topics will include ratios, proportionality, number theory, and the development of algebraic reasoning through the use of patterns, relations, and functions, with an emphasis on multiple representations (numerical, graphical, verbal, and/or symbolic). Technology will be integrated into the curriculum where appropriate. Prerequisites: Junior Standing and a C or better in MATH 3305.

MATH 4306. Partial Differential Equations. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
An introduction to theory and applications of partial differential equations. Topics for study may include separation of variables, heat equation, Laplace's equation, wave equation, Fourier series, and Sturm-Liouville eigenvalue problems. Prerequisite: MATH 3306.

MATH 4308. Survey of Mathematical Ideas II. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course is designed to bring together and supplement the technical material of other mathematics courses to communicate mathematics effectively. Topics in statistics, probability, trigonometry, precalculus, and calculus will be explored. Technology will be used where appropriate. Prerequisites: MATH 4304 and (MATH 1342 OR MATH 3311).

MATH 4309. Advanced Analysis. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours). [WI (https://catalog.tarleton.edu/academicaffairs/)]
A study of the theory of the calculus of functions of a single variable. Topics include the topology of the real line, functions, sequences and their limits, continuity, differentiation, and analysis of variance. Prerequisites: MATH 2414 and MATH 3320.

MATH 4311. Probability and Statistics II. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Topics will include normal distributions; sampling distributions; the central limit theorem; descriptive statistics; and the theory of statistical estimation and testing, with applications to proportions, means, contingency tables, univariate linear regression, and analysis of variance. Prerequisite: MATH 3311.

MATH 4320. Mathematical Modeling. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
An advanced course in mathematical modeling requiring students to build and validate deterministic models of complex phenomena. The course will emphasize both qualitative and quantitative computational techniques of applied mathematics. Prerequisites: MATH 2414 and 6 hours of advanced MATH.

MATH 4332. Abstract Algebra. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours). [WI (https://catalog.tarleton.edu/academicaffairs/)]
The study of preliminary notions, group theory, the theory of rings and ideals, and polynomial rings. Prerequisites: MATH 2414 and MATH 3318.

MATH 4370. Introduction to the History of Mathematics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
An introduction to the historical and philosophical development of the various branches of mathematics. The evolution of mathematical ideas will be studied from their developmental stages to the modern concepts used today. Prerequisite: 6 advanced hours in MATH.

MATH 4384. Internship. 3 Credit Hours (Lecture: 0 Hours, Lab: 4 Hours).
The student will complete a supervised and comprehensive work experience in a mathematics-related position with a public or private business organization for career preparation in a mathematics-related enterprise. The work experience must be formally approved and arranged with a cooperating sponsor prior to semester of enrollment in the course, and should be completed within the semester of course enrollment. Oral and written reports of the internship experience will be required. Prerequisites: At least 24 hours of degree-applicable MATH coursework with no grade lower than a 'C' in a MATH course, minimum 2.6 MATH GPA, minimum 2.6 overall GPA, junior or senior classification, and approval of department head.

MATH 4390. Math Topics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Topics will be selected from areas of mathematics suitable for upper level study. This course may be repeated once, with department head approval, as topics change. Prerequisites: MATH 2414 and 6 hours of upper level mathematics.

MATH 4486. Mathematics Problems. 1-4 Credit Hours (Lecture: 0 Hours, Lab: 1-4 Hours).
Special problems in mathematics. Not covered by any course in the curriculum. Work may be either theory or laboratory. May be repeated with approval of the department head for additional credit. Prerequisite: Approval of department head.