

MATHEMATICS (MATH)

MATH 0132 Foundations of Contemporary Mathematics 1 Credit

Department: College of Arts and Sciences

This course is intended for Non-STEM (Science, Technology, Engineering and Mathematics) majors who are also taking MATH 1332. Topics include fractions, sets, logic and number sense in support of the MATH 1332 curriculum. This course is not applicable toward any degree.

Prerequisite(s): (MATH 0370 or CRMA 0370 or CRMA 0371) or TSIA Math with a score of 336

Corequisite(s): MATH 1332

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

MATH 0214 Foundations of College Algebra 2 Credits

Department: College of Arts and Sciences

This course will provide the necessary review and foundation of topics in college algebra necessary for successful completion of MATH 1314. Topics include graphing, functions and solving equations. This course is not applicable toward any degree.

Prerequisite(s): TSIA Math with a score of 336 or SAT Math Section with a score of 530 or (SAT Overall Math/Verbal (OLD) with a score of 1070 and SAT Mathematics (OLD) with a score of 500) or (ACT Composite with a score of 23 and ACT Math with a score of 19) or STAAR Algebra II EOC Math with a score of 4000 or MATH 0370

Corequisite(s): MATH 1314

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

MATH 0224 Foundations of Business Math 2 Credits

Department: College of Arts and Sciences

This course will provide the necessary review and foundation of topics in algebra and business topics for successful completion of MATH 1324. Topics students study include linear, quadratic and polynomial functions. This course is not applicable toward any degree.

Prerequisite(s): TSIA Math with a score of 336 or SAT Math Section with a score of 530 or (SAT Overall Math/Verbal (OLD) with a score of 1070 and SAT Mathematics (OLD) with a score of 500) or (ACT Composite with a score of 23 and ACT Math with a score of 19) or STAAR Algebra II EOC Math with a score of 4000 or MATH 0370

Corequisite(s): MATH 1324

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

MATH 0242 Foundations of Statistical Methods 2 Credits

Department: College of Arts and Sciences

This course will provide the necessary review and foundation of topics in data analysis and statistics necessary for successful completion of MATH 1342. Topics students study include graphical representations of data, slope and linear equations, fractions, probability and support for computer skills. This course is not applicable toward any degree.

Prerequisite(s): TSIA Math with a score of 336 or SAT Math Section with a score of 530 or (SAT Overall Math/Verbal (OLD) with a score of 1070 and SAT Mathematics (OLD) with a score of 500) or (ACT Composite with a score of 23 and ACT Math with a score of 19) or STAAR Algebra II EOC Math with a score of 4000 or MATH 0370

Corequisite(s): MATH 1342

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

MATH 0270 Special Topics in Foundations of Mathematics 2 Credits

Department: College of Arts and Sciences

Topics in foundations of mathematics to suit the needs of individual students. This course is not applicable toward any degree. It may be taken as a co-requisite of MATH 1342, MATH 1314 or other first-year mathematics courses as deemed appropriate by the Director of First-Year Mathematics Experience.

Prerequisite(s): (MATH 0370 or CRMA 0370 or CRMA 0371) or TSIA Math with a score of 340

Prerequisite(s)/Corequisite(s): MATH 1314 or MATH 1342

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 0370 Foundations in College Mathematics 3 Credits

Department: College of Arts and Sciences

This course will provide the necessary review and foundation in topics in foundations of basic mathematics and algebra skills necessary to prepare students for co-requisite course entry into first-year mathematics courses. Topics include whole numbers, integers, fractions, decimals, ratios and proportions, percent, and introductory algebra topics. This course is not applicable toward any degree.

Prerequisite(s): TSIA Math with a score of 336

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

MATH 0372 Foundations in Precalculus 3 Credits

Department: College of Arts and Sciences

This course will provide the necessary review and foundations of topics in algebra necessary for successful completion of MATH 2311. Topics students study include solving linear and quadratic equations, functions and functional notation, as well as other topics for just-in-time review for MATH 2311. This course is not applicable toward any degree.

Corequisite(s): MATH 2311

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

MATH 1314 College Algebra(Non-Calculus) 3 Credits

Department: College of Arts and Sciences

A beginning course in the study and application of polynomial, rational, exponential and logarithmic functions, and systems of equations. Students will learn how to solve polynomial, rational and absolute values equations and inequalities, function notation, exponential and logarithm functions and solve systems of equations. This course DOES NOT prepare students to advance to the Calculus sequence.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 1316 Trigonometry 3 Credits

Department: College of Arts and Sciences

This course introduces the basic concepts of trigonometry. Students study trigonometric functions, graphs, identities, inverse trigonometric functions, trigonometric equations, and applications of trigonometry. Recommended for students who have not had high school trigonometry.

Prerequisite(s): MATH 1314

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 1324 Mathematics for Business and Social Sciences 3 Credits**Department:** College of Arts and Sciences

This course will introduce students to the basics of mathematics used in business and social sciences. The course will cover the application of common algebraic functions, including polynomial, exponential, and logarithmic, to problems in business, economics, and the social sciences are addressed. 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.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 1332 Contemporary Mathematics I 3 Credits****Department:** College of Arts and Sciences

This course includes introductory treatments of sets and logic, financial mathematics, probability and statistics with appropriate applications. Number sense, proportional reasoning, estimation, technology and communication are embedded throughout the course. This course is intended for non-STEM (Science, Technology, Engineering and Mathematics) majors.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 1333 Contemporary Mathematics II 3 Credits****Department:** College of Arts and Sciences

Intended for non-STEM (Science, Technology, Engineering and Mathematics) majors. Topics include number systems, graph theory and voting theory. Additional topics may be covered.

Prerequisite(s): MATH 1332**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 1342 Statistics 3 Credits****Department:** College of Arts and Sciences

A beginning course in the collection, analysis, presentation and interpretation of data and probability. Students will conduct analysis of data using descriptive statistics, correlation and regression, confidence intervals and hypothesis testing.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 1350 Fundamentals of Math for Elementary School Teachers 3 Credits****Department:** College of Arts and Sciences

This course introduces the theory behind elementary concepts and serves as a refresher of elementary computations. A connection between elementary concepts, state standards, and state testing will be made. PLEASE NOTE : Enrollment for this course is restricted to Interdisciplinary Studies majors only.

Prerequisite(s): MATH 1314 or MTH 1334**Restriction(s):**

Enrollment limited to students in the BS-INDS program.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 2310 Mathematical Modeling I 3 Credits****Department:** College of Arts and Sciences

This course is specifically designed for students who will become teachers in grades 4-8. Students will examine characteristics of situations to select or create math models in algebra, geometry, and trigonometry using real world situations.

Prerequisite(s): MATH 1314 or MTH 1334**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 2311 Precalculus I 3 Credits****Department:** College of Arts and Sciences

This course is an in depth study of topics from algebra. Students study polynomials, solving a variety of equations (linear, quadratic, radical, absolute value and systems of equations), solving inequalities, graphs of basic equations, functions and properties of functions, exponential and logarithm functions as well as applications using the various functions from the class.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 2312 Pre Calculus and Elementary Functions 3 Credits****Department:** College of Arts and Sciences

This course is an intensive review of concepts from algebra, trigonometry and analytic geometry that are needed in a Calculus course. Students study inverse functions, exponential and logarithmic functions, the unit circle, right triangle trigonometry, trigonometric functions and their inverses, trigonometric identities, laws of sines and cosines, techniques for solving exponential, logarithmic, and trigonometric equations.

Prerequisite(s): (SAT Mathematics (OLD) with a score of 500 or ACT Math with a score of 19) or MATH 2311 or MATH 1314**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 2318 Linear Algebra 3 Credits****Department:** College of Arts and Sciences

This course 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; quadratic forms, eigenvalues and eigenvectors; and applications in science and engineering.

Prerequisite(s): MATH 2413**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 2413 Calculus and Analytical Geometry I 4 Credits****Department:** College of Arts and Sciences

This course introduces the basic concepts of single variable Calculus. Students study limits and continuity, the derivative, techniques for differentiation of algebraic, logarithmic, exponential and trigonometric functions, indefinite and definite integrals, applications of the derivative and anti-differentiation, Fundamental Theorem of Calculus.

Prerequisite(s): MATH 2312 or MATH 1316**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 2414 Calculus and Analytical Geometry II 4 Credits**Department:** College of Arts and Sciences

This course continues the student of concepts of single variable calculus. Students study further integration techniques such including integration by parts and trig substitutions. In addition, students are introduced to the concepts of parametric equations, sequences, series and vectors. Students will also be introduced to several applications of calculus.

Prerequisite(s): MATH 2413 or MTH 148**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 2415 Calculus III 4 Credits****Department:** College of Arts and Sciences

This course will further the study of vectors and calculus involving vectors. In addition, the course will introduce the concepts of multi-variable calculus. Students will study limits, partial derivatives, multiple integrals, line integrals and surface integrals. Students will also investigate important theorems of multi-variable calculus including Green's Theorem, Stokes' Theorem and the Divergence Theorem.

Prerequisite(s): MATH 2414**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3300 History of Mathematics 3 Credits****Department:** College of Arts and Sciences

Historical origin and development of mathematical concepts through the sixteenth century. Topics include Egyptian and Babylonian mathematics, Greek mathematics, and early European mathematics.

Restriction(s):

Enrollment limited to students with a class of Junior, Post Baccalaureate or Senior.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3301 Ordinary Differential Equations 3 Credits****Department:** College of Arts and Sciences

This course will introduce students to the topic of solving differential equations. Students will learn how to solve first order differential equations using either integrating factor or separating variables, apply undetermined coefficients or variation of parameters to find the solution to a constant coefficient nonhomogeneous 2nd order differential equation, use Laplace transforms to determine the solution to a differential equations and to use eigenvalues and eigenfunctions to find the solution to a system of differential equations.

Prerequisite(s): MATH 2414**Prerequisite(s)/Corequisite(s):** MATH 3328 or MATH 2318**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3311 Foundations of Mathematics I 3 Credits****Department:** College of Arts and Sciences

Introduction to mathematical logic and the language and nature of proofs. Applications to sets, mathematical induction, relations and functions.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3312 Probability Statistics and Statistical Modeling 3 Credits****Department:** College of Arts and Sciences

This introduces the basic concepts of probability and statistics to Interdisciplinary Studies majors. Students will study principles and applications of probability and statistics. The class will emphasize using real-world data collected, organized, and analyzed by the students. Students also will learn to use a statistical computer software package such as MINITAB or EXCEL to do the statistical modeling on real-world problems with larger data sets taken from a real-world population in projects. PLEASE NOTE: Enrollment in this course is restricted to Interdisciplinary Studies majors

Prerequisite(s): MATH 1314**Restriction(s):**

Enrollment limited to students in the BS-INDS program.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3313 Elementary Geometry 3 Credits****Department:** College of Arts and Sciences

The development of Euclidean geometry, introduction to proofs, concepts of measurement and co-ordinate geometry.

Prerequisite(s): MATH 1316 or MATH 1350**Restriction(s):**

Enrollment limited to students in the BS-INDS program.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3316 Calculus Concept & Modeling II 3 Credits****Department:** College of Arts and Sciences

This course is specifically designed for students who will become teachers in grades 4-8. It includes principles and conceptual foundations of calculus and applications to middle-school mathematics.

Prerequisite(s): MATH 3313**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3321 Discrete Structures 3 Credits****Department:** College of Arts and Sciences

Combinatorics, graphs, Boolean algebra, algebraic structures, coding theory, finite state machines, machine design and computability.

Prerequisite(s): MATH 2414 and MATH 2318**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3322 Introduction to Advanced Mathematics 3 Credits****Department:** College of Arts and Sciences

This course provides introduction to logic and the basic methods of proof required to be successful in a proof oriented mathematics course. Students will study applications in basic set operations, relations, functions, cardinality, and the real number system to learn the basics of mathematics proofs.

Prerequisite(s): MATH 2414 or MATH 3311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 3350 Modern Algebra - Groups 3 Credits**Department:** College of Arts and Sciences

This course provides a proof-based introduction to abstract algebraic students mainly in group theory. Topics students will study include cyclic groups, normal subgroups, quotient groups, homomorphisms, isomorphism, permutation groups, the Sylow theorems, and the structure theorem for finite abelian groups

Prerequisite(s): MATH 3322**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3351 Modern Algebra - Rings 3 Credits****Department:** College of Arts and Sciences

This course provides a proof-based introduction to abstract algebraic structures concentrating mainly on rings and fields. Topics students will study include commutative rings, rings with unity, integral domains, subrings, ideals, quotient rings, principal ideal domains, unique factorization domains, and fields. This course is not a continuation of Math 3350 and can be taken without having had Math 3350.

Prerequisite(s): MATH 3322**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 3370 Introduction to the Theory of Statistical Inference 3 Credits****Department:** College of Arts and Sciences

An introduction to calculus-based statistics and probability. Students will study special probability distributions, nature of statistical methods, sampling theory, estimation and testing hypotheses.

Prerequisite(s): MATH 2414**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4131 Special Problems 1 Credit****Department:** College of Arts and Sciences

Special advanced problems in mathematics to suit the needs of individual students.

May be Repeated for a maximum of 3 hours

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4302 Introduction to Partial Differential Equations 3 Credits****Department:** College of Arts and Sciences

This first course in partial differential equations introduces the basic ideas from the theory of partial differential equations, and their connection with the simplest physical systems. This course focuses on the discussion of Boundary value problems with simple geometries in 1, 2, or 3 space dimensions for the heat equation, wave equation, and Laplace equation, separation of variables, Fourier Series, Sturm-Liouville eigenvalue problems and Helmholtz equation, Rayleigh Quotient, and introduction to finite difference methods.

Prerequisite(s): MATH 2318 and MATH 3301**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4307 Problem Solving 3 Credits****Department:** College of Arts and Sciences

This course is a study of heuristics and strategies used in solving problems, with extensive practice in problems involving skills in arithmetic, algebra, geometry, and logic.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4310 Complex Variables 3 Credits****Department:** College of Arts and Sciences

Complex numbers, analytic functions, complex line integrals, Cauchy integral formula and applications.

Prerequisite(s): MATH 3435 or MATH 2415**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory**MATH 4313 Introduction to Linear Regression Analysis 3 Credits****Department:** College of Arts and Sciences

Simple linear regression, theory of least squares, multivariate analysis, theory of the general linear model, application to real life data, modeling, and interpretation of computer-generated graphical and numerical results in regression analysis.

Prerequisite(s): MATH 3370**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4315 Numerical Analysis 3 Credits****Department:** College of Arts and Sciences

Algorithms for solving linear and non-linear equations and systems thereof, interpolating polynomials, finite difference approximations of derivatives, techniques of numerical integration, one-step and multi-step methods for solving ordinary differential equations and systems thereof.

Prerequisite(s): (MATH 3328 or MATH 2318) and MATH 3301**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4318 Applied Linear Algebra and Matrix Theory 3 Credits****Department:** College of Arts and Sciences

This course provides an introduction applied linear algebra and matrix theory. Topics that will be covered in the course include matrix factorization, canonical forms, orthogonality, matrix norms, projectors, least squares, generalized inverses and singular values

Prerequisite(s): MATH 2318 and MATH 3301**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4319 Introduction to Design and Analysis of Experiments 3 Credits****Department:** College of Arts and Sciences

Basic statistical concepts, analysis of variance, randomized blocks, Latin-squares, general factorial designs, 2k and 3k designs, modeling and analysis using MINITAB or SPSS.

Prerequisite(s): MATH 3370**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4321 Topics in Secondary Math 3 Credits****Department:** College of Arts and Sciences

Introduction to essential topics for pre-service 4-12 mathematics educators. Topics include quantitative reasoning, algebraic thinking, geometry, spatial reasoning, measurement, precalculus, mathematics models, and AP Calculus and Statistics.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 4325 Analysis I 3 Credits**Department:** College of Arts and Sciences

This course is an introduction to the workings behind the topic of real analysis. Students will study the real number system, and the axioms behind it, along with properties and results involving distance, sequences, and topological concepts. Next students will take a deep look at the standard real function results from Calculus such as continuity, differentiation, and integration.

Prerequisite(s): MATH 3322**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4326 Analysis II 3 Credits****Department:** College of Arts and Sciences

This course is an extension of Analysis I. It begins with a continuation of the study of the Riemann integral and The Fundamental Theorem of Calculus. Then it moves on to other, more generalized, types of integration such as the Riemann-Stieltjes integral. Next are the properties of metric spaces and the application of this type of space to sequences, series, continuity, and connectedness.

Prerequisite(s): MATH 4325**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4330 Advanced Linear Algebra 3 Credits****Department:** College of Arts and Sciences

Vector spaces, linear transformations, matrices, determinants, eigenvalues, eigenvectors, canonical forms, bi-linear mappings and quadratic forms.

Prerequisite(s): MATH 2318 and MATH 3322**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4331 Special Problems 3 Credits****Department:** College of Arts and Sciences

Special advanced problems in mathematics to suit the needs of individual students.

May be Repeated for a maximum of 12 hours

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory**MATH 4332 Independent Study 3 Credits****Department:** College of Arts and Sciences

A course for students to study advanced topics in mathematics not covered in other courses in a one on one setting with an instructor.

May be Repeated for a maximum of 6 hours

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4340 Introduction to Topology 3 Credits****Department:** College of Arts and Sciences

This course explores introductory properties of topological spaces and structures defined on them at an undergraduate level. This course introduces the concepts of point set topology, including metrizable, compactness, embeddings, Urysohn's lemma, and homotopy.

Prerequisite(s): MATH 4325**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4351 Combinatorics 3 Credits****Department:** College of Arts and Sciences

This course introduces fundamental concepts and results in combinatorics. Students will study counting techniques, binomial coefficients, partitions, and recurrence relations.

Prerequisite(s): MATH 3322**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4361 Combinatorial Design Theory 3 Credits****Department:** College of Arts and Sciences

This course introduces fundamental concepts and results in design theory, including pairwise balanced designs, graph decompositions, and Latin squares.

Prerequisite(s): MATH 3322 or MATH 3311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4371 Graph Theory 3 Credits****Department:** College of Arts and Sciences

This course introduces fundamental concepts and results in graph theory, appealing to mathematicians, computer scientists and engineers.

Prerequisite(s): MATH 3322 or MATH 3311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 4380 Theory Statistical Inference 3 Credits****Department:** College of Arts and Sciences

A formal introduction to statistical inference, sampling theory, general principles of statistical inference, goodness of fit tests, regression and correlation, analysis of variance.

Prerequisite(s): MATH 3370**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5300 Regression Analysis 3 Credits****Department:** College of Arts and Sciences

Review of simple linear regression analysis, theory of least squares, multiple regression models in matrix terms, multivariate analysis, and theory of the general linear model.

Prerequisite(s): MATH 3370**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5308 Ordinary Differential Equation 3 Credits****Department:** College of Arts and Sciences

Systems of linear differential equations, autonomous systems, stability, sensitivity, existence and uniqueness theorems, Fourier series, boundary value problems, derivation of selected numerical methods such as Runge-Kutta and multi-steps methods.

Prerequisite(s): MATH 3301 and MATH 4325**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 5310 Real Variables 3 Credits**Department:** College of Arts and Sciences

Analytical functions, pathological functions, set functions, Riemann integral, measure theory, Lebesgue integral, Riemann-Stieltjes and Lebesgue-Stieltjes integral.

Prerequisite(s): MATH 3380**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5312 Complex Variables 3 Credits****Department:** College of Arts and Sciences

Conformal mapping and analytic continuation, calculus of residues, and applications.

Prerequisite(s): MATH 4310**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory**MATH 5315 Numerical Analysis 3 Credits****Department:** College of Arts and Sciences

Algorithms for solving linear and non-linear equations and systems thereof. Interpolating polynomials, finite difference approximations of derivatives, techniques of numerical integration. One-step and multi-step methods for solving ordinary differential equations and systems thereof.

Prerequisite(s): (MATH 3435 or MATH 2415) and COSC 1336**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5317 Prob Thry/Stochastic Pro 3 Credits****Department:** College of Arts and Sciences

Theory of probability, random variables, well-known distributions, conditional probability, Bayes' formula, Markov Chain, counting process, Poisson processes, Chapman-Kolmogorov equations, gambler's ruin, branching process. Prerequisites: Graduate standing and MATH 3370 or its equivalent Offered: Other

Prerequisite(s): MATH 3370**Restriction(s):**

Enrollment limited to students with a class of Graduate.

Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5319 Design of Experiments 3 Credits****Department:** College of Arts and Sciences

Experimental design and analysis of experiments are developed as tools of the manufacturing and process industries. Analysis of variance, randomized blocks, Latin-squares design, general factorial design, 2k and 3k design are treated in detail.

Prerequisite(s): MATH 3370**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5320 Modern Algebra 3 Credits****Department:** College of Arts and Sciences

Groups, rings and the theory of fields. The theory of fields includes the study of subfields, prime fields, algebraic fields extensions and Galois fields.

Prerequisite(s): MATH 3350 or MATH 3351**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5325 Partial Differential Equations 3 Credits****Department:** College of Arts and Sciences

Boundary value problems with simple geometries in 1,2, or 3 space dimensions for the heat equation, wave equation, and potential (Laplace) equation, separation of variables, Fourier Series, Sturm-Liouville eigenvalue problems and Helmholtz equation, Rayleigh Quotient, introduction to finite difference methods.

Prerequisite(s): MATH 3301**Restriction(s):**

Enrollment limited to students with a class of Graduate.

Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5328 Appl Linear Algebra/Matrix Thy 3 Credits****Department:** College of Arts and Sciences

Matrix factorizations, canonical forms, orthogonality, matrix norms, projectors, least squares, generalized inverses, singular values.

Prerequisite(s): MATH 3301 and (MATH 3328 or MATH 2318)**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 5330 Linear Algebra II 3 Credits**Department:** College of Arts and Sciences

Vector-spaces, linear transformations, matrices, determinants, eigenvalues, eigenvectors, canonical forms, bi-linear mappings and quadratic forms.

Prerequisite(s): MATH 2414 and (MATH 3328 or MATH 2318)**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5331 Special Topics 3 Credits****Department:** College of Arts and Sciences

Advanced topics in mathematics to suit the needs of individual students. Course may be repeated for a maximum of six semester hours credit when the topic varies.

May be Repeated for a maximum of 6 hours

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5340 Topology 3 Credits****Department:** College of Arts and Sciences

Topological spaces, metric spaces, compact spaces, embedding, Urysohn's lemma and homotopy.

Prerequisite(s): MATH 3380**Restriction(s):**

Enrollment limited to students with a class of Graduate.

Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5351 Combinatorics 3 Credits****Department:** College of Arts and Sciences

This course introduces fundamental concepts and results in combinatorics such as counting techniques, binomial coefficients, partition and reference relations.

Prerequisite(s): MATH 3322 or MATH 3311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5361 Combinatorial Design theory 3 Credits****Department:** College of Arts and Sciences

This course introduces fundamental concepts and results in design theory, including airwise balanced designs, graph decompositions, and Latin squares.

Prerequisite(s): MATH 3322 or MATH 3311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5371 Graph Theory 3 Credits****Department:** College of Arts and Sciences

This course introduces fundamental concepts and results of graph theory, appealing to mathematicians, computer scientists and engineers.

Prerequisite(s): MATH 3322 or MATH 3311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5380 Statistical Inference 3 Credits****Department:** College of Arts and Sciences

Theories of point estimation, interval estimation and hypothesis testing, regression analysis, analysis of variance.

Prerequisite(s): MATH 3370**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5381 Advanced Statistical Methods 3 Credits****Department:** College of Arts and Sciences

Statistical methods and reasoning, principles and applications of probability and statistics with emphasis on real-world data pertaining to data collection, organization, and analysis. Specifically, descriptive, and inferential statistical methods, probability distribution, permutation-based methods of inference, bootstrap confidence intervals, and the binomial exact test for proportions, confounding, randomization, and sampling variability, linear regression, and correlation. Statistical computing language and environment R

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**MATH 5382 Time Series Analysis 3 Credits****Department:** College of Arts and Sciences

This course covers methods for analyzing data collected over time.

Topics include autoregressive moving average models (MA, AR, ARMA, ARIMA), exponential smoothing, model identification, parameter estimation, diagnostics, and forecasting. Appropriate statistical software (such as ITSM, R or SAS) used throughout.

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 5383 Predictive Analytics 3 Credits

Department: College of Arts and Sciences

Advanced statistical techniques for analyzing large and high dimensional data. Topics include data mining strategy, data processing, predictive modeling techniques for decision making, model assessment and comparison. This course will be taught using appropriate statistical software.

Restriction(s):

Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 5384 Advanced Machine Learning 3 Credits

Department: College of Arts and Sciences

Machine learning and statistical pattern recognition concepts that include cost functions, gradient descent, backpropagation, neural networks, natural language processing, sentiment analysis, chatbots, recommender systems, reinforcement learning, supervised learning and unsupervised, computer vision, text processing, and bioinformatics.

Restriction(s):

Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

MATH 5390 Thesis 3 Credits

Department: College of Arts and Sciences

Prerequisite: Approval of graduate advisor. Must complete both for required 6 credits.

Restriction(s):

Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS, Thesis/Dissertation

MATH 5391 Thesis 3 Credits

Department: College of Arts and Sciences

Prerequisite: Approval of graduate advisor. Must complete both for required 6 credits.

Restriction(s):

Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS, Thesis/Dissertation

MATH 5395 Internship 3 Credits

Department: College of Arts and Sciences

This is a supervised internship course resulting in the completion of a comprehensive final report. Internship is intended to provide students with hands-on experience in industry in an area related to Computational and Quantitative Methods. Each student is assigned to an industry partner and works with this partner at least 12 hours per week for one semester on a project involving data-driven decision making.

Restriction(s):

Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS