## MATHEMATICS

**MATH 1101 - Mathematical Modeling .................3.00 Credits** This course is an introduction to mathematical modeling using graphical, numerical, symbolic, and verbal techniques to describe and explore real world phenomena. Emphasis is on the use of elementary functions to investigate and analyze applied problems and questions, supported by appropriate technology and effective communication of quantitative concepts and results.

**MATH 1111 - College Algebra ...............................3.00 Credits** This course includes a study of topics in real numbers, linear and quadratic equations, complex numbers, various types of other functions and their graphs, exponential and logarithmic functions, systems of linear equations and inequalities.

*Prerequisite: Developmental MATH 0099 or Placement Test.*

**MATH 1113 - Pre-calculus with Trig......................3.00 Credits** This course is the study of functions and their graphs. Topics include trigonometric functions, exponential and logarithmic functions, transcendental functions and polar coordinates.

*Prerequisite: MATH 1111 or Placement Test.*

**MATH 1201 - Survey of Calculus .........................3.00 Credits** This course includes a study of topics in limits, continuity, differentiation of elementary functions, applications of the derivative, the definite integral and applications.

*Prerequisites: MATH 1111.*

**MATH 1211 - Calculus I ........................................4.00 Credits** This is a beginning course in calculus. Topics include differentiation and integration of algebraic and trigonometric functions, with applications to graphs of functions, rectilinear motion, maxima and minima, areas, volumes and work.

*Prerequisite: MATH 1113*

**MATH 1311 - Informal Geometry ........................3.00 Credits**

A study of the basic theorems and constructions in plane Euclidean geometry and an introduction to space geometry, central angles, tangents, inscribed and circumscribed circles, polyhedrons and polygons.

*Prerequisite: MATH 1111.*

**MATH 2008 - Foundations of Numbers**

**and Operations .......................................................3.00 Credits** This course is an Area F introductory mathematics course for early childhood education majors. This course will emphasize the under- standing and use of the major concepts of number and operations. As a general theme, strategies of problem solving will be used and discussed in the context of various topics.

*Prerequisite(s): Math 1101, Math 1111, or Math 1113.*

**MATH 2111 - Linear Algebra ...............................3.00 Credits**

This course concentrates on operations with vectors, matrices, systems of linear equations, determinants, vector spaces, linear trans- formations, eigenvalues and eigenvectors.

*Prerequisite: MATH 1211.*

**MATH 2212 - Calculus II.......................................4.00 Credits** This course is a continuation of Calculus I. Topics include differentiation and integration of transcendental functions, techniques of integration, arc length, surface or volumes, force, work, and introduction to differential equations, improper integrals, sequences and series and parametric equations.

*Prerequisite: MATH 1211 .*

**MATH 2213 - Calculus III .....................................4.00 Credits** Topics include vectors, the calculus of vector-valued functions, polar coordinates, spherical coordinates, function of several variables, directional derivatives, Lagrange multipliers and multiple integrals.

*Prerequisite: MATH 2212 .*

**MATH 2411 - Basic Statistics ................................3.00 Credits** This course will include an introduction to probability and basic concepts of descriptive and inferential statistics. The computer and graphing calculators will be an integral part of this course.

*Prerequisite: MATH 1111 or MATH 1113.*

**MATH 3000 - Numbers and Their Applications..3.00 Credits** This course will cover the basic properties of the system of natural numbers, the system of whole numbers, the system of rational numbers and the system of real numbers. This course will also cover nomenclature and representations of numbers, number patterns, elements of number theory and applications.

*Prerequisite: MATH 1111 or MATH 1113.*

**MATH 3001 - Math Concepts**

**using Technology......................................................3.00 Credits** This course explores the technical tools to study concepts in Geometry, Algebra and Calculus. Software such as Geometric Pad, Maple V, Interactive Pre-calculus and Language Proofs and Logic will be used to explore pre-calculus and calculus concepts and their applications in problem solving. Graphing calculators will be used to demonstrate concepts in mathematics and to do problem solving.

*Prerequisite: MATH 1113.*

**MATH 3101 - Introduction to Number Theory ...3.00 Credits** Introduction to the classical arithmetic properties of the integers. Divisibility properties, primes and their distribution, congruencies, Diophantine equations and their applications, number-theoretic functions, Fermat and Euler theorems, continued fractions, Fibonacci numbers, Pythagorean triples and perfect numbers.

*Prerequisite: MATH 2212*

**MATH 3111 - Discrete Structures.........................3.00 Credits** This course includes topics such as logic, set relations, functions, counting techniques, mathematical induction, representations, combinatorial problems, elementary graph theory, network flow, recursion and finite state machine.

*Prerequisite: MATH 1113.*

**MATH 3112 - Discrete Mathematics.....................3.00 Credits** This course includes a study of topics in combinatorial mathematical processes. Topics in mathematical induction, set theory, number theory, combinations, permutations, probability theory including the induction principle, relations, recursions, the counting principle, generating functions, logic, and graph theory are covered.

*Prerequisite: MATH 1113.*

**MATH 3211 - Ordinary Differential**

**Equations……………………………………….......3.00 Credits**

This course includes topics in ordinary differential equations: separable equations, homogeneous and non homogeneous equations, exact equations, Euler equations, non- linear ordinary differential equations, the study of Laplace transforms and how to use them to solve practical problems as well as solving systems of linear differential equations.

*Prerequisite: MATH 2212.*

**MATH 3213 - Modern Geometry..........................3.00 Credits** This course is the study of metric, affine and projective geometries by means of groups of transformations and their invariants on the Euclidean plan.

*Prerequisite: MATH 2111 .*

**MATH 3314 - Math Statistics ................................3.00 Credits** Calculus-based course in probability and statistics covering probability distributions, probability densities, random variables, sampling, experimental design and nonparametric statistics and decision theory.

*Prerequisite: MATH 2212.*

**MATH 3411 - Statistical Methods .........................3.00 Credits** This course deals basic statistical methods encountered in applications. Topics covered include normal distribution, confidence interval, statistical inferences, hypothesis testing, regression and correlation, categorical data and non-parametric methods, analysis of variance. Statistical methods will be a major requirement for the mathematics program. It supports our efforts to strengthen our program and offer more Applied Mathematics courses to our majors who are seeking employment in areas requiring the use of statistics as well as those majors who intend to pursue graduate programs in statistics.

*Prerequisite: Math 2411*

**MATH 3413 - Introduction to Combinatorics .....3.00 Credits** This course is the study of basic graph theory, permutations, combinations, inclusion-exclusion principle, recurrence relations, generation functions, occupancy problems, applications to probability theory, geometry of the plane, maps on the sphere, coloring problems, finite structures, systems of distinct representatives, existence problems, magic squares, and Latin squares.

*Prerequisite: MATH 2111.*

**MATH 3423 - Intro to Operations Research........3.00 Credits** This course is the study of deterministic and stochastic models including transportation and assignment problems, network analysis, decision theory, queuing theory and simulation.

*Prerequisite: MATH 2111.*

**MATH 4111 - Modern Algebra I...........................3.00 Credits** This course covers basic concepts in groups, rings, integral do- mains, homeomorphisms and isomorphism of groups.

*Prerequisite: MATH 2212*

**MATH 4112 - Modern Algebra II .........................3.00 Credits** This course covers elementary concepts in ring theory and field theory. *Prerequisite: MATH 4111.*

**MATH 4211 - Elements of Analysis I....................3.00 Credits** This course is the study of the real number system, point- set theory of the real line, global and local properties of continuous functions, Law of Mean, convergence of sequences and series, and the Theory of Riemann Integration.

*Prerequisite: MATH 2213.*

**MATH 4212 - Elements of Analysis II ..................3.00 Credits** This course is the study of functions of several variables, implicit-function theorems, vectors in **Rn**, linear transformations in **Rn**, calculus of functions in higher dimensional Euclidean spaces, multiple integrals, line and surface integrals.

*Prerequisite: MATH 4211.*

**MATH 4214 - Intro to Complex Variables...........3.00 Credits**

The course includes a study of analytic, harmonic, continuous, and logarithmic functions, Cauchy-Riemann equations, power series, branch point, contours and contour integrals, Cauchy's theorem, and applications.

*Prerequisite: MATH 2213*

**MATH 4215 - Numerical Analysis ........................3.00 Credits** This course will provide an introductory knowledge of elementary numerical methods found useful in the field of computing. This will include number representation and errors, locating roots of equations, interpolation and numerical differentiation, numerical integration, minimization and maximization multivariate functions.

*Prerequisite: MATH 2213*

**MATH 4220 - Partial Differential Equations .......3.00 Credits** This course deals with method of characteristics for first and second order partial differential equations, separation of variables, hyperbolic equations, parabolic equations, elliptic equations, Fourier series, Green's function. This course strengthens the applied math courses offerings in the mathematics program.

*Prerequisite: MATH 3211.*

**MATH 4313 - Topology .........................................3.00 Credits** This course is the study of elementary topology. The topics include point set theory, topological spaces, metric spaces, subspaces, continuous mapping, homeomorphisms, connectedness, compactness, and intuitive concepts in topology.

*Prerequisite: MATH 4211*

**MATH 4511 - History of Mathematics .................3.00 Credits**

This course includes topics in numeral systems, Babylonian and Egyptian mathematics, Pythagorean and Euclidean mathematics, Hindu and Arabian mathematics, European mathematics from the Dark Ages to the Present.

*Prerequisite: Senior standing.*

**MATH 4921 - Senior Project I ………………… 1.00 Credits**

In this course, students will broaden their educational experience by reading and understanding technical literature in the areas of mathematics and computer science, organizing and writing a professional-level proposal, attending seminars and preparing a professional-level presentation. Students will draw upon and synthesize knowledge from their previous course work. Though revision of both the proposal and the oral presentation, students will improve their ability to communicate the main ideas.

*Prerequisite: Senior Students*

**MATH 4922 - Senior Project II ………………….. 2 Credits**

In this course, students will broaden their educational experience by reading and understanding technical literature in the areas of mathematics and computer science, organizing and writing a professional-level paper, project implementation and coding, attending seminars and preparing a professional-level presentation. Project implementation should satisfy all requirements mentioned in the approved proposal accomplished during the course CSCI 4921. Students will draw upon and synthesize knowledge from their previous course work and educational experience.

*Prerequisite: Senior Students and MATH 4921*