

MATHEMATICS

Department of Mathematics

OFFICE: Just Hall of Science Building

MATH 111 (3) **College Algebra**. Prerequisite: MATH 004 with a grade of "C" or better or the equivalent and Test Standing. The function concepts, solving quadratic equations, graphing the quadratic function, inequalities, absolute value, absolute inequalities, Fundamentals theorem of Algebra, roots, factors, systems of equations and matrices, math induction and Binomial Theorem, arithmetic and geometric progressions, logarithms, complex numbers, partial fractions, and applications of all topics.

MATH 112 (3) **Plane Trigonometry**. Prerequisite: MATH 111 with a grade of "C" or better. Right and oblique triangular solutions, identities, trigonometric equations, systems of angular measurements, and applications.

MATH 118 (5) **College Algebra and Trigonometry**. Prerequisite: Test Standing, MATH 004 or equivalent. Polynomial equations, exponents and radicals, logarithms, quadratic equations, inequalities, complex numbers, permutations and combinations, probability, determinants, simultaneous linear equations, induction, binomial theorem, progressions and series, triangular solutions, identities, trigonometric equations, systems of angular measurement applications.

MATH 215 (3) **Mathematics of Finance**. Prerequisite: Department approval. Simple and compound interest, simple and compound discount, annuities, amortization, sinking funds, valuation of bonds, depreciation, life annuities, life insurance and reserves.

MATH 217 (3) **Introduction to Finite Mathematics (Education)**. Prerequisite: MATH 111. Introductory ideas for students of education, compound statements, sets and subsets, partitions and counting, elementary probability theory.

MATH 221 (3) **Calculus Industrial or Business**. Prerequisite: MATH 111. Functions, limits, continuity, differentiation, applications, basic analytic geometry, algebraic, exponential and logarithmic functions, integration, applications, series and sequences, improper integral. Specific applications.

MATH 226 (3) **Concepts and Structures of Mathematics I**. Prerequisite: MATH 111 with a grade of "C" or better. Study of various numeration systems rational and real numbers, fraction and decimal algorithms, ratios, percentages, consumer mathematics, introduction to problem-solving and logic, use of patterns and Venn diagrams.

MATH 227 (3) **Concepts and Structures of Mathematics II**. Prerequisite: MATH 226. . Statistical graphs, measures of

central tendencies, variations, odds and probability, conditional probabilities, expected values, use and abuse of statistics. Introduction of geometry and concepts of measurements.

MATH 231 (4) **Calculus I with Laboratory**. Prerequisite: MATH 112 or MATH 118. Functions, limits, continuity, differentiation, limiting forms, applications, properties of continuous functions, analytic geometry and integration. The laboratory component is designed to reinforce the lecture component with activities requiring the use of technology in the form of computers with selective software and graphing utilities.

MATH 232 (4) **Calculus II with Laboratory**. Prerequisite: MATH 231. Applications of the definite integral, logarithmic exponential and inverse trigonometric functions. Techniques and further application of the definite integral, parametric equations and polar coordinates. The laboratory component is designed to reinforce the lecture component with activities requiring the use of technology in the form of computers with selective software and graphing utilities.

MATH 233 (4) **Calculus III with Laboratory**. Prerequisite: MATH 232. Infinite sequences and series, differential calculus of functions of several variables, multiple integrals. The laboratory component is designed to reinforce the lecture component with activities requiring the use of technology in the form of computers with selective software and graphing utilities.

MATH 251 (3) **Finite Mathematics**. Prerequisite: MATH 111 or Department approval. Compound statements, sets and functions, probability theory, elementary linear algebra, convex sets, finite Markov chains, continuous probability theory.

MATH 271 (3) **Elementary Statistics**. Prerequisite: MATH 112. Introduction, frequency distributions, location measures, variation, symmetry, skewness, peakedness, index numbers, probability, theoretical distributions, sampling, estimation, tests of hypotheses, nonparametric tests, linear regression, coefficient of correlation, time series analysts.

MATH 301 (3) **Elementary School Mathematics**. Prerequisite: MATH 111. Counting and numerical concepts, problem solving, equipment, achievement, examinations, present issues.

MATH 302 (3) **Junior High Mathematics**. Prerequisite: Department approval. Aims and problems of teaching, techniques of teaching, arousing and maintaining interest, aids and trends, tests and measurements, organization and treatment of subject matter, organization and duties of teachers of junior high competence.

MATH 303W (3) **Introductory Set Theory and Logic**. Prerequisite: MATH 231, with a grade of "C" or better. Sets and relations, natural number sequence, extension of

natural number to reals, logic, informal axiomatics, Boolean algebra, interval and set theory, algebraic theories, first order theories.

MATH 306 (3) Elementary Concepts of Geometry.

Prerequisite: Department approval. Basic notions of lines, angles, triangles, circles and proofs. Stress is placed on synthetic methodology and reasoning.

MATH 307 (3) Probability and Statistics for Engineers.

Prerequisite MATH 232. Introduction to concepts of probability and statistics required to solve problems in various disciplines; mathematical basis for probability and statistics includes axioms of probability, continuous sampling distributions, and discrete probability, hypothesis testing, confidence intervals, probability estimations for risk assessment, data processing and statistical inference, statistical techniques of data analysis, simple and multiple regression model development; stochastic processes, emphasis is on the application of probability, statistics and reliability to rational decision making, data analysis and model estimation in engineering context.

MATH 311W (3) Abstract Algebra I. Prerequisite:

MATH 303. Basic concepts of modern algebra, preliminaries, elementary ideas of groups, rings, integral domains and fields.

MATH 315 (3) Senior High Mathematics. Prerequisite:

Department approval. Aims and problems techniques, arousing and maintaining interest, aids and trends, tests and measurements, traditional and non-traditional courses, operations, number systems, professional duties, supervision and improvement of instruction, geometry.

MATH 321W (3) Introduction to Modern Geometry.

Prerequisite: MATH 232. Euclidean, non-Euclidean, projective and affine geometrics with emphasis on the appropriate postulates and the postulational method. Transformation theory.

MATH 331 (3) Linear Algebra and Matrix Theory.

Prerequisite: MATH 303. A theoretical study of equations, matrices, vector spaces, inner product spaces linear transformations bilinear and quadratic forms and eigenvalues.

MATH 332 (3) Linear Algebra and Matrix Theory with Applications. Prerequisite: MATH 331.

Numerical methods of linear algebra, Fourier Series, vector and tensor analysis, orthogonality, unitary, normal, and Hermetian operators, applications to differential equations, physics and engineering, special theory and infinite dimensional linear spaces.

MATH 335 (3) Logic. Prerequisite: MATH 303.

Symbolic logic, statement calculus, monies, axiomatic treatments, predicate calculus, equality, relations and functions, cardinals and ordinals, counting, the axiom of choice.

MATH 341 (3) Introduction to Number Theory.

Prerequisite: MATH 233. Multiplicativity and divisibility,

congruencies, arithmetic functions, primes, quadratic residues, addibility, generating functions, partitions, geometric number theory, ruler and compass constructions, and special topics.

MATH 351 (3) Advanced Calculus. Prerequisite: Math

233. Sets and functions, continuity, integration, convergence, differentiation, and applications to geometry and analysis, differential geometry and vector calculus.

MATH 355 (3) Introduction to Probability and Statistics. Prerequisite: MATH 233.

Random variables, conditional probability and stochastic independence, special distributions.

MATH 356 (3) Introduction to Mathematical Statistics.

Prerequisite: MATH 355. Estimations, order statistics, limiting distributions, statistical hypotheses, variance, normal distribution theory, point and interval estimation, sampling, regression and correlation.

MATH 368 (3) Ordinary Differential Equations.

Prerequisite: MATH 233. Introduction to differential equations, first-order differential equations, higher-order differential equations, series solutions of linear equations, the Laplace transform and systems of linear first-order differential equations.

MATH 369 (3) Introduction to Dynamical Systems.

Prerequisite: MATH 368. Introduction, linear systems, fixed points, Lyapunov function, Lyapunov's method, periodicity and chaos, the Poincare-Bendixon theorem, the Hoph bifunction, fractals and Cantor set.

MATH 371 (3) Vector and Tenor Analysis. Prerequisite:

MATH 233. Algebra of vectors, differential vector calculus, differential geometry, integration, static and dynamic applications, tensor analysis. Riemannian geometry, applications of tensor analysis.

MATH 381 (3) Projective Geometry. Prerequisite:

MATH 233. Basic notions, triangles and quadrangles, duality principle, fundamental theorem and theorem of Pappus, Desarguesian figures, projectives, polarities, conics, finite planes, parallelism, coordinates. (A general sequence of synthetic and analytic projective geometry.)

MATH 385 (3) Numerical Analysis. Prerequisite: MATH

233. Summation of series, evaluation of expressions, equation solvability, systems of linear equations, interpolation, numerical integration and differentiation, ordinary differential equations, matrix algebra, eigenvalues and eigenvectors, partial differential equations.

MATH 401W (3) Arithmetic for Children. Prerequisite:

Department approval. A study of recent curricular changes of interest to the prospective teacher, special problems including lessons and teachable units will be emphasized in three major areas: teaching the number system, teaching algebraic principles and teaching geometry in the grades.

MATH 402W (3) Mathematics in the Secondary School.

Prerequisite: Department approval. Materials and sources of value to prospective teachers of high school, middle school and junior high school mathematics, reports, current articles, state-adopted textbooks, yearbooks and histories, special problems in teaching geometry and algebra.

MATH 403S (3) Seminar in Mathematics.

Prerequisite: Department approval. The provisions to the student of an opportunity to discuss pertinent trends and ideas in mathematics and to evaluate the experience he has had through study and practice during his previous years of training in mathematics.

MATH 404 (3) Number Theory and Cryptography.

Prerequisite: MATH 331 or department approval. Topics in elementary number theory, finite fields, and quadratic residues. Cryptography public key, primality and factoring, elliptic curves.

MATH 411 (3) Abstract Algebra II.

Prerequisite: MATH 311. Groups rings, integral domains, modules, vector spaces, fields, linear transformations, special topics in group, ring, and field theory.

MATH 415 (3) Partial Differential Equations I.

Prerequisite: MATH 368. Heat equations, Laplace's equation, Fourier series, wave equation, Sturm-Liouville eigenvalue problems, nonhomogeneous problems, method of Green's functions, infinite domain problems and the methods of characteristics for wave equations.

MATH 416 (3) Partial Differential Equations II.

Prerequisite: MATH 415. First order partial differential equations and applications, multidimensional partial differential equations, existence and uniqueness, methods of variations, finite difference and finite element numerical methods, use of MatLab in solving partial differential equations.

MATH 421 (3) Modern Geometry.

Prerequisite: MATH 321. Modern elementary geometry, transformations, constructions, projective geometry, non-Euclidean geometries, foundations, analyticity, groups, complex numbers and limit operations, differential geometry, combinatorial topology, n-dimensional geometry and abstract spaces.

MATH 425 (3) Topics and Issues in Secondary Mathematics.

Prerequisite: Department approval. Forces shaping today's mathematics programs, teaching for special outcomes, classroom applications.

MATH 430 (3) Mathematical Modeling.

Prerequisite: MATH 221 or 231. Discrete models, graphs, digraphs, games, Markov chains, recursion, differential equations, probability and statistics, linear algebra, strange attractors, basic applications, computer graphics, optimization, experimental modeling, dimensional analysis and similitude, dynamic systems (chaotic), model fitting, control system, and applications using advanced mathematics.

MATH 431 (3) Real Analysis.

Prerequisite: MATH 233. Real number system, basics, numerical sequences and series, continuity, differentiation, Riemann-Stieltjes integral, sequences and series of functions, special series, functions of several variables, the Lebesgue theory.

MATH 435 (3) The Teaching of Mathematics.

Prerequisite: Department approval. Theory of arithmetical meanings, learning and rational, applied meanings, current trends.

MATH 437(3) Fourier Series.

Prerequisite: MATH 368. Linear spaces, orthogonal functions. Fourier series. Legendre polynomials and Bessel functions, applications.

MATH 441 (3) Complex Analysis.

Prerequisite: MATH 233. Complex numbers and representations, point sets, sequences, functions, analytic functions of one complex variable, elementary functions, integration, power series, calculus of residues, conformal representation, applications.

MATH 447 (3) Sampling Methods.

Prerequisite: MATH 271 or MATH 356. Simple random sampling, sampling for proportions and percentages, estimation of sample size, stratified random sampling, ratio estimates.

MATH 451 (3) General Topology.

Prerequisite: MATH 303. Elementary set theory, ordinals and cardinals, topological spaces, cartesian products, connectedness, special topologies, separation and covering axioms, metric spaces, convergence, compactness, function spaces, complete spaces, elementary homotopy and homology theory.

MATH 455 (3) Experimental Design.

Prerequisite: MATH 447. Completely randomized design, randomized block designs, factorial experiments, split plot design, confounding.

MATH 461 (3) Mathematical Statistics.

Prerequisite: MATH 356. Random variables and probability distributions, statistical inference, estimation, testing of hypotheses, analysis of variance, least squares.

MATH 466W (3) Operation Research.

Prerequisite: MATH 355. Learning programming, network analysis, PERT-CPM, dynamic programming, queuing theory and decision analysis.

MATH 471 (3) Approximation and Interpolation.

Prerequisite: MATH 385. Preliminaries, interpolation, remainder theory, convergence theorems, infinite interpolation, uniform, best and least square approximations, spaces, polynomials and functions, closure and completeness, expansion theorems, degree of approximation, approximation of linear functions.

MATH 485 (3) Number Theory.

Prerequisite: MATH 341. Congruencies, representation of numbers by decomposable forms, divisibility, local methods, analytic methods, algebraic topics.

MATH 491 (3) **History of Mathematics Education.**
Prerequisite: Department approval. Introduction, mathematics in schools, forces and issues related to Elementary and Early Childhood Education (K-6, 7-12), education of teachers of mathematics, school mathematics in Canada, future outlook.

MATH 493 (3) **Historical Topics in Mathematics Classrooms.** Prerequisite: Department approval. Historical development of numbers and numerals, computation, geometry, algebra, trigonometry, calculus, modern mathematics.