

MATHEMATICS (MATH)

NOTE: Students enrolling in mathematics classes must receive at least a grade of C in all its pre-requisite mathematics and computer science courses.

301 A REVIEW OF MATHEMATICAL TOPICS (3)

Prerequisite: Bachelor's degree and consent of the department.

A review of the basic elements of calculus, linear algebra, and the nature of proof.

302 RECENT TRENDS IN MATHEMATICS (3)

Prerequisite: Bachelor's degree and/or consent of the department.

Course for in-service teachers. Changes in the teaching, philosophy, and course content of pre-collegiate mathematics.

304 NUMBER THEORY FOR MIDDLE SCHOOL TEACHERS (3)

Prerequisite: MATH 141 or MATH 162 or equivalent; and a 200-level mathematics course.

Prime numbers. Euclidean algorithm. Greatest common divisors and least common multiples. Modular arithmetic. Diophantine equations. Integration of the content in elementary and middle school. May not be used for graduation credit in mathematics or mathematics secondary education options.

305 GEOMETRY FOR MIDDLE SCHOOL TEACHERS (3)

Prerequisite: MATH 141 or MATH 162 or equivalent; and a 200-level mathematics course

Incidence relation, angles, congruence, measurement, compass-and-straightedge constructions, circles, arcs and arc length, polygons, similarity, right-triangle trigonometry, area, volume, coordinate geometry in two and three dimensions. Integration of content in the elementary and middle school. May not be used for graduation credit in mathematics or mathematics secondary education options.

306 MODERN ALGEBRA FOR MIDDLE SCHOOL TEACHERS (3)

Prerequisite: MATH 141 or MATH 162 or equivalent.; and a 200-level mathematics course.

Groups, rings, fields and their applications. Integration of content in the elementary and middle school. May not be used for graduation credit in mathematics or mathematics secondary education options.

307 HISTORY OF MATHEMATICS FOR MIDDLE SCHOOL TEACHERS (3)

Prerequisites: MATH 209 and MATH 305 or equivalent

The historical basis of numeration, operations, geometry, algebra, trigonometry, and calculus. The cultural aspect of mathematics and its contributions to knowledge and learning. Integration of content in the elementary and middle school. May not be used for graduation credit in mathematics or mathematics secondary education options.

308 MATRICES AND LINEAR TRANSFORMATIONS (3)

Prerequisite: MATH 201 and 262.

Vector spaces; bases; dimensionality; linear transformation; determinants; matrices, matrix inversion; rank; equivalence.

309 CALCULUS FOR TEACHERS I (3)

Prerequisite: Bachelor's degree and consent of the department.

A review of the basic elements of calculus with special emphasis on teaching strategies. (Not applicable towards the master's degree in mathematics.)

310 CALCULUS FOR TEACHERS II (3)

Prerequisite: MATH 309 or consent of the department.

A continuation of MATH 309. Not applicable toward the master's degree in mathematics.

311 PROBABILITY AND STATISTICS FOR TEACHERS (3)

Prerequisite: Bachelor's degree and consent of the department.

Basic elements of probability and statistics with special emphasis on teaching strategies. (Not applicable towards the master's degree in mathematics.)

315 INTRODUCTION TO STATISTICS LECTURE AND LABORATORY /5/ (4)

Prerequisite: MATH 262.

Descriptive statistics, discrete and continuous random variables, expectation, distribution functions, central limit theorem, point estimation, confidence intervals, and hypothesis testing SAS Laboratory. Credit will not be given for both MATH 315 and 317. Additional course fee.

318 PROBABILITY AND MATHEMATICAL STATISTICS (3)

Prerequisite: MATH 263 and 315.

Moment generating functions, transformations of random variables, Bayes Theorem, sufficiency, likelihood estimators, Chi-square tests, regressions and contingency tables. SAS used.

325 LINEAR PROGRAMMING (3)

Prerequisite: MATH 201 or 214.

Linear equations, problem formulation, simplex method, duality theory, postoptimal analysis, transportation problem, game theory.

326 INTRODUCTION TO OPERATIONS RESEARCH (3)

Prerequisite: MATH 201 or 214 and 209 or 261.

Linear programming, game theory, dynamic programming, graph theory, and Markov chains. Emphasis on applications in business, industry, and behavioral sciences.

327 ELEMENTARY NUMBER THEORY (3)

Prerequisite: MATH 261.

Properties of integers: divisibility, greatest common divisors, primes, congruences, Diophantine equations, arithmetic functions, quadratic residues.

329 MATHEMATICAL LOGIC (3)

Prerequisite: MATH 261 or consent of the department.

A formal study of the propositional calculus and the predicate calculus, including formal semantics and axiomatizations. Completeness theorems for both systems will be proven.

342 GEOMETRY I (3)

Prerequisite: MATH 261 and one unit of high school plane geometry (regular or honors) with grade of C or higher or MATH 305 or equivalent.

Incidence geometry, distances, measure, congruences, inequalities, parallel postulate, perpendicular lines and planes, similar triangles, polygons, circles, and spheres, construction with ruler and compass. A writing emphasis course.

345 HISTORY OF MATHEMATICS (3)

Prerequisite: MATH 262 and 342, or equivalent.

Chronological survey of the growth and contributions of mathematics to knowledge and learning. Credit not given for both Math 320 and 345.

354 NUMERICAL ANALYSIS I (3)

Prerequisite: MATH 263.

Solution of linear systems by direct and iterative methods, matrix inversions, evaluation of determinants, characteristic values and vector of matrices, application of boundary value problems in ordinary differential equations numerical solution of partial differential equations.

355 NUMERICAL ANALYSIS II (3)

Prerequisite: MATH 354.

A continuation of MATH 354.

356 INTRODUCTION TO COMPLEX VARIABLES (3)

Prerequisite: MATH 263.

Complex numbers and complex space, differentiation and integration of elementary functions, infinite series, Taylor and Laurent expansions, Cauchy's theorems and applications.

358 INTRODUCTION TO REAL VARIABLES (3)

Prerequisite: MATH 263.

Real numbers, real functions, limits, continuity, uniform continuity, differentiability, mean value theorems, theory of the Riemann integral.

361 INTRODUCTION TO MODERN ALGEBRA I (3)

Prerequisite: MATH 262.

Groups, rings, and fields.

370 SPECIAL TOPICS IN MATHEMATICS (1-3)

Prerequisite: To be determined by instructor and consent of the department.

Mathematics topics of current interest. May be repeated for credit with a different topic.

377 THE TEACHING OF REMEDIAL MATHEMATICS FOR SECONDARY TEACHERS (3)

Prerequisite: Bachelor's degree and teaching experience.

Strategies and techniques in the teaching of remedial mathematics. Analysis of modern mathematics curricula. Evaluation of instructional materials for a mathematics laboratory. Constructing units. Micro-teaching.

379 PRACTICUM IN MATHEMATICS LABORATORY EXPERIENCES (3)

Prerequisite: MATH 377, 378 or equivalent; consent of the department; and teaching experience.

Classroom observation and supervised participation in organizing, administering and evaluating materials for a mathematics laboratory in grades K-9.

Note: All graduate students are eligible to enroll for 400-level classes, except those designated as restricted to master's degree students or requiring departmental permission. Prior consultation with the department is recommended.

401 CONTINUING EDUCATION TOPICS FOR PRIMARY SCHOOL MATHEMATICS TEACHERS (1-3)

Prerequisite: Standard Teaching Certificate. Cannot be used to satisfy requirements for certification or for a bachelor's or master's degree.

An exploration of both content and pedagogical topics for teachers of primary school mathematics. Topics may include new curriculum programs, materials and teaching strategies, calculators and computers, number systems, operations of arithmetic, and problem solving, as well as topics of current interest. A hands-on approach using manipulatives and concrete models will be a focus for the course. May be repeated for up to a maximum of six credit hours.

402 CONTINUING EDUCATION TOPICS FOR MIDDLE SCHOOL MATHEMATICS TEACHERS (1-3)

Prerequisite: Standard Teaching Certificate. Cannot be used to satisfy requirements for certification or for a bachelor's or master's degree.

An exploration of both content and pedagogical topics for teachers of middle school or junior high school mathematics. Topics may include new curriculum programs, materials and teaching strategies, calculators and computers, geometry, probability and statistics, relations, equations and problem solving, as well as other topics of current interest. May be repeated for up to a maximum of six credit hours.

408 CONCEPTS OF GEOMETRY I (3)

Prerequisite: MATH 342.

Axiom systems, Euclidean geometry, non-Euclidean geometry, theory of incidence, theory of order, affine geometries, similarity and congruence, models of geometries, distance and measurement, ruler and compass constructions.

410 PROJECTIVE GEOMETRY (3)

Prerequisite: MATH 342.

Analytic and axiomatic projections, theory of conic sections, Pascal's and Branchon's theorems, linear transformations.

411 DIFFERENTIAL GEOMETRY (3)

Prerequisite: MATH 353 or 358.

Theory of curves and surfaces in Euclidean space, Frenet-Serret formulas, Gaussian curvature, geodesics.

415 ANALYSIS I (3)

Prerequisite: MATH 358.

Real number system, functions and limits of real variables, types of convergence, Riemann Stieltjes integrals, implicit functions, other selected topics.

416 ANALYSIS II (3)

Prerequisite: MATH 415.

Continuation of MATH 415.

420 MODERN ALGEBRA I (3)

Prerequisite: MATH 361.

Theory of groups, rings, and fields.

421 MODERN ALGEBRA II (3)

Prerequisite: MATH 420.

Continuation of MATH 420.

422 COMPLEX VARIABLES I (3)

Prerequisite: MATH 356 or 358.

Complex numbers and polygenic and monogenic functions, theory of residues, Taylor and Laurent series, Cauchy-Riemann and Laplace equations.

426 THEORY AND APPLICATION OF INFINITE SERIES (3)

Prerequisite: MATH 358.

Infinite series of real and complex terms including the summability methods of Abel and Cesaro; tests for convergence of series of positive constants including those of Cauchy, Maclaurin, Gauss; alternating series; conditional convergence and Riemann's theorem; absolute and uniform convergence; theorems of Weierstrass, Cauchy, Abel, Levi and Sternitz; introduction to the theory of divergent series.

427 NUMBER THEORY (3)

Prerequisite: MATH 327 or equivalent.

Selected topics in classical, analytic, and algebraic number theory.

431 PARTIAL DIFFERENTIAL EQUATIONS (3)

Prerequisite: MATH 271 and 358.

Classical solutions of first and second order partial differential equations, Bessel and Legendre functions, orthogonal functions, solutions of boundary value problems by the separation of variables and integral transformations, Laplace's equation, wave equation.

433 ADVANCED ORDINARY DIFFERENTIAL EQUATIONS (3)

Prerequisite: MATH 271 and 358.

Boundary value problems, linear differential equations with periodic coefficients, nonlinear differential equations, perturbation theory, Poincare's method.

441 ADVANCED NUMERICAL METHODS (3)

Prerequisite: MATH 271, MATH 354 or 358, and a knowledge of some programming language.

Difference equations, iteration, Aitken's Delta Square method, Steffensen's method, systems, Bairstow's method, Bernoulli's method, quotient-difference algorithm.

443 INTERPOLATION AND APPROXIMATION (3)

Prerequisite: MATH 441.

Chebyshev polynomials, Aitken-Neville algorithm, extrapolations, Romberg integrations, Taylor algorithm, Runge-Kutta methods, Adams-Bashforth and Adams-Moulton methods, stability.

451 MATHEMATICAL MODELS AND APPLICATIONS (3)

Prerequisite: High school mathematics teaching experience and consent of the department.

Modern application of mathematics in such fields as economics, industrial management, psychology, political science, biology, ecology, and geography for high school classroom utilization.

454 MODERN APPLIED ALGEBRA (3)

Prerequisite: MATH 361.

Algebraic theory with applications to theoretical computing. Topics include finite state automata, Turing machines, computability, the theoretical limits of computers, and coding theory.

461 POINT SET TOPOLOGY (3)

Prerequisite: Consent of the department.

Concept of topology, topological and metric spaces, continuity, connectedness, generalized limits, separation concepts.

471 MATHEMATICAL STATISTICS I (3)

Prerequisite: MATH 315 or equivalent.

Random variables, conditional probability, multidimensional distributions, functions of random variables, central limit theorem, limiting distributions.

472 MATHEMATICAL STATISTICS II (3)

Prerequisite: MATH 471.

Test of hypothesis, point estimation, confidence intervals, sufficient statistics, Rao Blackwell theorem, multivariate analysis.

492 GRADUATE SEMINAR (3)

Prerequisite: Twenty-one graduate level credit hours in mathematics and consent of the department.

Conducted by graduate faculty of department. The course may be repeated under a different topic with the permission of the department.

**495 THE GRADUATE MATHEMATICS
EXPERIENCE**

(3-6)

Prerequisite: MATH 415, 420 and one of 408, 410 or 411; consent of the graduate committee of the department.

An individualized mathematics course which is normally among the last course(s) taken by master's candidates. The content is variable and may be a thesis, an expository paper, an historical paper, the development of a particular curriculum, a field experience in mathematics or other suitable and acceptable topic.