M.A.M.Ed. and M.S.M.T. COURSE DESCRIPTIONS

The first twelve courses listed below belong to both the M.A.M.Ed. and M.S.M.T. programs. The M.A.M.Ed. degree requires only the first 12 whereas the M.S.M.T. degree requires all 18 (two of the additional courses are only two credit hours).

M.A.M.Ed. students should consult the program director if they would like to replace some of the M.A.M.Ed. requirements by M.S.M.T courses Math 470, 642, 644, 651 or 672.

Courses that are part of the M.A.M.Ed. and M.S.M.T. Programs

**610 - Calculus for Mathematics Teachers I:** A review of topics from precalculus using algebraic, numerical, and graphical perspectives including linear functions, exponential functions, logarithms, polynomials, and trigonometric functions. An introduction to limits, continuity, the derivative, and basic properties of real numbers. Introduction to graphing calculators and free graphing software with applications to classroom teaching. Offered every Fall.

**611 - Calculus for Mathematics Teachers II:** A continuation of Math 610. The derivative and its applications, including optimization and related rates. Introduction to integration and numerical algorithms using graphing calculators. Offered every Winter. Prerequisite: 610.

**612 - Calculus for Mathematics Teachers III:** A continuation of Math 611. Techniques of symbolic and numerical integration with geometric applications. Sequences, series, power series, and Taylor series. Offered every Spring. Prerequisite: 611.

**618 – Topics in Calculus and Differential Equations: A Historical Perspective:** Taylor's theorem, parametric equations, slope fields, Euler's method. The second half of the course will look at the history of calculus and the development of ideas such as limits, least upper bounds, convergence of series, countability, and cardinality. Offered every Summer. Prerequisite: Math 612

**620 - Geometry for Mathematics Teachers:** Axiom systems, types of reasoning used in proofs, Euclidean geometry results with concentration on triangles and circles, introduction to non-Euclidean geometry, and introduction to geometry classroom software. Offered every Winter. Prerequisite: 660.

**631 - History of Mathematics through Problem Solving for Mathematics Teachers:** Topics include the development of calculus, probability theory, number theory, non-Euclidean geometry, and set theory. Offered every Winter. Prerequisites: 620, 670, with 650 as a co requisite.
640 - Multivariable Calculus for Mathematics Teachers: Functions of several variables, vectors, dot products and cross products, partial differentiation, directional derivatives, optimization, Lagrange multipliers, polar and spherical coordinates. Use of software packages to illustrate three-dimensional objects. Offered every Fall. Prerequisite: 618.

650 - Probability and Statistics for Mathematics Teachers I: Combinatorics, sets, probability, random variables, distribution and density functions, multiple integration, standard probability laws, jointly distributed random variables. Use of graphing calculators, applets, and software packages to illustrate concepts. Offered every Winter. Prerequisites: 640 and 660.

660 - Discrete Structures for Mathematics Teachers: Logic and proof, number theory, sequences and mathematical induction, sets and functions, equivalence relations, and introduction to combinatorics. Offered every Fall.

670 - Abstract Algebra for Mathematics Teachers: Examines the integers, prime numbers, the Euclidean algorithm, the uniqueness of prime factorization, equivalence relations, rational numbers, real numbers, and complex numbers. Provides examples of groups, rings, and fields and also covers the Fundamental Theorem of Algebra, modular arithmetic, and roots of polynomials of small degree. Offered every Spring. Prerequisite: Math 660.

671 - Abstract and Linear Algebra for Mathematics Teachers: A continuation of Math 670. Examines the irreducibility of polynomials, criteria for solvability by radicals, rational values of trigonometric functions, difference functions, partial fraction decomposition, and geometric constructions with ruler and compass. Also examines linear independence, spanning sets, and the basis of a vector space. Along with Math 670, it provides the theoretical foundation for many topics covered in high school mathematics courses. Offered every Summer. Prerequisite: Math 670.

680 – Real Analysis for Calculus Teachers: Construction and properties of the real numbers. Proofs of essential results from calculus such as the intermediate value theorem, extreme value theorem, mean value theorem, existence of the Riemann integral, and Taylor’s theorem. Offered every Fall. Prerequisites: Math 618 and Math 660.

Additional courses required for the M.S.M.T. degree

470 – Advanced Linear Algebra: Vector spaces, basis and dimension; matrix representation of linear transformations and change of basis; diagonalization of linear operators; inner product spaces; diagonalization of symmetric linear operators, principal-axis theorem, and applications. Offered every Fall. Prerequisite: Math 672.
642 – Multivariable Calculus for Mathematics Teachers II: (2 credit hours) Line and surface integrals, change of variable in multiple integration, Green's and Stokes' theorems. Offered every Fall following the conclusion of Math 640. Prerequisite: Math 640.

644 – Differential Equations for Mathematics Teachers: This course will continue the study of differential equations (DE’s) begun in MAT 618. Topics include solutions and applications of linear DE’s, second order DE’s with constant coefficients; linear systems; eigenvalues and eigenvectors of matrices, phase portraits and explicit solutions; nonlinear planar systems; linearization and stability analysis. Offered every Summer. Prerequisites: Math 618 and Math 672.

651 - Probability and Statistics for Mathematics Teachers II: Central limit theorem, point and interval estimation of parameters, hypothesis testing, least squares and regression. Offered every Spring. Prerequisite: 650

672 – Linear Algebra for Mathematics Teachers: (2 credit hours) An introduction to matrices, determinants, linear transformations, and eigenvalues. Offered every Spring. Prerequisite: Math 671.

TCH 473 offered every Fall by the College of Education.