Mathematics Courses Required for MS with Teaching Concentration (21 credits):

3 MAT 711 – Survey of Math Problems I
Selected topics from logical reasoning, probability, combinatorics, graph theory, codes, number theory, constructibility, game theory, limits, functions, set theory and foundations, and plane geometry. Problem solving and techniques of proof will be emphasized throughout. Connections will be made between the mathematics of this course and secondary mathematics. Prereq: permission

3 MAT 712 – Survey of Math Problems II
Continuation of topics listed for MAT711 with emphasis on problem solving and techniques of proof. Connections will be made between the mathematics of this course and secondary mathematics. Prereq: MAT711 or permission

3 MAT 714 – History of Mathematics
Historical development of mathematics from primitive origins to present time. Lives of many mathematicians and their contributions to the development of mathematics. Prereq: permission

3 Algebra
MAT 653 – Abstract Algebra I
Sets, functions, groups, quotient groups, homomorphism theorems, Abelian groups, rings, polynomial rings, division rings, Euclidean domains, fields and vector spaces. Prereq MAT251 & MAT330

MAT 654 – Abstract Algebra II
Sets, functions, groups, quotient groups, homomorphism theorems, Abelian groups, rings, polynomial rings, division rings, Euclidean domains, fields and vector spaces. Prereq MAT453/653

MAT 703 – Abstract Algebra III
Detailed study of the following algebraic structures: groups, rings and ideals, fields, modules, and Galois theory. Prereq: year of abstract or permission

MAT 704 – Abstract Algebra IV
Detailed study of the following algebraic structures: groups, rings and ideals, fields, modules, and Galois theory. Prereq: MAT703

MAT 655 – Elementary Theory of Numbers I
Topics include divisibility, arithmetic functions, congruencies, quadratic residues, primitive roots, Diophantine equations, continued fractions, algebraic numbers, partitions. Prereq MAT330

MAT 656 – Elementary Theory of Numbers II
Topics include divisibility, arithmetic functions, congruencies, quadratic residues, primitive roots, Diophantine equations, continued fractions, algebraic numbers, partitions. Prereq MAT455/655

MAT 663 – Advanced Matrix Theory and Applications

MAT 669 – Combinatorics I
Graph models, covering circuits, graph colorings, trees and searching general counting methods for arrangements and selections, generating functions, recurrence relations, and inclusion-exclusion. Prereq MAT251

MAT 670 – Combinatorics II
Advanced topics in combinatorics. Topics selected by instructor. Prereq MAT469/669
3 Analysis

MAT 657 – Intro to Real Analysis I
Topics include finite and infinite sets, axiomatic study of real numbers, topology of Cartesian spaces, sequences of functions, continuous functions, differentiation of functions of one variable. Prereq MAT251, MAT330 and MAT 283

MAT 658 – Intro to Real Analysis II
Topics include uniform continuity and fixed point theorems, sequences of continuous functions, approximation theorems, Reimann-Stieltjes integral, uniform convergence and infinite integrals, series of functions, differentiation in Rn. Prereq MAT457/657

MAT 707 – Real Analysis I

MAT 708 – Real Analysis II
Theory of measure, integration and differentiation, Banach spaces, Hilbert spaces, spaces of continuous functions. Prereq MAT707

MAT 659 – Elementary Complex Analysis
Complex numbers, analytic functions, contour integration, conformal mapping, applications. Prereq MAT251, MAT330 and MAT283

MAT 709 – Complex Function Theory I
Analytic functions, conformal mappings, Cauchy’s theorem, power series, Laurent series, the Reimann mapping theorem, harmonic functions, subharmonic functions, canonical mappings of multiply connected regions, analytic continuation. Prereq MAT457/657 or MAT659

MAT 710 – Complex Function Theory II
Analytic functions, conformal mappings, Cauchy’s theorem, power series, Laurent series, the Reimann mapping theorem, harmonic functions, subharmonic functions, canonical mappings of multiply connected regions, analytic continuation. Prereq MAT709

MAT 771 – Applied Analysis I
Functional analysis in Banach spaces and Hilbert spaces, with emphasis on computational applications. Theoretical topics to be selected from: linear functionals and operators, fixed point theorems, iterative methods, elementary spectral theory. Applications to be selected from: finite element methods, finite difference methods, approximation and interpolation, optimization algorithms. Prereq permission

3 Applications

MAT 665 – Numerical Analysis I
Intro to numerical math and scientific computing. Topics include methods of error estimation, interpolation theory, numerical integration, and solutions of linear and nonlinear equations. Emphasizes hands-on computer work based on these techniques. Prereq MAT182, CSC136 or equivalent, MAT330 or MAT365

MAT 687 – Intro to Partial Differential Equations
Method of separation of variables, Fourier series, divergence theorem and Green’s identities, equations of mathematical physics, initial and initial boundary value problems, well-posedness, heat conduction in a thin rot, vibrations of a string, Laplace’s equation, solution of the Dirichlet problem for a disc and for a rectangle. Prereq MAT427/627 or MAT429/629

STA 667 – Intro to Mathematical Statistics
Intro to statistical inference, distributions of random variables, common discrete and continuous probability models, transformations limiting distributions, sufficiency, completeness, unbiasedness, the information inequality, unbiased estimation, the methods of moments, maximum likelihood estimation, Bayesian estimation, confidence intervals, hypothesis testing, uniformly most powerful tests, likelihood ratio tests and related procedures, linear models, and non-parametric models. Prereq STA411

STA 691 – Statistics for Scientists I
Frequency distributions, descriptive statistics, elementary probability; Bernoull, binomial and normal distributions; statistical sampling, estimation and hypothesis testing. Prereq MAT127 or MAT128
3 Foundations

**MAT 651 – Foundations of Math I**
Intro to logic, set algebra and Boolean algebra, with applications to the theory of computing machines.  
Prereq MAT251 or MAT330

**MAT 652 – Foundations of Math II**
Formalization, proofs, and models of quantificational logic; axiomatics; application to mathematical theories, including set theory.  Prereq MAT451/651

**MAT 701 – Foundations of Mathematics III**
Selection of topics from: model theory, recursive function theory, set theory, mathematics of mathematicians.  Prereq MAT452/652

**MAT 702 – Foundations of Mathematics IV**
Selection of topics from: model theory, recursive function theory, set theory, mathematics of mathematicians.  Prereq MAT701

**MAT 683 – General Topology I**
Topological spaces, nets and filters, compactness, continuous functions, product and quotient spaces, intro to algebraic topology.  Prereq MAT251, MAT330 or equivalent

**MAT 684 – General Topology II**
Topological spaces, nets and filters, compactness, continuous functions, product and quotient spaces, intro to algebraic topology.  Prereq MAT483/683

**MAT 680 – College Geometry**
Study of advanced geometrical topics using the methods of proof of elementary geometry.  Prereq MAT181 or consent