Graduate Program Requirements in the Mathematics Education, M.S. Program

Written by:
Dr. Debanjan Bhattacharjee, Associate Professor

UVU's graduate program in mathematics education is significantly different from its undergraduate mathematics education program. Below is a summary of ways in which the graduate program in this field requires greater depth of study; demands on student intellectual or creative capacities; knowledge of the literature of the field; and ongoing student engagement in research, scholarship, creative expression, and/or relevant professional practice.

Qualifying Exam

Every student in the Mathematics Education, M.S. program must pass the Qualifying Exam to matriculate into the program. This ensures the preparedness of the students by clearly validating that admission to the graduate program in mathematics is strict and not open to all.

Extensive Coursework Requirements

Every student in the Mathematics Education, M.S. program must have a Bachelor of Science in Mathematics Education. The highest level of knowledge in mathematics and statistics acquired by students, who are typically in-service classroom teachers, is typically limited to the content of MATH 3100 (Foundations of Geometry), MATH 3200 (Foundations of Analysis), MATH 3300 (Foundations of Abstract Algebra), and STAT 3040 (Probability and Statistics for Engineering and the Sciences).

The Mathematics Education, M.S. program offers graduate-level courses containing several topics that are not taught in undergraduate courses. Course examples are provided below, along with pertinent information on content coverage and rigor.

MATH 6100 Topics in Geometry and Topology
Topics not covered in MATH 3100 include:

- topology of one-dimensional Euclidean Space, such as compactness, connectedness, countability, separability, and homeomorphisms.

MATH 6210 Real Analysis
Topics not covered in MATH 3200 include:

- uniform sequence convergence
- analytic functions
- the multivariable form of Taylor's Theorem
- operator norms
- the Inverse Function Theorem
- the Implicit Function Theorem
- the Mean Value Theorem for Vector Valued Functions
- the Lebesgue Characterization of Riemann Integrability in R^n
- Jordan regions
- Fubini's Theorem

MATH 6310 Modern Algebra
Topics not covered in MATH 3300 include:

- Ring Theory, including Integral Domains, Ideals, and Factor Rings
- Field Theory
- constructions and use of Ring Homomorphisms/Isomorphism
- Polynomial and Euclidian Rings
- field extensions
- geometric construction

MATH 6330 Advanced Linear Algebra
Topics not covered in MATH 2270 include:

- rigorous development of abstract vector space theory based on proofs and axioms
- rigorous construction of the determinant and relevant theorems
- dual spaces
- duals of inner product spaces
- Riesz Representation Theorem
- adjoint of a linear transformation
- self-adjoint operators
- advanced spectral theory
- spectral theory of symmetric matrices
- generalized eigenvectors
- generalized eigenspaces
- Jordan Canonical Form

STAT 6010/6020 Theory of Statistics I/II

- This course sequence starts with definitions of sigma fields and axiomatic definition of probability and goes much deeper into the topics of random variables, multivariate transformations, convergence, sufficiency, Fisher information, theory of estimation, hypothesis testing, and more.
- This course sequence uses the textbook *Probability and Statistical Inference* by Nitis Mukhopadhyay, which is a graduate-level textbook for mathematical statistics.

MATH 6350 Introduction to Combinatorics

- There is no course at the undergraduate level that teaches combinatorics.

MATH 6610 Numerical Methods and Modeling

- There is no course like this at the undergraduate level.