# MATHEMATICS (MA)

**MA 520. Algebraic/Analytic Reasoning.** **4 Credits.**
Students examine K-12 mathematics content from the middle and secondary grades and build their ability to explain it in terms of fundamental concepts and principles.? The algebra of the real numbers is explored through the foundation of different algebraic systems, including groups, rings and fields, with emphasis on the role of axiomatic reasoning in the solution of equations.? Finally, students explore how K-12 mathematics ultimately extends beyond algebraic concepts, examining the role of fundamentally analytic principals such as the completeness axiom and continuity in the context of powers and roots, exponentials and logarithms, and the trigonometric functions.
**Prerequisites:** None
**Offered:** Every year, Fall

**MA 521. Algebraic Reasoning.** **2 Credits.**
Students apply proof-based reasoning in the context of different algebraic systems, including groups, rings and fields. Specific examples include finite fields and matrix rings, as well as the real and complex numbers. Emphasis is placed on the interplay between axiomatic algebra and the existence and solution of algebraic equations.
**Prerequisites:** None
**Offered:** As needed

**MA 522. Analytic Reasoning.** **2 Credits.**
Students explore properties of the real numbers and functions of real numbers based on the completeness axiom, including continuity in the context of powers and roots, exponentials and logarithms, and the trigonometric functions. Definitions and properties of these functions are developed and proved, with an emphasis on their reliance on continuity.
**Prerequisites:** None
**Offered:** As needed

**MA 541. Complex Variables.** **2 Credits.**
This course introduces students to the complex number system. Topics include historical development, arithmetic, algebraic operations, geometrical interpretations, solving polynomials. Emphasis is placed on viewing the field of complex numbers from multiple perspectives to see connections between geometry, algebra, and trigonometry.
**Prerequisites:** None
**Offered:** As needed

**MA 580. Euclidean and Non-Euclidean Geometry.** **4 Credits.**
Students study concepts in Absolute, Euclidean and non-Euclidean geometries, including planar geometry, hyperbolic geometry, and spherical geometry. In particular, students explore topics which may include finite geometries, axiom systems, transformations and symmetries, analytic geometry, circles, triangles, quadrilaterals, the parallel postulate, Pythagorean Theorem, area and similarity.
**Prerequisites:** None
**Offered:** Every year, Spring

**MA 583. Mathematics: Historical Insights.** **2 Credits.**
Students explore mathematics from various historical perspectives. In particular, they investigate the contributions of ancient Babylonian, Egyptian and Persian cultures, and consider the historical methods of solving quadratic and cubic equations, as well as development of the calculus.
**Prerequisites:** None
**Offered:** As needed