Department: MATHEMATICAL SCIENCES   Semester Hours: 3

Course Title and Number: MATH 304 - History of Mathematics to 17th Century

Course Description: Mathematical developments from the ancients through the 17th century. Emphasis on the development of an interrelationship among special topics from arithmetic, algebra, geometry and calculus, across different cultures and through time. Not used in major or minor GPA calculation for mathematical sciences majors or minors.
PRQ: MATH 229 or consent of department.

Course Objectives:

- To understand how mathematical thought and consequently the nature of mathematics developed across different cultures and ages.

- To understand the relative importance of problem solving in mathematics, and how the search for solutions to unsolved problems has led to important discoveries.

- To understand how different branches of mathematics relate, by seeing how concepts develop dependently.

- To understand the development of the algorithms of common mathematics.

Content:

- Development of numeration: Numeration systems of Mesopotamia, Ancient Egypt and Greece, Ancient China, Pre-Columbian Latin America and Africa; origins of place value and zero; positive and negative numbers; development of symbolism during the European Renaissance.

- Development of computational algorithms: addition and multiplication by successive doubling (Egyptian); lattice multiplication; Napier's rods; logarithms and anti-logarithms.

- Development of geometry: relations between geometric figures and their measurement; unsolved problems of antiquity and attempts to solve them; the origin of the concept of a proof; Euclid's *Elements*; geometric approaches to computation; Apollonius and celestial measurements; analytic geometry; common discoveries among varied cultures.

- Rational and irrational numbers: unit fractions and the fraction 2/3 in ancient Egypt; the development of rational numbers by the Greeks; irrational numbers; incommensurability; common fractions, positive and negative numbers.

- Algebra: linear equations; the method of false position; the development of algebra, from Greece to the Renaissance.

- Early number theory: figurate numbers; prime numbers and the sieve of Eratosthenes; magic squares; the *Precious Mirror* and *Pascal's Triangle*; pi as an infinite product.

- Calculus: the infinitesimal method which lead to calculus; maxima and minima - the beginnings of differential calculus; the contributions of Fermat, Descartes, Newton and Leibnitz.

- Overview of mathematics after the seventeenth century: non-Euclidean geometries and other algebras.

Course requirements: Discussion on mathematical thought and tis development. Discussion on the role of problem solving in mathematics and the aspect of algortihms in common mathematics. Homework involving problem solving and writing aobut branches of mathematics and the development of mathematical thought. Homework collected and graded. Quizzes. Hour examinations and

a comprehensive final examination.

Assessment Instruments: Judgment on student involvement and depth of contributions in class discussions. Homework problems and papers. Quizzes and hour examinations. Final examination.

Selective Bibliography:

Boyer and Merzbach, **A History of Mathematics**, 2nd ed. Wiley (1991).
Katz, **History of Mathematics** (2nd ed.), Harper and Row (1998).