COURSE NAME: A COURSE IN THE HISTORY OF MATHEMATICS

COURSE CODE: MATH6634

# of CONTACT HRS: One semester (13 weeks – 48 hrs of teaching)

LEVEL: Graduate

NUMBER OF CREDITS: 4

SEMESTER: II

RATIONALE:

The history of mathematics illuminates modern mathematics in many ways. It includes: the birth of the axiomatic method around 500 BCE; impressive development of geometry, trigonometry and a certain form of algebra up to around 350 AD; the birth of alternative methods of invention in the 1600's; the development of calculus in the late 1600's. All of these developments have become part of modern mathematics and all can become useful underpinnings of modern pedagogy.

COURSE DESCRIPTION:

In this course, students will study the origins and development of topics of great modern importance. The course is designed primarily for graduate students interested in teaching and mathematics pedagogy. However, it is suitable for all mathematics students also. The course will focus primarily on the axiomatic development of mathematics, the creative processes leading to new methods, and, the development of the calculus.

LEARNING OUTCOMES:

On successful completion of the course, the student should be able to:

- Produce proofs of geometrical results similar to those of antiquity, presented in a deductive format similar to that used in antiquity;
- Perform explorations and computations similar in nature to those performed historically in the development of the calculus;
- Compare and contrast the methods of exploration, discovery, and proof from different time periods;

- Investigate mathematical developments from time periods not covered by this course.

COURSE CONTENT:

Euclid (12 hours): The definitions, postulates, and common notions of Book I; the 48 propositions of Book I; brief description of the nature of the remaining 12 books.

Archimedes (12 hours): The measurement of a circle; the quadrature of the parabola; the area of an ellipse; the volume and surface area of a sphere; the method of compression; the method of discovery.

Early Quadratures and Tangent Methods (14 hours): Kepler; Cavalieri; arithmetical quadratures; quadratures of fractional powers; Fermat; Descartes; the rules of Hudde and Sluse

Newton (10 hours): Fluxions; the Fundamental Theorem of Calculus; the Chain Rule; infinite series; reversion of series; the sine and cosine series; the integral tables.

Total contact hrs = 48 hrs lecture

TEACHING METHODOLOGY:

Teaching will be organized as 48 contact hours of interactive lectures. The hours will be allocated to the four main areas (Euclid, Archimedes, early quadratures and tangents, and Newton) with each receiving approximately 13 hours of coverage. For each area, students will be assigned background reading to introduce them to the context of the material being introduced. They will then be guided through original or adapted sources to see first-hand how the material was developed. Then they will receive written assignments to ensure that they have gained insight into the mathematical way of thinking of that particular time. All course materials will be posted on the course website, currently supported by OURvle. Each student will also choose a historical topic not covered by the syllabus and present a paper on its historical development.

ASSESSMENT:

The course assessment has two components consisting of coursework (60%) and final exam (40%)

Four assignments, one for each content area, weighted 10% each

One written assignment on a topic not covered by the syllabus, weighted 20%

One written final exam (3 hours), weighted 40%

REFERENCE MATERIALS:

Books:

Morris, K., (1990) *Mathematical Thought from Ancient to Modern Times,* 10th Edition, Oxford University Press, New York. ISBN-10: 0195061357

Edwards Jr., C. H. (1994) *The Historical Development of the Calculus*, Springer Study 9th Edition. ISBN-10: 0387943137

Websites:

1. The MacTutor History of Mathematics Archives, www-history.mcs.st-andrews.ac.uk/index. This is a good place to browse and get distracted.

2. The History of Mathematics, www.math.tamu.edu/~dallen/masters/hist_frame.htm. This is a good source of readings in various topics. It also contains a good list of further readings and some interesting problems.