Spring 2013

Math 257 – History of Mathematics (3)

Course Description: The historical development of mathematical thought.

Pre: 216 or 242 or 252A

Week 1: Ancient Mathematics
Lectures 1–3 deal with the development of counting and number systems, and the mathematics of early Egypt and Babylonia.

Week 2: Early Greek Mathematics
Lectures 4–7 concern the Pythagorean theorem and irrational numbers.

Week 3: Euclid's *Elements*: Part I, Geometry
Lecture 8 deals with Euclid, while lecture 9 deals with Archimedes' contributions to geometry.

Week 4: Euclid's *Elements*: Part II, Number Theory
In addition to the number theory in the *Elements*, we will study Diophantus (lectures 11 and 12).

Week 5: Early Astronomy, Number Systems
Lecture 10 discusses Ptolemy and other early astronomers. The class will also cover astronomy from other cultures, especially the Mayans. This led directly to the need for more efficient computational systems (lecture 13).

Week 6: The Theory of Equations
The solution of cubic and quartic equations by Omar Khayyam (lecture 14) and the mathematicians of the Italian Renaissance (lecture 16).

Week 7: The Prehistory of the Calculus
Lectures 17–20 discuss the mathematics of the first half of the 17th Century.

Week 8: The Calculus
The invention of the calculus by Newton and Leibniz are the topic of lectures 22 & 23.

Week 9: Sequences and Series
Fibonacci (lecture 15), Taylor series (lecture 24) and Fourier series (lecture 25).

Week 10: Non–euclidean Geometry
The discovery of non–euclidean geometries by Bolyai and Lobachevski in the early 19th Century (lectures 26 & 27).

Week 11: The Birth of Modern Algebra
Lectures 28–30 deal with the beginnings of abstract algebra in the work of Galois, Hamilton, Boolea and others.

Week 12: Foundations
Beginnings of the formalization of mathematics, including the Erlanger Program (lecture 31) and the arithmetization of analysis (lecture 32).

Week 13: Set Theory
Lectures 33 & 34 treat Cantor's development of set theory and its adoption as the basis of mathematics.

Week 14: Abstraction
The continuing formalization of mathematics in the early 20th Century (lectures 35 & 36).

Week 15: Metamathematics
Logic and Gödel's incompleteness theorem (lectures 37 & 38).

Week 16: Overview of the Twentieth Century
The development of the computer and its influence on mathematics (lecture 39). Other highlights (lecture 40).

Grades will be determined by the following factors:

1. Homework 20%
2. Two midterms 30%
3. Paper 20%
4. Final Exam 30%