

SSI2 167
Stories of Early Mathematics
Course Syllabus

January 14, 2014

1 Introduction

Catalog Description

This course will examine the historical development of geometry from its origins in the ancient world through the emergence of non-Euclidean geometry in the nineteenth century. Students will examine the uses and development of geometry in the ancient world, its formalization in early Greece, its rescue in the Islamic world, and finally its partial overthrow in the non-Euclidean geometry of Gauss, Lobachevsky, and János Bolyai. Students will consider some of the consequences of non-Euclidean geometry on how we view mathematical truth. Following this brief survey, they will then select one part of this discussion to explore further, leading to a thoughtful and carefully researched paper on some aspect of the story: A description of one part of the historical development of geometry, a discussion of the impact of non-Euclidean geometry on our understanding of mathematical truth, or a biography of one of the mathematicians involved.

While mathematical proof will not be expected of class participants, students in the course will be best prepared by having taken a course in geometry at the high school level.

Objectives

Adapted from the core rubric:

1. Students will continue to develop the skills of academic inquiry and presentation developed in the Seminar in Scholarly Inquiry I.
2. Students will learn to develop a thesis statement, to gather and assess source material, and to produce a scholarly paper or project.
3. Students will learn something of the early history of mathematics.

Prerequisites

High School algebra or permission of the instructor. Although not required, a course in geometry at the high school level or later would be helpful.

2 Topics

The Mathematics

- Geometry in the ancient world
 - Babylon
 - China
 - Egypt
 - India
- The beginnings of Greek geometry:
 - Thales and the introduction of formal proof
 - Pythagoras
- Stories of Alexandria and the geometry of Euclid
- Archimedes
- The Islamic world
- Geometry in the Islamic world
- How the Islamic world saved Euclid (and Ptolemy, and ...)
- The parallel postulate
- The development of non-Euclidean geometry: How Gauss, Lobachevsky and János Bolyai changed the world
- What is mathematical truth? The three schools of thought in Mathematics

Written Work

- Introduction to the term project / paper
- Warm-up exercises: Essays and a shorter paper
- Thesis development (Term paper / project)
- Annotated bibliography
- Developing a draft
- Short class presentations by students.

3 Selected References

- Aaboe Aaboe, Asger, *Episodes From the Early History of Mathematics*, Mathematical Association of America, 1998. (Comments: A delightful and readable collection of essays.)
- Berggren Berggren, J. L., *Episodes in the Mathematics of Medieval Islam*, Springer-Verlag, 1986
- Burton Burton, David, *The History of Mathematics*, McGraw-Hill, 2011 Comments: An earlier edition is in the UPS library. The current edition is the textbook for Math 420, Spring, 2011.
- Fowler Fowler, *The Mathematics of Plato's Academy*, Claredon Press 1999
(Comments: In UPS library)
- Gray Gray, Jeremy, *Worlds out of Nothing: A Course in the History of Geometry in the 19th Century*, Springer Verlag, 2007 (Comments: Jeremy Gray is one of the leading historians of mathematics today. I have ordered this for our library (and have a personal copy))
- Gillins Gillins, Richard J., *Mathematics in the Time of the Pharoahs*. MIT Press, 1972 (Comments: In UPS library)
- Greenberg Greenberg, Marvin Jay, *Euclidean and Non-Euclidean Geometries*, Fourth Edition, W. H. Freeman and Company, 2008 (Comments: We have used this for our Honors 213 and Math 300 courses for many years. It contains considerable information on the development of the axiomatic method, the history of Euclidean geometry, the development of non-Euclidean geometry, and some of the foundational issues involved.)
- Heath1981 Heath, Thomas, *A History of Greek Mathematics*, Dover 1981
(Comments: In UPS library)
- Katz2004 Katz, Victor J.: *A History of Mathematics*, Addison-Wesley, 2004
(Comments: In UPS library)
- Klein Klein, Felix, *Lectures on Mathematics*, MacMillan & Co., 1894 (Comments: In UPS library. The library copy was owned by Francis W. Hanawalt, Professor of Mathematics at the then College of Puget Sound, 1908 - 1934)
- Kline1972 Kline, Morris, *Mathematical Thought from Ancient to Modern Times*, Oxford University Press, 1972 (Comments: In UPS library)
- Kline1982 Kline, Morris, *Mathematics and the Loss of Certainty*, Oxford University Press 1982 (Comments: In UPS library)
- Knorr Knorr, Wilbur, *The Ancient Tradition of Geometric Problems*, Birkh'auser, 1986 (Comments: In UPS library)

- Lloyd Lloyd, G. E. R., *Early Greek Science*, North 1970. (Comments: In UPS library)
- Li1987 Li Yan and Du Shiran, *Chinese Mathematics - A Concise History*, Crossley, John, and Lun, Anthony, translators. Oxford: Clarendon Press, 1987 (Comments: In UPS library)
- Mankiewicz Mankiewicz, *The Story of Mathematics*, Princeton University Press, 2000 [?] (Comments: In UPS library)
- Martzloff Martzloff, Jean-Claude, *A History of Chinese Mathematics* (Stephen S. Wilson translator) 1997. (Comments: In UPS library)
- Mikami Mikami, Yoshio, *The Development of Mathematics in China and Japan*, Cambridge University Press, 1959. (Comments: In UPS library)
- Neubebauer1951 Neugebauer, Otto, *The Exact Sciences in Antiquity*, Princeton University Press, 1951. (Comments: In UPS library)
- Russo Russo, Lucio (Levy, Silvio, translator) *The Forgotten Revolution*. Springer 2003 (Comments: In UPS library)
- Struik1987 Struik, Dirk J.: *A Concise History of Mathematics*, Dover Publications, 1987 (Comments: In UPS library)
- Suzuki Suzuki, Jeff, *A History of Mathematics*
- VanderWaerden Van der Waerden, B. L., *Geometry and Algebra in Ancient Civilizations*, Springer 1983

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