

LTCC Proposed Course

Title: History of Mathematics – Non-Euclidean and Projective Geometry in the 19th Century

Basic Details:

Core Audience: Pure

Course Format: Basic (10 hours)

Course Description:

Keywords: Non-Euclidean geometry, projective geometry, primary and secondary sources

The course gives an introduction to the transformation of geometry during the 19th century, and to the methods for conducting research in the history of modern mathematics. No previous knowledge of either subject is assumed.

The discovery of a possible geometry of space that differed from Euclid's was one of the great breakthroughs of the 19th century, and it ushered in a transformation not only of geometry but our ideas about the truth of mathematics.

We study the origins of non-Euclidean (or hyperbolic) geometry in the work of Bolyai, Lobachevskii and Gauss in the 1830s, look at the successful and more rigorous accounts given by Riemann, Beltrami in the 1850s and 1860s, and consider the simple but powerful techniques introduced by Poincaré in the 1880s. We then study the rediscovery of projective geometry as it arose in the work of Poncelet and Gergonne in France in the 1820s, and look at how the subject was taken forward by Plücker in the 1830s. We conclude with a consideration of Klein's view of geometry, the growth of axiomatic projective geometry, and culminate with Hilbert's *Grundlagen* first published in 1899.

At the same time we look in detail at several original sources, discuss the nature of sources (primary and secondary; good and bad), and consider how to write a historical essay.

The final assessment consists of writing a 2000 word essay on a historical subject that brings together the topics and skills presented in the course.

Recommended reading

J. Gray, *Worlds Out of Nothing*, Springer;

J. Stillwell, *Sources of Hyperbolic Geometry*, American and London Mathematical Societies

Format

Seven lectures and three discussion classes. Original sources in translation will be provided in class and electronically – most are accessible through digital libraries on the web.

Support Facilities

Data projector

Lecturer Details

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