

**CHAPMAN UNIVERSITY**  
**University Honors Program**  
**One University Drive**  
**Orange, CA 92866**  
**(714) 744-7646**

**COURSE SYLLABUS**

**HON 321**

**Fall 2009**

**The New Mathematics of the Italian Renaissance**

Catalog Description:

*Prerequisite: acceptance to the University Honors Program, or permission of instructor.*

The class is designed to explore the birth of new mathematics during the Italian Renaissance. On one hand painters and mathematicians invented perspective and projective geometry, building on the body of Greek geometry. On the other hand merchants, accountants, and mathematicians developed modern algebra, building on the existing body of Islamic algebra. (Offered as needed.) 3 credits.

Restrictions: Acceptance to the University Honors Program, or consent of instructor

Essential Equipment and Facilities: Seminar-style classroom with computer equipment.

Course Goals, Objectives and Learning Outcomes:

This course enables students to:

- Examine why mathematics does not emerge in a vacuum. Learn how it is connected to, influenced by, and influential on other disciplines as it develops.
- Become skilled at demonstrating this principle when looking at new pieces of mathematics.
- Appreciate and learn the language to use to frame and solve a problem, so that when reading about a modern rendition of a discovery, we don't lose perspective, making us unable to appreciate the magnitude of progress.
- Be able to explain when you see principles in action in mathematics, and where it is likely to happen next.

Content:

This course will focus on:

- Euclid and the axiomatic method. We will read some of Euclid's work, and we will discuss in depth the nature of the axiomatic system, and its implications in a variety of disciplines.

- Archimedes and Apollonius. We will discuss what conics are, why they are interesting, and the different ways in which Archimedes and Apollonius interpreted them.
- What do we mean when we say “There are several different kinds of geometry” or “What is geometry all about?” This is a fundamental topic, which was slow to emerge and only became clear to mathematicians in the 1800s. We will discuss how this links to a new (fundamentally new) mathematical idea: Group Theory.
- Was there algebra in the Greek way of thinking? What were the obstacles to its development (it does not seem such a big deal to multiply a couple of polynomials!)?
- What was going on in the Islamic world during the late part of the first millennium A.D.? What were they reading, translating, inventing?
- What is an equation? Why should we solve it? How do we do that? Can we find formulas for second, third, fourth, fifth degree equations? Why or why not? How does Group Theory come back in discussion?
- Algebra in early Renaissance: what are the questions? What are the methods? What are the applications?
- Perspective and projective geometry. What is the modern equivalent of that?

Suggested readings:

Euclid, Elements, Book 1

L.B.Alberti, On Painting, Chapter 1

F.Klein, The Erlangen Program

Anonymous, The Section of the Canon (Ta Katatome Kanonis), Introduction

W.Kandinsky, Point, Line, to Plane, Chapter 1

N.Cardano, The Great Art, Chapters 1 and 2

D.J.Struik, A Source Book in Mathematics, 1200-1800, Sections 1.1, 1.2, 2.1, 2.3, 2.4, 3.4, 3.5, 3.6, 3.7.

L.Russo, The Forgotten Revolution, Chapter 11.

Plato, Timaeus, Sections 1 through 6.

W.S.Anglin and J.Lambek, The Heritage of Thales, Sections 22 through 26.

Instructional Strategies:

- Introduction of topics, followed by oral presentations by class members on the various aspects of the topic under discussion.
- Written reports on some ideas under discussion.
- Two short tests.
- Additional help outside classroom, if needed and/or requested.

Methods of Evaluation:

- Oral presentations, with emphasis on clarity and depth.
- Occasional written assignments.
- Essays will be evaluated on various attributes: grammar and syntax, appropriateness and variety of references, relevance to the issue, depth of the analysis, correctness of the technical aspects.

Chapman University Academic Integrity Policy:

The course syllabus should include the following statement:

Chapman University is a community of scholars which emphasizes the mutual responsibility of all members to seek knowledge honestly and in good faith. Students are responsible for doing their own work, and academic dishonesty of any kind will not be tolerated anywhere in the university

Students with Disabilities Policy:

The course syllabus should include the following statement:

In compliance with ADA guidelines, students who have any condition, either permanent or temporary, that might affect their ability to perform in this class are encouraged to inform the instructor at the beginning of the term. The University, through the Center for Academic Success, will work with the appropriate faculty member who is asked to provide the accommodations for a student in determining what accommodations are suitable based on the documentation and the individual student needs. The granting of any accommodation will not be retroactive and cannot jeopardize the academic standards or integrity of the course.

Bibliography (optional):

**Prepared by:**

Daniele Struppa, fall 2009

**Last revised:**

Daniele Struppa, Fall 2009