

**MATH 499 Mathematics Seminar  
Syllabus and Course Information  
Fall 2010**

**Instructor:** Sheldon Lee  
**Email:** shlee@viterbo.edu  
**Office:** RC 213  
**Office Hours:** Mon 10 – 11, 2 – 3, Tues 12 – 3, Wed 10 – 11, Thurs 2 – 4  
**Textbook:** William Dunham. *Journey Through Genius*  
**Meeting Time:** Wednesdays, 3:00 - 4:00, MRC 573  
Monday 12/13 9:50 - 11:50 AM

**Catalog Course Description:** Selected topics of current interest in mathematics are researched and presented. Students, faculty, and occasional guest speakers share in the presentations. Prerequisite: grades of C or higher in 260 and 320 or consent of instructor.

**Course Goals:**

1. The major goal of this course is for students to read, absorb, understand and present mathematical material. Students do mathematical research and make mathematical presentations.
2. Students will investigate the history (and mythology) of mathematics. This satisfies the requirement by the DPI for math education majors.

**Course Objectives:**

Students shall become acquainted with some of the best mathematicians of all time and their contributions in solving important, difficult problems. Students will also learn of the tactics used and the insights made by these exemplars in making the breakthroughs they are credited with.

Throughout the text, axioms are assumed. It is the responsibility of the students to (a) recognize when an unproved assumption is being made, (b) check to see if the assumption is reasonable, and (c) demonstrate why the assumption is valid.

The text includes chapters on the following topics. They cover a wide range of history and mathematical content:

- 1.Hippocrates and the Quadrature of the Lune
- 2.Euclid's Proof of the Pythagorean Theorem.
- 3.Euclid and the Infinitude of Primes
- 4.Archimedes' Determination of Circular Area
- 5.Heron's Formula for Triangular Area
- 6.Cardano and the Solution of the Cubic
- 7.Isaac Newton and the Binomial Theorem
- 8.The Bernoullis and the Harmonic Series
- 9.Leonard Euler and His Infinite Sums
- 10.Euler's Number Theory
- 11.Cantor and the Non-denumerability of the Continuum
- 12.Cantor and the Transfinite Realm

## Course Procedures:

At the first meeting we will assign the first round of chapters to each member of the class and then the weekly activity will be a presentation by a student of the material in the assigned chapter. You should present the material as if you were giving a “lecture”, using appropriate blackboard/overhead skills and being prepared to answer questions anyone might ask. I encourage you to make use of both overhead technology and the blackboard in your presentation. You should plan on leaving about 10 minutes at the end of your talk for questions and discussion.

Grades will be determined by your level of participation and the quality of your presentations; you want to show that you have read the material with understanding and that you can explain it in detail.

We will treat the date and time allotted for the final exam as a regular meeting since there will be no exams for this course. It is a seminar, which means that presentations will be made by both the participants (students) and the facilitator (professor). That is what a seminar is. Moreover, the term *seminar* implies that there should be a free interchange of ideas; if a student does not participate in the discussion, then that student has not fully attended the seminar, and cannot be given the highest grade.

Participants in a seminar are not presenting what they have learned to the professor; they are sharing what they have learned with the rest of the group. This comes with the assumption that the presenter respects his or her fellows as academic and intellectual peers who may not be in possession of the particular piece of learning that is about to be shared. The new material is to be explained clearly and thoroughly (your peers don't have this information yet) but without condescension (they are your peers).

Each student will chose one topic and present it in written form by the end of the semester.

### Americans with Disability Act:

If you are a person with a disability and require any auxiliary aids, services or other accommodations for this class, please see me or Wayne Wojciechowski in MC 320 (796-3085) within 10 days to discuss your accommodation needs.

Week	Date	Topic/Presenter
1	9/1	
2	9/8	Hippocrates
3	9/15	Euclid I
4	9/22	Euclid II
5	9/29	Archimedes
6	10/6	Heron
7	10/13	
8	10/20	
9	10/27	
10	11/3	
11	11/10	
12	11/17	
	11/24	THANKSGIVING BREAK
13	12/1	
14	12/8	
15	12/13	

**Additional topics:**

Linear equations/elementary geometry/quadratic equations in ancient Babylonia or China (many possible topics)

Other proofs from Euclid's Elements

Count Buffon and the needle problem

The cycloid

Evolution and meaning of mathematical symbols: +, -, ×, =, √, , ε, δ,

Napier's bones (slide rule)

Lunes: the sum of areas of two lunes constructed on two sides of a triangle which is inscribed in a semicircle, equals the area of that triangle.

The Mandelbrot set

Koch snowflake

Probability and Pascal's triangle

Poincaré's hyperbolic geometry model

Golden rectangle

Konigsberg bridge problem

Proof that  $1 = 2$

Math and music

Many other possibilities (see me for ideas)