

4/16/07

Math 4400 Syllabus **

1st Part of the Summer, 2007 Semester ✧ Distance Delivery UMEP Version

Course Title: History of Mathematics and Number Theory
 Credits: 3 semester
 Prerequisites: The equivalent of 9 semester hours of upper level mathematics courses

Class Meeting Schedule: First Part of Summer Semester, Tuesdays and Thursdays from 4:15 p.m. to 7:00 p.m. at your distance deliver site (class originates from USU's Logan Campus in Engr 401)

Conductor: Jim Cangelosi

website: <http://umep.usu.edu>

Office: Lund 325C

Phone: 797-1415

e-mail: jcang@math.usu.edu

Office hours: By appointment

Math 4400 is organized into 4 units which will be concurrently-conducted throughout the seven-week course. The four units are as follows:

1. **A Chronological Parallel of Events in the History of Mathematics with Events in the History Civilization**

The purpose of Unit 1 is to provide you with a chronology to which you will refer throughout the course (i.e., in subsequent units). For example, during Unit 3, you might refer back to Unit 1's time-line to relate Galileo's paradoxical association of \mathbb{N} with $\{n^2: n \in \mathbb{N}\}$ to Cantor's definition of an infinite set. This will not only help keep dates in perspective, but also help you understand how social and political influences of the day shaped mathematics.

About 05% of your time in the course should be devoted to Unit 1.

2. **Math 4400's Influence on the History of Mathematics (especially the field of number theory)**

The purpose of Unit 2 is to lead you and your Math 4400 colleagues to live mathematical history. Working individually as well as in collaborative groups, you will undertake two types of projects: (a) A pure mathematical project in which you formulate original number-theoretic propositions and then design, present, and refine proofs regarding our propositions and (b) identify original applied mathematical problems and work toward solutions of those problems. Number theory will be the primary focus of this unit. Note

that throughout the course – but especially in Unit 2 – emphasis is placed on developing our talent for (a) discovering mathematical relationships, (b) using the language of mathematics to articulate those relationships precisely, and (c) designing and expressing proofs about those relationships. You and your colleagues will develop a number theoretic structure to include the following topics:

- ♪ Relationships involving {perfect numbers}, {polygonal numbers}, {Mersene numbers}, and other subsets of \mathbb{N}
- ♪ Divisibility theorems
- ♪ Prime number theorems
- ♪ Linear Diophantine equations
- ♪ Linear congruences

Unit 2 provides you with an ongoing experience to which you associate and, thus, better understand historical events encountered in other units (e.g., less successful and more successful attempts to prove Fermat's Last Theorem).

About 50% of your time in the course should be devoted to Unit 2.

3. **The Birth and Evolution of Mathematical Thought and the Dynamic State of Mathematics Today**

The purpose of Unit 3 is for you to develop an accurate vision of how mathematical thought has evolved over the centuries as well as to heighten your awareness of the level of mathematical discovery and invention taking place today. You will comprehend treatises on (i) the interplay among philosophy, religion, politics, science, individual personalities, societies, and cultures influencing mathematical inventions and discoveries, (ii) examples of research in applied mathematics, (iii) examples of research in pure mathematics, (iv) new directions in the philosophy and study of mathematics. Much of Units 2 and 3 will be structured around the history of Fermat's Last Theorem.

About 10% of your time in the course should be devoted to Unit 3.

4. **David M. Burton's *The History of Mathematics***

The purpose of Unit 4 is for you to comprehend a traditional treatise of the history of mathematics, namely, Burton's *The History of Mathematics* (6th ed., 2007). The book includes chronological accounts as well as exercises and problems to engage you in mathematical activities with historical significance. The Chapter titles are as follows: (1)

Early Number Systems and Symbols, (2) Mathematics in Early Civilizations, (3) The Beginnings of Greek Mathematics, (4) The Alexandrian School: Euclid, (5) The Twilight of Greek Mathematics: Diophantus, (6) The First Awakening: Fibonacci, (7) The Renaissance of Mathematics: Cardan and Tartaglia, (8) The Mechanical World: Descartes and Newton, (9) The Development of Probability Theory: Pascal, Bernoulli, and Laplace, (10) The Revival of Number Theory: Fermat, Euler, and Gauss, (11) Nineteenth Century Contributions: Lobachevsky to Hilbert, (12) Transition to the Twentieth Century: Cantor and Kronecker, and (13) Extensions and Generalizations: Hardy, Hausdorff, and Noether.

About 35% of your time in the course should be devoted to Unit 4.

Course References:

The following is the textbook for Unit 4:

Burton, D.M. (2007). *The history of mathematics* (6th ed.). New York: McGraw-Hill.

For other units you will use a variety of references such as excerpts from the following trade books: Barrow's *Pi in the Sky*, Singh's *Fermat's Enigma*, Kasner & Newman's *Mathematics and the Imagination*, Hoffman's *Archimedes' Revenge*, NCTM's *Historical Topics for the Mathematics Classroom*, Stewart & Golubitsky's *Fearful Symmetry*, King's *The Art of Mathematics*, Dunham's *The Mathematical Universe*, Flato's *The Power of Mathematics*, Hardy's *A Mathematician's Apology*, and Tymoczko's *New Directions in the Philosophy of Mathematics*. There are also some videotape programs that may prove useful.

You will be provided with three opportunities to demonstrate how well you are achieving the goals of the four units. These opportunities are tentatively scheduled for the 4th, 10th, and 14th class meetings and will influence the final course grades as follows:

Opportunity	Tentative Date	Units Involved	Relative Influence on Final Grade
#1	5/24/07	1,2,3,4	20%
#2	6/14/07	1,2,3,4	35%
#3	6/28/07	1,2,3,4	45%

Note: In coordination with the Disability Resource Center, reasonable accommodations will be provided for qualified students with disabilities. If you need accommodations because of special exceptionalities, please meet with Jim during the first week of the semester to make arrangements. Accommodations and alternative format print materials (e.g., large print, audio, diskette or Braille) are available through the Disability Resource Center, located in Taggart Student Center room 104, phone number 797-2444.