Webster University Course Syllabus

Middle School Mathematics MAT Program

Fall 2002

MTHC 5120 Topics for the Middle School Teacher

3 Credit Hours

Instructor: Dr. Nancy English

Textbook: There will be no textbook for this class; handouts will be provided that will take the place of a textbook

Class Meeting Time: Tuesday 5:00 - 7:30 pm

Class Meeting Location: WEBH 325

Necessary Materials: 3 Ring binder
Loose leaf paper
Graph paper
Ruler and compass
Graphing calculator (TI-82 or TI-83 recommended)

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Course Description:

This course, designed for teachers of grades 5 - 8, will focus on a myriad of topics in mathematics. Students will have a chance to immerse themselves in the study of topics with which they generally might not have had much familiarity in the past.

Learning Outcomes:

Students will learn material beyond the scope of a high school mathematics class. It is hoped that many of the topics studied will be able to be translated to simpler versions that can be used in a middle school or high school classroom. Students will be asked to research a topic of their choice in order to write a comprehensive paper and to present their findings to the class.

Schedule of required readings, class preparations and assignments, lectures, discussions, student presentations, and exams:

Schedule and Course Content:

Class 1: The history and the usefulness of $\sqrt{-1}$.
Tuesday August 20

Class 2: A little review of exponential functions and logarithms.
Tuesday August 27

Class 3: The history and the mathematics of the New Madrid Fault.
Tuesday September 3

Class 4: The history and the usefulness of the number, e.
Tuesday September 10

Class 5: The history and development of the number, π
Tuesday September 17

Class 6: The history and the mathematics of the St. Louis Arch
Tuesday September 24

Class 7: More on the St. Louis Arch
Tuesday October 1

Class 8: Programming the TI - 83 Calculator
Tuesday October 8

Tuesday October 15 **No Class - Webster Fall Break**

Class 9: Chaos and Fractals
Tuesday October 22

Class 10: Chaos and Fractals
Tuesday October 29

Class 11: Chaos and Fractals
Tuesday November 5

Class 12: The fourth dimension and infinity
Tuesday November 12

Class 14: This will be either a spill-over day to complete any previous topic
Tuesday November 19 that was cut short because of lack of time, or it will be a
day to explore a topic of general class interest.

Class 15: Student presentations
Tuesday December 3

Class 16: Student presentations
Tuesday December 10

Resources used:

1. Flatland, A Romance of Many Dimensions, Edwin A. Abbott, Dover Publications (1992).

2. Rudolf V.B. Rucker, Geometry, Relativity, and the Fourth Dimension, Dover Publications (1997).

3. Ivars Peterson, The Mathematical Tourist (Snapshots of Modern Mathematics), Freeman and Company (1988).

4. Ian Stewart, What Shape is a Snowflake?, W.H. Freeman (2001).

5. James Gleick, Chaos, Making a New Science, Penguin Books (1987).

6. Heinz-Otto Peitgen, Hartmut Jurgens, Dietmar Saupe, Chaos and Fractals, New Frontiers of Science, Springer-Verlag (1992).

7. Heinz-Otto Peitgen, Hartmut Jurgens, Dietmar Saupe, Fractals For the Classroom, Part One, Introduction to Fractals and Chaos, NCTM and Springer-Verlag (1992).

8. Michael Barnsley, Fractals Everywhere, Academic Press, San Diego, 1988.

9. Jonathan Choate, Robert L. Devaney, Alice Foster, Fractals, A Tool Kit of Dynamic Activities, Key Curriculum Press, Emeryville, CA, 1999.

10. Michael McGuire, An Eye for Fractals, Addison Wesley, Reading, PA, 1991.

11. Penick, James Lal, Jr., The New Madrid Earthquakes, University of Missouri Press, Columbia, Missouri and London, 1981.

12. Stewart, David, Director, Center for Earthquake Studies, One University Plaza, Cape Girardeau, MO.

13. Maor, Eli, e: the Story of a Number, Princeton University Press, Princeton, New Jersey, 1994.

14. Maor, Eli, To Infinity and Beyond, A Cultural History of the Infinite, Princeton University press, Princeton, New Jersey, 1987

15. Nahin, Paul J., An Imaginary Tale, The Story of $\sqrt{-1}$, Princeton University Press, Princeton, New Jersey, 1998.

Student Evaluation:

Students will be graded on their written papers and their oral presentations. There will be several assignments throughout the course which will be graded by the instructor. Student work will be assessed throughout the course.

A	93 - 100	C+	77 - 80
A-	90 - 92	C	73 - 76
B+	87 - 89	C-	70 - 72
B	83 - 86	D	60 - 69
B-	80 - 82	F	0 - 59

Instructional Methods/Student Responsibilities:

- This class will be composed of lecture, group work, lab work, discussion, homework, project work.
- Attendance and punctuality are required in that both of those directly influence class performance.
- Homework will be assigned at almost every class meeting. Completed homework assignments should be kept inside a three-ring binder. The binder will be evaluated several times throughout the course. It is expected that homework assignments be complete and

correct. Work is expected to be completed using a pencil rather than a pen. Various assignments will be collected and graded at the discretion of the instructor.

- Students are responsible for obtaining information about missed assignments. Being absent from one class does not excuse a student from being responsible for that class period's work at the following class period.
- There may be several projects assigned during the semester that will enhance the learning of the various topics.
- Each student will be responsible for giving an oral presentation to the class, along with a written paper on that subject which will be submitted to the instructor on the day of that presentation.

Syllabus Changes:

This syllabus is serving only as a framework for work throughout this course. It is subject to change at the discretion of the instructor in order to accommodate instructional and/or student needs. It is the student's responsibility to keep abreast of such changes.

Some Suggested Topics For Student Class Presentations:

Abacus, Napier's Rods and other Calculating Devices
Arabic Mathematicians
Arches
Archimedes
The Calendar (A History of its development)
Lewis Carroll
Chinese Mathematicians
Codes
History of computers and computer languages
Conic Sections
Cycloids and Hypercycloids
Date of Easter
René Descartes
M.C. Escher
Leonard Euler
Five Platonic Solids
The Four Color Problem for maps (Just recently solved)
Karl Gauss (1976)
Harmonic Ratios
David Hilbert

Knot Theory
Mathematics and the American Indian
Mathematics in Literature
Mathematics of Music
Missouri's Mathematicians
Mobius Strip and Klein Bottle
Modern Age Numerals as in Post Office codes and UPC Codes
Optical illusions
Origins of Trigonometry
Blaise Pascal's "Mystic Hexagram"
Pantograph
The Parallel Postulate and Non-Euclidean Geometries
Polar Coordinates and Polar Curves
Primes and Twin primes
Soap Bubbles or Geometry of minimal Surfaces
Steiner Points
Stonehenge
Topology
Trisecting the Angle, Duplicating a Cube, and Squaring a Circle - the three problems of antiquity.
US Presidents and Mathematics - Who had the most math ability?