MATHEMATICS THINKING SKILLS
CRITICAL & CREATIVE THINKING 650
FALL 1999

INSTRUCTOR: Joan Lukas, Professor of Mathematics & Computer Science
EMAIL: Joan.Lukas@umb.edu
OFFICE HOURS: TuTh 2-4 PM and Monday after class
OFFICE: Science 3-091 **PHONE:** 287-6463
CLASS MEETINGS: Wheatley 2-209 M 4-6:30 PM

COURSE DESCRIPTION:
This course examines several types of mathematical thinking in the context of number theory, algebra, geometry, and elementary calculus and relates them to critical and creative thinking skills. Developmental and experiential factors in learning and teaching mathematics are considered, as well as techniques for determining learners' mathematical abilities and learning styles. Readings, discussion, research, and problem–solving are used to provide a historical context, and to suggest connections with other disciplines. Individual and small-group projects are adapted to student interests.

TEXTS AND MATERIALS:
Courant, Richard and Herbert Robbins. What is Mathematics?. New York: Oxford University Press, 2nd edition, revised by Ian Stewart, 1996.

Mason, John with Leone Burton and Kaye Stacey. Thinking Mathematically. Reading, MA: Addison Wesley Publishing Company, 1995.

Handouts for assignments and additional readings will be given out in class. Manipulative materials and graphing calculators will be loaned to you as needed. Other books, journals, and materials for individual projects will be obtained as needed from a variety of sources.

COURSE OBJECTIVES:
Development of students' abilities to reason about mathematics, to solve mathematical problems, to communicate mathematical ideas, and to evaluate approaches to mathematics education.

COURSE REQUIREMENTS AND EVALUATION CRITERIA:

Attendance and class participation: 10%
This class will involve a high degree of discussion and sharing of ideas and approaches. Therefore, class attendance is essential. You cannot be considered for a grade of A if you miss more than one class or B if you miss more than two. More than three absences will necessitate withdrawal from the course.

Written assignments: 14%
Seven assignments concerning readings and class work; each receives 0, 1 or 2 points.

Journal: 11%
Your journal describing activities and ideas related to class and mathematics is to be handed in weekly beginning September 20.

Class presentation and handout: 10%
due September 27.

Take-home mid-semester exam: 25%
Will be assigned October 25 and due November 8

Final presentation and paper: 30%
Presentations (10%) will be given in class December 13 and during final exam period. Papers (20%) due during finals.

ACCOMMODATIONS:
Section 504 of the Rehabilitation Act of 1973 offers guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation recommendations from the Ross Center (287-7430). The student must present and discuss these recommendations with each professor within the first few weeks of class, preferably by the end of the Drop/Add period.

SCHEDULE

DATE	TOPIC(S)	ASSIGNMENT DUE
September 13	Introduction, overview	
September 20	What is Mathematics?	Written Assignment #1 with journal
September 27	Presentations	1-page handout for presentation, and journal
October 4	Number Sense	Written Assignment #2 with journal
October 11	Columbus Day: no class	
October 18	Curriculum Standards & Frameworks	Written Assignment #3 with journal
October 25	Mathematics curricula	Written Assignment #4 with journal; midterm questions given out
November 1	Patterns	Journal
November 8	Geometry	Mid-term Exam
November 15	Probability	Written Assignment #5 with journal
November 22	Technology	Written Assignment #6 with journal
November 29	Evolution of mathematics	Written Assignment #7 with journal
December 6	Integration with other disciplines	Journal
December 13	Final presentations begin	Journal

Finals week	Final presentations completed.	Final projects

This syllabus will be expanded and revised in accordance with backgrounds and interests of students.

SELECTED REFERENCES:

Davis, Philip J. and Reuben Hersh. The Mathematical Experience. Boston: Houghton Mifflin Company, 1981.

Dehaene, Stanislas. The Number Sense – How the Mind Creates Mathematics. New York: Oxford University Press, 1997.

Kapidia, Ramesh and Manfred Borovcnik, Eds. Chance Encounters: Probability in Education. Dordrecht: Kluwer Academic Publishers, 1991.

Massachusetts Mathematics Curriculum Framework. Achieving Mathematical Power. Massachusetts Department of Education. 1996.

National Council of Teachers of Mathematics. Curriculum and Evaluation Standards for School Mathematics. Reston, Virginia: NCTM, l989.

And

Professional Standards for Teaching Mathematics. 1991

Steen, Lynn Arthur. On the Shoulders of Giants – New Approaches to Numeracy. Washington: national Academy of Sciences Press, 1990.

Young, Robert M. Excursions in Calculus – An Interplay of the Continuous and the Discrete, The Dolciani Mathematical Expositions # 13. Washington: Mathematical Association of America, 1992.

Mathematics Teacher

Organization, Websites, and Journals

National Council of Teachers of Mathematics: www.nctm.org
Journal for Research in Mathematics Education

Mathematical Association of America: www.maa.org
American Mathematical Monthly:
Mathematics Magazine

International Group for the Psychology of Mathematics Education:
Proceedings of Conferences http://members.tripod.com/~IGPME/

This syllabus is available electronically at
www.cs.umb.edu/~joan/cct650/Syllabus.html