MATHMATICS 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
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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:


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.
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<thead>
<tr>
<th>Date</th>
<th>Topic(s)</th>
<th>Assignment due</th>
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<tbody>
<tr>
<td>September 13</td>
<td>Introduction, overview</td>
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<tr>
<td>September 20</td>
<td>What is Mathematics?</td>
<td>Written Assignment #1 with journal</td>
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<td>September 27</td>
<td>Presentations</td>
<td>1-page handout for presentation, and journal</td>
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<td>October 4</td>
<td>Number Sense</td>
<td>Written Assignment #2 with journal</td>
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<td>October 11</td>
<td>Columbus Day: no class</td>
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<td>October 18</td>
<td>Curriculum Standards &amp; Frameworks</td>
<td>Written Assignment #3 with journal</td>
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<td>October 25</td>
<td>Mathematics curricula</td>
<td>Written Assignment #4 with journal; midterm questions given out</td>
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<td>November 1</td>
<td>Patterns</td>
<td>Journal</td>
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<td>November 8</td>
<td>Geometry</td>
<td>Mid-term Exam</td>
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<td>November 15</td>
<td>Probability</td>
<td>Written Assignment #5 with journal</td>
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<td>November 22</td>
<td>Technology</td>
<td>Written Assignment #6 with journal</td>
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<td>November 29</td>
<td>Evolution of mathematics</td>
<td>Written Assignment #7 with journal</td>
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<td>December 6</td>
<td>Integration with other disciplines</td>
<td>Journal</td>
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<td>December 13</td>
<td>Final presentations begin</td>
<td>Journal</td>
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Finals week: Final presentations and final projects completed.

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

**Selected References:**


And


Mathematics Teacher

**Organization, Websites, and Journals**

National Council of Teachers of Mathematics: [www.nctm.org](http://www.nctm.org)

Journal for Research in Mathematics Education

Mathematical Association of America: [www.maa.org](http://www.maa.org)

American Mathematical Monthly:

Mathematics Magazine

International Group for the Psychology of Mathematics Education:

Proceedings of Conferences [http://members.tripod.com/~IGPME/](http://members.tripod.com/~IGPME/)

This syllabus is available electronically at [www.cs.umb.edu/~joan/cct650/Syllabus.html](http://www.cs.umb.edu/~joan/cct650/Syllabus.html)