

**SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE
DEPARTMENT OF MATHEMATICS
COURSE INFORMATION, Fall 2004**

CI/Math 321, Section 001– Mathematics Content and Methods for the Elementary School III

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OFFICE HOURS:
Mon: 11-1
Tues: 11-1
Wed: 11-1

Always feel free to contact me for an appointment at other times. I will do what I can to be available.

CLASS MEETS: Section 1: Monday-Wednesday 9:00-10:45am, Wham 202.
 Section 3: Tuesday 5:30-0900pm, Wham 202.

CATALOG DESCRIPTION:

(Same as Mathematics 321). Modern approaches to mathematics instruction for the elementary grades. Mathematics content focuses on: straight-edge and compass construction. Justification and proof of geometric properties. Three dimensional geometry. Coordinate geometry. Transformations expressed in coordinate notation. Analysis of linear relationships geometrically and algebraically. Modeling various “real-world” situations by linear equations and inequalities. Setting up and solving equations and inequalities. Exploration of statistical data. Representation of data, interpretation of data, misrepresentation of data. Introduction to the fundamental ideals of statistics, measures of spread and central tendency. Introduction to the fundamental concepts of probability. Odds, expected value. Simulation. Emphasis is placed throughout on reasoning, multiple representations of mathematics concepts, making connections and communication. Two hours lecture and two hours lab per week. Prerequisite: 220

Objectives:

The broad objectives of Math/CI 120-220-321-322 are to provide a sound basis in mathematics content and pedagogy for preservice elementary school teachers. Upon completion of each course students will have mastered the mathematics content described in the specific course objectives and will be able to:

- evaluate and select the most effective resources, manipulatives, technologies, etc. to represent ideas and concepts in multiple ways;
- use varied approaches to mathematical concepts and procedures in order to meet the needs of students with diverse learning characteristics;
- adapt learning experiences and use alternate approaches suitable for individuals with disabilities.
- anticipate and build on students’ natural ways of thinking about mathematical ideas and concepts;
- anticipate misconceptions that may occur in students’ thinking about mathematical concepts and procedures, and design experiences to minimize these misconceptions;
- engage students in building their own mathematical knowledge through inquiry, investigation, group and individual work;
- use examples that are meaningful to their students (tied to students’ experiences);
- connect mathematics with students’ real-life experiences;
- integrate technology into classroom instruction (where that technology is available);
- design instructional experiences that promote communication of mathematical reasoning verbally and in writing.
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The specific objectives of Math/CI 321 are as follows:

EUCLIDEAN GEOMETRY

- perform the “basic” geometric constructions and explain why they work
- explain (with justification based on axioms) why the sum of the angles in a triangle is a straight angle
- understand and explain symmetries present in three dimensional figures
- understand and explain why there are only 5 Platonic solids.
- construct elementary proofs of elementary facts based on axioms

COORDINATE GEOMETRY

- identify and/or locate points in the Cartesian coordinate system
- understand and explain reflections, rotations and translations in the language of coordinate geometry
- understand and explain linear equations and inequalities both geometrically and algebraically
- set up and solve linear models of “real-world” situations (e.g. the relationship between the Fahrenheit and Celsius temperature scales).

CONCEPTS OF PROBABILITY AND STATISTICS

- understand, explain and use various means of organizing and picturing statistical information.
- understand, explain and use the fundamental concepts of statistics to analyze data. This includes measures of spread, central tendency; normal distributions.
- understand and explain the misuses of statistics.
- understand and explain the basic concepts of probability – sample space, event, probability of an event
- understand, explain and use the appropriate counting techniques to compute theoretical probabilities
- be able to calculate elementary probabilities
- be able to compute the odds of an event
- understand and explain the distinction between theoretical probability and experimental data.

Course Outline:

Geometric explorations.

1 week

Straight edge and compass constructions. Why the constructions work. Developing the process of justification in the mathematical sense.

2 weeks

Axioms of Euclidean Geometry. Elementary results of Euclidean Geometry.

2 weeks

Symmetries of three-dimensional figures. Patterns relating number of edges, vertices and faces. The 5 Platonic solids.

1 week

Coordinate geometry. Symmetry and rotations in coordinate notation. Translations, reflections and rotations in coordinate notation. Composition of motions.

1-2 weeks

Linear relationships expressed via tables, graphs, formulas. Linear equations understood graphically and algebraically. Slope and intercepts. Developing a linear equation (or inequality) model from “real-world” data. Applications such as the relationship between Fahrenheit and Celsius temperatures.

1-2 weeks

Collecting, organizing and depicting information (data). Analyzing data – measures of central tendency, box-and-whisker plots, quartiles, percentiles, range, variance, standard deviation. Normal distribution.
2 weeks

Misleading graphs and statistics. **1.5 weeks**

Probability. Experiment, sample space, event. Probability tree diagrams. Counting techniques (permutations, combinations, fundamental counting principle). Odds, conditional probability, expected value. Simulation. Understanding theoretical probability vs. experimental probability.
2.5 weeks

Assessment/Evaluation

Students will be assessed based on:

- in-class tests and quizzes;
- homework and written assignments;
- class participation, including being prepared for class, contributing to the discussion, demonstrating and explaining to the class, participation in small group activities;
- individually prepared resource notebook, including manipulative materials, suitably cross-referenced;
- cumulative final exam

TEXTS and REFERENCES:

REQUIRED:

Van de Walle, J. *Elementary School Mathematics – Teaching Developmentally*. 5th edition, 2004

Ma, Li Ping, *Knowing and Teaching Elementary Mathematics*, Lawrence Erlbaum Associates, 1999.

Becker and Shimada (Eds), *The Open-Ended Approach: A New Proposal for Teaching Mathematics*, NCTM, 1997.

Principles and Standards for School Mathematics. NCTM, 2000 (May be downloaded from the NCTM site)

Selected articles (details to be announced in class)

OPTIONAL REFERENCES/RESOURCES:

Musser, Burger and Peterson, *Mathematics for Elementary Teachers*, 5th edition, Wiley

Billstein, Libeskind, Lott, *A Problem Solving Approach to Mathematics for Elementary School Teachers*, (7th edition). Addison Wesley, 1999.

Mathematical Sciences Education Board, NRC, *Measuring Up*. National Academy Press, 1993.

- **Last day to drop with refund: Friday, September 3, 2004.**
- **Last day to drop (W grade; no refund): Monday, October, 2004.**
- **If you need to drop this class, make sure you do so with your College Advisor. Students who simply stop attending class will receive a grade of WF. This counts as an “F” in computing the GPA.**

- **Be aware of the University policy regarding the grade of INC. I abide by it.**