

Course: Structure of Mathematical Systems **Fall 2010**
Department: Mathematics **Number:** 1420 **Credit:** 3 semester hours
Text: "Shapes and Measurement" and "Algebra and Change" from *Reconceptualizing Mathematics*, San Diego State University
Instructor: David Cochener **Office Hours:** 8-9, 11:10-12:10 MWF 9:30-11:30 TT **Office:** Claxton 327
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University Goals:

The course objectives given below are consistent with the following university goals:

- (1) Skills of inquiry, abstract and logical thinking and critical analysis;
- (2) the ability to understand and use numbers and statistics

The objectives for this course are the following Standards recommended by NCTM:

Standard 1: Knowledge of Mathematical Problem Solving

Candidates know, understand, and apply the process of mathematical problem solving.

- 1.1 Apply and adapt a variety of appropriate strategies to solve problems.
- 1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts.
- 1.3 Build new mathematical knowledge through problem solving.
- 1.4 Monitor and reflect on the process of mathematical problem solving.

Standard 2: Knowledge of Reasoning and Proof

Candidates reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry.

- 2.1 Recognize reasoning and proof as fundamental aspects of mathematics.
- 2.2 Make and investigate mathematical conjectures.
- 2.3 Develop and evaluate mathematical arguments and proofs.
- 2.4 Select and use various types of reasoning and methods of proof.

Standard 3: Knowledge of Mathematical Communication

Candidates communicate their mathematical thinking orally and in writing to peers, faculty, and others.

- 3.1 Communicate their mathematical thinking coherently and clearly to peers, faculty, and others.
- 3.2 Use the language of mathematics to express ideas precisely.
- 3.3 Organize mathematical thinking through communication.
- 3.4 Analyze and evaluate the mathematical thinking and strategies of others.

Standard 4: Knowledge of Mathematical Connections

Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

- 4.1 Recognize and use connections among mathematical ideas.
- 4.2 Recognize and apply mathematics in contexts outside of mathematics.
- 4.3 Demonstrate how mathematical ideas interconnect and build on one another to produce a coherent whole.

Standard 5: Knowledge of Mathematical Representation

Candidates use varied representations of mathematical ideas to support and deepen students' mathematical understanding.

- 5.1 Use representations to model and interpret physical, social, and mathematical phenomena.
- 5.2 Create and use representations to organize, record, and communicate mathematical ideas.
- 5.3 Select, apply, and translate among mathematical representations to solve problems.

Standard 6: Knowledge of Technology

Candidates embrace technology as an essential tool for teaching and learning mathematics.

6.1 Use knowledge of mathematics to select and use appropriate technological tools, such as but not limited to, spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.

Standard 7: Dispositions

Candidates support a positive disposition toward mathematical processes and mathematical learning.

- 7.3 Commitment to learning with understanding
- 7.6 Use of various teaching tools including technology

Standard 11: Knowledge of Geometries

Candidates emphasize relationships among quantities including functions, ways of representing mathematical relationships, and the analysis of change.

- 11.1 Use visualization, the properties of two and three-dimensional shapes, and geometric modeling.
- 11.2 Build and manipulate representations of two- and three-dimensional objects using concrete models, drawings, and dynamic geometry software.
- 11.3 Specify locations and describe spatial relationships using coordinate geometry.
- 11.4 Apply transformations and use symmetry, congruence, and similarity.
- 11.5 Demonstrate knowledge of the historical development of Euclidean and non-Euclidean geometries including contributions from diverse cultures.

Standard 12: Knowledge of Data Analysis, Statistics, and Probability

Candidates demonstrate an understanding of concepts, practices related to data analysis, statistics, and probability.

- 12.1 Design investigations that can be addressed by creating data sets and collecting, organizing, and displaying relevant data.
- 12.2 Use appropriate statistical methods and technological tools to analyze data and describe change.
- 12.3 Apply basic concepts of probability.
- 12.4 Demonstrate knowledge of the historical development of probability and statistics including contributions from diverse cultures.

Standard 13: Knowledge of Measurement

Candidates apply and use measurement concepts and tools.

- 13.1 Select and use appropriate measurement units, techniques, and tools.
- 13.2 recognize and apply measurable attributes of objects and the units, systems, and processes of measurement.
- 13.3 Employ estimation as a way of understanding measurement units and processes.
- 13.4 Demonstrate knowledge of the historical development of measurement and measurement systems including contributions from diverse cultures.

Nature of Instruction

As often as possible, concepts are approached from a problem solving viewpoint. Mathematical explorations involving materials (e.g. attribute blocks), calculators, and computers provide contexts for some of the concepts taught. Lecture and demonstrations are used when appropriate.

Out-of-Class Requirements

Assignments are given nearly every day. Problems come from the textbooks and from teacher-prepared handouts. Students are expected to read and interpret mathematical exposition.

Withdrawal

September 10, 2010 is the last day for withdrawing from the class without record. October 8, 2010 is the last day to drop the course with an automatic "W." November 8, 2010 is the last day to withdraw with a "W."

Mid-Term Grades

A mid-term grade will be awarded for all students in this course. The grade awarded may not necessarily be based on 50% of the course requirements and may or may not vary from the final grade. Your mid-term grade will be posted on *AP Web*.

Philosophy

The philosophy of mathematics education that underlies the choice of content and instructional methods is consonant with the vision of mathematics education depicted in the 2000 NCTM document Principles and Standards for School Mathematics. We assume that students learn by constructing meaning for the concepts and symbolism they encounter as they actively engage in problem solving. Thus, as instructors we strive to create an environment in which preservice teachers can explore mathematics. We also assume that not only are we teaching mathematics explicitly through our instruction but we are also implicitly providing a model for how one might approach teaching mathematics. Thus, we reflect on the pedagogy at two levels:

- 1) how well does the instruction help students, who are preservice teachers, to learn mathematics;
- 2) how well does the instruction prepare preservice teachers, who are our students, to think about teaching mathematics.

Academic and Classroom Misconduct

Students are expected to conduct themselves appropriately at all times. Academic and classroom misconduct will not be tolerated. Students must read the "Code of Student Conduct" in the new Student

Handbook for an understanding of what will be expected of them within the academic setting.

Class Attendance and Decorum

Regular and prompt class attendance is expected. If you have no unexcused absences a bonus of 2 points will be added to your final average. If you have only one unexcused absence, a one point bonus will be added.

Five days of unexcused absence will constitute a mandatory failure or withdrawal, whichever is appropriate. Arriving late or leaving early may count as an absence at the instructor's discretion. All cell phones, pagers, etc. should be turned off during class. Each cell phone interruption will result in a 5-point deduction.

Students will be expected to work together in cooperative groups.

Disabilities

A student who has a condition that may affect his/her academic performance is encouraged to make an appointment with me or with the Coordinator of Disability Issues, telephone 221-6230, to discuss this matter.

ASSESSMENT

Attendance/Promptness: Five unexcused absences will result in a grade of F or a W whichever is appropriate. Three tardies will count as an unexcused absence.

Homework: On ten days, homework will be collected at the BEGINNING of the period. The homework will be checked for EFFORT. Each student will receive either five, three, or no points based upon the homework attempts. I expect to see something recorded for every question. If you have no idea how to work a problem, at least record the important information or write what you think you know. No late homework will be accepted. Two homework scores will be dropped.

Homework Presentations: Every student will be expected to present at least two homework problems, which will be worth up to 10 points (3 points for a correct solution; 2 points for correct notation and language; 5 points for a thorough and reasonable answer.)

Extra Credit: A student can earn up to 25 extra credit points. Each additional homework presentation will be worth 2 extra credit points. There will probably be other extra credit opportunities as well.

Tests: There will be 3 major tests and one final examination. There will be one make-up test given at the end of the semester.

Assessment	Homework (8)	Presentation (2)	Tests (3)	Final (1)	Total Points
Points Each	5	10	100	150	
Total	40	20	300	150	510

A, [90%, 100%]; B, [80%, 90%]; C, [70%, 80%]; D [60%, 70%]; F [0%, 60%]

The material in this syllabus is subject to change in the event of extenuating circumstances.