I. **OVERVIEW**

The following information will appear in the 2009 - 2010 catalog

**MATH-106 Structure of Mathematics 2**

4 Units

**Prerequisite:** Satisfactory completion of MATH 105 .

Elementary probability, statistics and geometry for prospective elementary school teachers. Includes Euclidean geometry, measurement, and analytic geometry. Field trips are not required. Course is applicable to the associate degree. General Education:

CSU-GE - B4

II. **LEARNING CONTEXT**

Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**

   a. Statistics
      
      i. Organization and description of data
      
      ii. Measures of central tendency and dispersion
      
      iii. Common statistical distributions
      
      iv. Interpretation of data

   b. Probability
      
      i. Computing probabilities in simple experiments
      
      ii. Compound experiments and tree diagrams
      
      iii. Conditional probability
      
      iv. Odds and expected value
      
      v. Simulation
      
      vi. Geometric probability

   c. Measurement
      
      i. The nature of measurement
      
      ii. Standard vs. nonstandard units
      
      iii. Length, perimeter, and area
iv. Volume and surface area

d. Geometry
   i. Recognizing and analyzing geometric shapes
   ii. Properties of geometric shapes
   iii. Three-dimensional shapes
   iv. Triangle congruence and similarity
   v. Geometric constructions
   vi. Coordinate geometry
   vii. Geometry using transformations

e. Relations and Functions
   i. Domain and range
   ii. Definition of a function
   iii. Function models

B. ENROLLMENT RESTRICTIONS

1. Prerequisites
   Satisfactory completion of MATH 105.

2. Requisite Skills
   Before entering the course, the student will be able to:
   a. Define the vocabulary of the structure of number systems.
   b. Compare and contrast other numeration systems with the Hindu-Arabic base 10 place value system.
   c. Name and describe the properties of the real number system.
   d. Apply the operations of the real number system to selected problems.
   e. Select appropriate problem solving strategies and use the strategies to solve problems.
   f. Use various algorithms for calculations and evaluate the effectiveness of each.
   g. Develop positive attitudes toward mathematics and mathematics teaching.
   h. Identify resources available to elementary mathematics teachers.
   i. Use mental arithmetic, paper and pencil calculations, and calculators as appropriate
   j. Select appropriate problem solving strategies and use them to solve problems.
C. **HOURS AND UNITS**

<table>
<thead>
<tr>
<th>METHOD</th>
<th>TERM HOURS</th>
<th>UNITS</th>
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<td>Lect</td>
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<tr>
<td>Disc</td>
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D. **METHODS OF INSTRUCTION (TYPICAL)**

_Instructors of the course might conduct the course using the following method:_

1. Lecture/discussion
2. Demonstrations of problem solving by instructor and/or students
3. Exercise sets which develop mathematical skills and provide practice in applying those skills
4. (optional) Field trips, projects, and readings from professional journals to inform students of current issues in elementary mathematics education
5. Problem-solving exercises require students to analyze problems and either select appropriate previously learned solution methods or create their own method
6. Class discussions require students to analyze and compare different teaching strategies and philosophies

E. **ASSIGNMENTS (TYPICAL)**

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**

_Time spent on coursework in addition to hours of instruction (lecture hours)_

Homework assignments should be assigned on a daily or weekly basis. Exercises from the textbook can be used for these assignments, to be supplemented as desired. Each hour of class time should produce almost 2 hours of homework.

Several exams should occur during the semester, apportioned as appropriate. Each exam should require several hours of preparation from the student.

A comprehensive final exam should be held during the scheduled time. This exam should require several hours of preparation from the student.

2. **EVIDENCE OF CRITICAL THINKING**

_Assignments require the appropriate level of critical thinking_

Homework is expected to help foster a student's understanding of the material, and give them an understanding of the level of performance that will be expected of them. The textbook itself has many fine examples of such problems.

Quizzes and exams should challenge a student to perform at a high level. Free-response questions are expected to be the norm, such as the following:

1. Draw a closed, non-simple, polygonal curve.
2. Using a compass and straightedge, divide a given line segment into 5 equal pieces.
3. A club consists of 3 sophomores, 3 juniors, and 4 seniors. There is an election for the offices of president, vice-president, treasurer, and secretary. What is the probability that all 4 officers are seniors?
4. Find the mean, median, mode, first quartile, and third quartile, for a data set of 29 2-digit numbers.

F. **TEXTS AND OTHER READINGS (TYPICAL)**

2. **Other**: Mathematics Framework for California Public Schools, Published 2005, California Department of Education

3. **Other**: Principles and Standard for School Mathematics, Published 2000, National Council of Teachers of Mathematics

III. **DESIRED LEARNING**

A. **COURSE GOAL**

As a result of satisfactory completion of this course, the student should be prepared to:

Explain advanced mathematical concepts to Elementary and Junior-High level students, including probability and statistics, geometry, and problem solving.

B. **STUDENT LEARNING GOALS**

Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. **Required Learning Goals**

   Upon satisfactory completion of this course, the student will be able to:

   a. design and perform statistical experiments.

   b. organize, present, and interpret data in both graphical and numerical form.

   c. calculate and interpret the common statistical measures of central tendency and dispersion.

   d. design and perform probability experiments.

   e. calculate probabilities of simple and multi-stage events.

   f. use probability to design simulations of real life situations, to perform the simulations, and interpret the results.

   g. state the essential characteristics of two- and three-dimensional figures.

   h. calculate area, volume, and surface area of figures, using both standard and nonstandard units.

   i. define similarity and congruence of triangles and apply the definitions to solve problems.

   j. use the principles of transformation geometry to prove facts about geometric objects.

   k. identify, use, and evaluate resources available to elementary mathematics teachers.

   l. select appropriate problem-solving strategies and use the strategies to solve problems.

IV. **METHODS OF ASSESSMENT (TYPICAL)**

A. **FORMATIVE ASSESSMENT**

1. Assigned homework

2. Tests given regularly throughout the semester
3. (optional) Projects and reports

B. **SUMMATIVE ASSESSMENT**

1. Tests given regularly throughout the semester
2. Final examination