I. GENERAL COURSE INFORMATION

Subject and Number: **Mathematics 116**
Descriptive Title: **Geometry and Measurement for Prospective Elementary School Teachers**
Course Disciplines: **Mathematics**
Division: **Mathematical Sciences**

Catalog Description:
In this course, designed for prospective elementary school teachers, students focus on the conceptual and procedural understanding of geometry and measurement. Students explore informal geometry, congruence, similarity, constructions, transformations, tessellations, and measurement involving both English and metric units in one, two, and three dimensions. The use of appropriate units in real-world geometric situations is emphasized throughout the course. Group activities, hands-on activities and use of computer software are integrated throughout the course.

Note: The maximum UC credit allowed for students completing Mathematics 110, 111, 115, and 116 is one course.

Conditions of Enrollment:
Prerequisite: Mathematics 60 AND Mathematics 110 with a minimum grade of C in prerequisite or equivalent

Course Length:	**X Full Term**	**Other (Specify number of weeks):**
Hours Lecture:	**2.00 hours per week**	**TBA**
Hours Laboratory:	**3.00 hours per week**	**TBA**
Course Units:	**3.00**	

Grading Method: **Letter**
Credit Status: **Associate Degree Credit**

Transfer CSU: **X Effective Date: January 22, 2002**
Transfer UC: **X Effective Date: Fall 2002**

General Education:
El Camino College:
4B – Language and Rationality – Communication and Analytical Thinking
Term: Other:
6 – Mathematics Competency
Term: Other:

CSU GE:

IGETC:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

SLO #1 Identify Geometric Shapes
Students will identify two- and three-dimensional geometric shapes, explain their attributes and discuss the relationships among the geometric shapes.

SLO #2 Use Geometric Tools
Students will use geometric tools (compass, protractor, straightedge, and dynamic geometry software) to construct geometric figures.

SLO #3 Solve and Interpret Geometric Application Problems
Students will use the concepts of measurement to solve geometric application problems, determine the appropriateness of a solution, and if errors are made, explain the misconceptions or errors made and how to solve the problem correctly using written or oral means.

SLO #4 Explain Geometric Formulas
Students will use words and diagrams to explain the derivation of geometric formulas.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Given common two- or three- dimensional shapes, determine the perimeter and area or surface area and volume using both English and metric units.
    - Performance exams
2. Using a straightedge and compass, construct two-dimensional geometric figures.
    - Class Performance
3. Using transformations, construct two- and three- dimensional designs and tessellations
    - Performance exams
4. Solve analytical geometry problems involving lines and slopes.
    - Homework Problems
5. Recognize and analyze attributes of plane and solid geometric figures, testing for congruence and/or similarity, when appropriate.
    - Performance exams
6. Compare and contrast aspects of non-Euclidean geometries with Euclidean geometry.
    - Homework Problems
7. Solve a variety of application problems, using various modes of visualization, pattern recognition techniques, data table analysis, spatial reasoning, geometric modeling, and, where appropriate, computer software.
    - Performance exams

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	10	I	GEOMETRY OF LINES A. Basic terms, concepts and relationships among points, lines, and planes, including types and measurements of angles. B. Linear measure: length, perimeter, and circumference and appropriate use of units C. Conversion of units between English and metric systems D. Construction of angles, parallel lines, perpendicular lines, and angle bisectors
Lab	15	II	GEOMETRY OF LINES ACTIVITIES based on A. Basic terms, concepts and relationships among points, lines, and planes, including types and measurements of angles. B. Linear measure: length, perimeter, and circumference and appropriate use of units C. Conversion of units between English and metric systems D. Construction of angles, parallel lines, perpendicular lines, and angle bisectors
Lecture	14	III	GEOMETRY OF PLANE FIGURES A. Curves and polygons: definitions, properties and classifications, with an emphasis on triangles and quadrilaterals B. Perimeter and area of rectangles, triangles, parallelograms, trapezoids, regular polygons, and circles including use of appropriate units C. Formal construction of regular, inscribed n-gons (n = 3, 4, 6, 8, 12) D. Similar and congruent figures E. Indirect measurements, including the connection between slope and tangent ratio F. Symmetries, rigid and nonrigid transformations, including translations, rotations, and reflections G. Tessellations of geometric figures in the plane H. The Pythagorean Theorem and real world applications I. Comparing aspects of non-Euclidean and Euclidean geometries

			J. Applications using data tables, pattern recognition, and computer software
Lab	21	IV	GEOMETRY OF PLANE FIGURES ACTIVITIES based on A. Curves and polygons: definitions, properties and classifications, with an emphasis on triangles and quadrilaterals B. Perimeter and area of rectangles, triangles, parallelograms, trapezoids, regular polygons, and circles including use of appropriate units C. Formal construction of regular, inscribed n-gons (n = 3, 4, 6, 8, 12) D. Similar and congruent figures E. Indirect measurements, including the connection between slope and tangent ratio F. Symmetries, rigid and nonrigid transformations, including translations, rotations, and reflections G. Tessellations of geometric figures in the plane H. The Pythagorean Theorem and real world applications I. Comparing aspects of non-Euclidean and Euclidean geometries J. Applications using data tables, pattern recognition, and computer software
Lecture	12	V	GEOMETRY OF SOLIDS A. Definition and attributes, including Euler's formula, of polyhedra; prisms, pyramids, cones, cylinders, and spheres B. Representations of three-dimensional figures in two-dimensions: isometric and orthogonal drawings C. Measurement of mass, capacity, surface area, and volume in both English and metric units D. Tessellations on the surface of a sphere
Lab	18	VI	GEOMETRY OF SOLIDS ACTIVITIES based on A. Definition and attributes, including Euler's formula, of polyhedra; prisms, pyramids, cones, cylinders, and spheres B. Representations of three-dimensional figures in two-dimensions: isometric and orthogonal drawings C. Measurement of mass, capacity, surface area, and volume in both English and metric units D. Tessellations on the surface of a sphere
Total Lecture Hours		36	
Total Laboratory Hours		54	

Total Hours	90

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

A pentagon has interior angle measures that form an arithmetic sequence. Determine the measure of each interior angle if the least measure is 60 degrees.

C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:

1. Verify Euler's formula for a cube, a tetrahedron, and an octahedron. Write one or two complete and substantive sentences explaining how Euler's formula differs for each of these solids.

2. Present to your classmates a complete explanation of why the formula for the area of a circle is πr^2. Use manipulatives to illustrate your reasoning, where appropriate.

D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:

Performance exams
Objective Exams
Other exams
Written homework
Homework Problems

V. INSTRUCTIONAL METHODS

Group Activities
Lecture
Other (please specify)
Problem solving using computer software

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study
Answer questions
Required reading
Problem solving activities
Other (specify)
Problem solving using computer software

Estimated Independent Study Hours per Week: 4

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Douglas Aichele and John Wolfe. GEOMETRIC STRUCTURES, AN INQUIRY-BASED APPROACH FOR PROSPECTIVE ELEMENTARY AND MIDDLE SCHOOL TEACHERS. Pearson Prentice-Hall, 2008.
Qualifier Text: Discipline Standard

B. ALTERNATIVE TEXTBOOKS

C. REQUIRED SUPPLEMENTARY READINGS

D. OTHER REQUIRED MATERIALS

Straight edge, compass, protractor, and scientific calculator

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Mathematics-60 AND	Sequential
Course Prerequisite Mathematics-110	Sequential

B. Requisite Skills

Requisite Skills
a. solve problems using the Pythagorean Theorem (Mathematics 60) MATH 60 - Use the properties of right triangles to solve problems.
b. demonstrate a proof of the Pythagorean Theorem (Mathematics 60) MATH 60 - Formulate and prove conjectures using deductive reasoning.
c. utilize congruence theorems to recognize congruent triangles (Mathematics 60) MATH 60 - Use proportional reasoning, as well as congruence and similarity, in problem solving.
d. recognize and utilize the properties of operations on real numbers (Mathematics 110) MATH 110 - Perform binary operations on whole numbers in a variety of numeration systems.
e. recognize and solve arithmetic and geometric sequence problems (Mathematics 110) MATH 110 - Recognize, model, and solve pattern problems, including arithmetic and geometric patterns and sequences, using inductive or deductive reasoning.
f. ability to use various problem solving strategies, including the use of tables, indirect reasoning, and pattern recognition (Mathematics 110) MATH 110 - Attack and solve application problems with systematic and creative problem solving strategies (Polya's problem solving guidelines).

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification

D. Recommended Skills

Recommended Skills

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by Linda Ho on 11/01/2001.

BOARD APPROVAL DATE: 01/22/2002

LAST BOARD APPROVAL DATE: 05/18/2020

Last Reviewed and/or Revised by: Susanne Bucher **Date:** 03/01/2020

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