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| **Course Acronym:** | MATH |
| **Course Number:** | 116 |
| **Descriptive Title:** | Geometry and Measurement for Prospective Elementary School Teachers |
| **Division:** | Mathematical Sciences |
| **Department:** | Mathematics |
| **Course Disciplines:** | Mathematics |
| **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.<br><br>*Note: The maximum UC credit allowed for students completing Mathematics 110, 111, 115, and 116 is one course.* |
| **Prerequisite:** | Math 110 with a minimum grade of C or concurrent enrollment. |
| **Co-requisite:** | |
| **Recommended Preparation:** | |
| **Enrollment Limitation:** | |
| **Hours Lecture (per week):** | 2 |
| **Hours Laboratory (per week):** | 3 |
| **Outside Study Hours:** | 4 |
| **Total Course Hours:** | 90 |
| **Course Units:** | 3 |
| **Grading Method:** | Letter Grade only |
| **Credit Status:** | Credit, degree applicable |
| **Transfer CSU:** | Yes |
| **Effective Date:** | January 22, 2002 |
| **Transfer UC:** | Yes |
| **Effective Date:** | |
| **General Education: ECC** | Area 4B - Language and Rationality: Communication and Analytical Thinking, Area 6 - Mathematics Competency |
| **Term:** | |

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| **Other:** | |
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| **Other:** | |
| **IGETC:** | |
| **Term:** | |
| **Other:** | |
| **Student Learning Outcomes:** | **SLO #1 Identify Geometric Shapes**<br><br>Students will identify two- and three-dimensional geometric shapes, explain their attributes and discuss the relationships among the geometric shapes.<br><br>**SLO #2 Use Geometric Tools**<br><br>Students will use geometric tools (compass, protractor, straightedge, and dynamic geometry software) to construct geometric figures.<br><br>**SLO #3 Solve and Interpret Geometric Application Problems**<br><br>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.<br><br>**SLO #4 Explain Geometric Formulas**<br><br>Students will use words and diagrams to explain the derivation of geometric formulas. |
| **Course Objectives:** | 1. Given common two- or three-dimensional shapes, determine the perimeter and area or surface area and volume using both English and metric units.<br>2. Using a straightedge and compass, construct two-dimensional geometric figures.<br>3. Using transformations, construct two- and three-dimensional designs and tessellations<br>4. Solve analytical geometry problems involving lines and slopes.<br>5. Recognize and analyze attributes of plane and solid geometric figures, testing for congruence and/or similarity, when appropriate.<br>6. Compare and contrast aspects of non-Euclidean geometries with Euclidean geometry.<br>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. |
| **Major Topics:** | **I. GEOMETRY OF LINES (10 hours, lecture)**<br><br>A. Basic terms, concepts and relationships among points, lines, and planes, including types and measurements of angles.<br>B. Linear measure: length, perimeter, and circumference and appropriate use of units<br>C. Conversion of units between English and metric systems<br>D. Construction of angles, parallel lines, perpendicular lines, and angle bisectors |

## II. GEOMETRY OF LINES ACTIVITIES (16 hours, lab)

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

## III. GEOMETRY OF PLANE FIGURES (14 hours, lecture)

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

## IV. GEOMETRY OF PLANE FIGURES ACTIVITIES (20 hours, lab)

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

## V. GEOMETRY OF SOLIDS (12 hours, lecture)

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

**VI. GEOMETRY OF SOLIDS ACTIVITIES (18 hours, lab)**

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

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| **Total Lecture Hours:** | 36 |
| **Total Laboratory Hours:** | 54 |
| **Total Hours:** | 90 |
| **Primary Method of Evaluation:** | 2) Problem solving demonstrations (computational or non-computational) |
| **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. |
| **Critical Thinking Assignment 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. |
| **Critical Thinking Assignment 2:** | Present to your classmates a complete explanation of why the formula for the area of a circle is $\pi r^2$. Use manipulatives to illustrate your reasoning, where appropriate. |
| **Other Evaluation Methods:** | Homework Problems, Objective Exam, Other Exams, Performance Exams, Written Homework |
| **Instructional Methods:** | Group Activities, Lecture |
| **If other:** | Problem solving using computer software |
| **Work Outside of Class:** | Answer questions, Problem solving activity, Required reading, Study |
| **If Other:** | Problem solving using computer software |
| **Up-To-Date Representative Textbooks:** | Douglas Aichele and John Wolfe. <u>GEOMETRIC STRUCTURES, AN INQUIRY-BASED APPROACH FOR PROSPECTIVE ELEMENTARY AND MIDDLE SCHOOL TEACHERS</u>. Pearson Prentice-Hall, 2008. (Discipline Standard) |
| **Alternative Textbooks:** | |
| **Required Supplementary Readings:** | |
| **Other Required Materials:** | Straight edge, compass, protractor, and scientific calculator |
| **Requisite:** | Prerequisite |
| **Category:** | sequential |
| **Requisite course(s): List both prerequisites** | Mathematics-110 |

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| **and corequisites in this box.** | |
| **Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).** | **Recognize and utilize the properties of operations on real numbers**<br><br>MATH 110 - Perform binary operations on whole numbers in a variety of numeration systems.<br><br>**Recognize and solve arithmetic and geometric sequence problems**<br><br>MATH 110 - Recognize, model, and solve pattern problems, including arithmetic and geometric patterns and sequences, using inductive or deductive reasoning.<br><br>**Ability to use various problem solving strategies, including the use of tables, indirect reasoning, and pattern recognition**<br><br>MATH 110 - Attack and solve application problems with systematic and creative problem solving strategies (Polya's problem solving guidelines). |
| **Requisite Skill:** | |
| **Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable** | |
| **Requisite course:** | |
| **Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).** | |
| **Requisite Skill:** | |
| **Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable** | |
| **Enrollment Limitations and Category:** | |
| **Enrollment Limitations Impact:** | |
| **Course Created by:** | Linda Ho |
| **Date:** | 11/01/2001 |
| **Original Board Approval Date:** | 01/22/2002 |
| **Last Reviewed and/or Revised by:** | Susan Tummers |

| Date: | 03/03/2023 |
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| Last Board Approval Date: | 07/17/2023 effective FALL 2024 |