

**University of Arkansas – Fort Smith
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General Syllabus

MATH 22473 Geometry and Measurement II

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite: MATH 22373 Geometry and Measurement I

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

Students study the connections among geometric and measurement ideas and the instantiation of pedagogical methods used by current practitioners at the Kindergarten through 6th grade level. The mathematical content domains involve Arkansas Math Standards concepts associated with congruence, area, volume, and topology using transformational geometry, coordinate geometry, spherical geometry and traditional Euclidean geometry.

B. Additional Description - None

II. Student Learning Outcomes

A. Subject Matter

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

1. Draw significant connections between knowledge of geometric mathematical domains and age appropriate pedagogical methodologies that lead to significant K through 6 student knowledge.
2. Create age appropriate mathematical learning plans that engage all students using the common core process and content standards.
3. Use proper geometric notation.
4. Convert units of area, volume, mass, and temperature measure.
5. Perform basic constructions, with and without technology.
6. Identify the basic transformations.
7. Explore and construct translations, rotations, reflections, dilations, and tessellations with and without technology.
8. Derive formulas for and compute the area of polygons and circles.
9. Derive formulas for and compute the surface area of polyhedra, cones, and

- spheres.
10. Derive formulas for and compute the volume of polyhedra, cones, and spheres.
 11. Compute the sides of a triangle using the Pythagorean Theorem.
 12. Prove the Pythagorean Theorem.
 13. Develop the Distance Formula and the equation of a circle using the Pythagorean Theorem.
 14. Understand the connection between the coordinate system, geometry, and algebra.
 15. Complete a project/presentation/lesson involving K-6 Geometric content which integrates the practices and domains from the Arkansas Math Standards.

B. University Learning Outcomes

This course enhances student abilities in the following areas.

Analytical Skills

Critical Thinking Skills: Students will identify problems and develop and justify solutions to problems by researching, evaluating and comparing information from varying sources. Students will recognize geometry as a tool for dealing with space relations. Students will apply analytic techniques in identifying possible solutions to problems drawn from a wide variety of areas.

Quantitative Reasoning: Students will interpret and/or draw inferences regarding quantitative relations through as spatial concepts such as linear measure, area, volume, and among a variety of shapes in varying dimensions. Students will apply appropriate mathematical models to solve problems along with representing information symbolically, visually, numerically, and verbally. Students will interpret models and data in order to draw inferences and recognize the limitations of quantitative analysis.

Communication Skills (written and oral)

Students will communicate proficiently by composing coherent documents appropriate for elementary students, teachers, and administrators. Students will communicate effectively in a public setting while demonstrating examples or sharing relevant research and information in statistics, probability, or geometry.

III. Major Course Topics

- A. K through 6 Mathematics Pedagogy
 1. Use of manipulatives for conceptual understanding
 2. Standards of Mathematical Practice
- B. Basic Notation and Terms in Geometry
 1. Vocabulary for transformations, units of measurement
 2. Symbols for congruence, similarity
- C. Constructions
 1. Reflections over horizontal or vertical lines
 2. Using constructions to prove congruence
- D. Congruence

1. Basic definition using corresponding parts of 2 polygons
 2. Triangle congruence theorems: SAS, SSS, ASA, SAA, HL, LL, HA
- E. Conversions
1. Dimensional analysis for 1-, 2-, and 3-dimensions within customary and metric systems
- F. Similarity
1. Basic definition
 2. Relationship to congruence
 3. Triangle similarity theorems: SSS, SAS, AA
- G. Transformational Geometry
1. Draw, describe, and contrast translations, rotations, reflections, dilations
 2. Use technology and manipulatives to construct transformations
- H. Area
1. Derive and use formulas for area for various polygons, including triangles and types of quadrilaterals
 2. Circles
 3. Composite shapes
- I. Surface Area
1. Derive and use formulas for surface area for prisms, pyramids, cylinders, cones, spheres, and composite shapes
 2. Associate with area of nets of 3-D shapes
- J. Volume
1. Derive and use formulas for volume for prisms, pyramids, cylinders, cones, spheres, and composite shapes
- K. The Pythagorean Theorem
1. Derive and use the formula to find missing sides of right triangles
 2. Applications: distance formula, equation of a circle
- L. Coordinate Geometry
1. Distance formula
 2. Midpoint formula