

Mathematics 4321 – College Geometry

Student Learning Outcomes

- 1. The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course.** Students will read, interpret, and use the vocabulary, symbolism, and basic definitions used in college geometry including logic and proof; points, lines, and angles; planar figures; congruence; similarity; space figures; coordinate and transformational geometry; constructions; and non-Euclidean geometry.
- 2. The students will describe the fundamental principles including the laws and theorems arising from the concepts covered in this course.** Students will identify and apply the laws and formulas that result directly from the definitions; for example, methods of proof, properties of parallel lines, properties of congruent and similar figures, properties of planar figures, formulas for and relationships among perimeter, (surface) area, and volume, analytic geometry, and the parallel postulate and non-Euclidean geometries.
- 3. The students will apply course material along with techniques and procedures covered in this course to solve problems.** Students will use the facts, formulas, and the techniques learned in this course to prove theorems in geometry, tackle problems involving geometric constructs, and teach children to do the same.
- 4. The students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.** Students will acquire a level of proficiency in the fundamental concepts and applications necessary for further study in academic fields requiring a solid background in geometry as a prerequisite, or for work in occupational fields requiring a solid background in geometry. These fields might include teaching mathematics in the middle and secondary schools; engineering; architecture; graphic media; art; physical sciences; computer science; finance; life sciences; and social sciences, as well as mathematics. Students who are future educators in particular will acquire the understanding and skills to teach logical and geometrical reasoning, to work with peers in group activities to promote both listening skills and oral communication skills, and to analyze ideas, different points of view, and various approaches to problem solving.
- 5. The students will integrate technology and technological methods into teaching and learning.** Students will acquire a level of proficiency in particular in using Geometer's Sketchpad to solve geometrical problems and to illustrate geometrical ideas.
- 6. The students will gain a broader understanding and appreciation for geometry and reasoning/proof.** Students will acquire an appreciation for the role of proof in mathematics, in geometry in particular, and a proficiency in logical reasoning in the context of formal geometry proofs and in other contexts.

Course Content

Textbook: *Geometry for Pre-Service Middle School and High School Teachers*, by Moreland and Huckaby. Content consists of the following topics, listed according to the corresponding lessons in the text.

LESSON 1 -- INDUCTIVE VERSUS DEDUCTIVE REASONING

LESSON 2 -- LOGIC

LESSON 3 -- INTRODUCTION TO GEOMETRY

LESSON 4 -- INTRODUCING PROOFS

LESSON 5 -- PROPERTIES OF PARALLEL LINES

LESSON 6 -- CONGRUENT FIGURES

LESSON 7 -- POLYGONS

LESSON 8 -- QUADRILATERALS

LESSON 9 -- INEQUALITIES IN GEOMETRY AND INDIRECT PROOFS

LESSON 10 -- RATIO, PROPORTION, AND SIMILARITY

LESSON 11 -- RIGHT TRIANGLES

LESSON 12 -- CIRCLES, ANGLE MEASUREMENT,

CHORDS, TANGENTS, AND SECANT SEGMENTS

LESSON 13 -- THE GEOBOARD AND THE GEOMETER'S SKETCHPAD

LESSON 14 -- PERIMETER AND AREAS

LESSON 15 -- NETS, ISOMETRIC DRAWING, ORTHOGRAPHIC DRAWINGS

LESSON 16 -- SURFACE AREAS AND VOLUMES

LESSON 17 -- COORDINATE GEOMETRY

LESSON 18 -- LOCUS AND CONSTRUCTIONS

LESSON 19 -- TRANSFORMATIONAL GEOMETRY

LESSON 20 -- NON-EUCLIDEAN GEOMETRY

LESSON 21 -- HISTORY OF GEOMETRY