Miami-Dade Community College
MTG 4212 – College Geometry

Course Description: Topics include the axiomatic structure of Euclidean geometry as well as concepts from advanced Euclidean geometry and non-Euclidean geometry. *Three Credits*

Prerequisite: MAC 2312.

Course Competencies:

Competency 1: The student will demonstrate an understanding of the historical background and foundations of geometry by

a. identifying the contributions of Thales and Pythagoras to Euclidean geometry.

b. identifying the contributions of Euclid to the development and systemization of mathematical thought.

c. identifying three classic construction problems in antiquity: squaring the circle, trisecting an angle, and doubling the cube.

d. identifying the historical significance of Playfair's Postulate as a restatement of Euclid's Parallel Postulate.

e. identifying the contributions of Saccheri, Bolyai, Lobachevsky, Poincare, and Riemann in the historical development on non-Euclidean geometries.

Competency 2: The student will demonstrate an understanding of the structure of axiomatic systems of geometry by

a. identifying the features of axiomatic systems including undefined terms, defined terms, postulates, propositions, and rules of inference or logic.

b. determining whether an axiomatic system is consistent, complete, and independent.

c. identifying the significance of models in axiomatic geometrical systems.

d. constructing direct proofs and proofs by contradiction.

Competency 3: The student will demonstrate an understanding of the significance of the neutral geometry of Euclid by

a. identifying the first 28 Propositions from Book I of Euclid's *Elements*.

b. identifying the significance of the first 28 Propositions in non-Euclidean geometry.

Competency 4: The student will demonstrate an understanding of advanced Euclidean geometry by

a. constructing proofs utilizing only the propositions of neutral geometry.

b. constructing proofs utilizing the Parallel Postulate.

c. constructing proofs utilizing the congruence relations of triangles.

d. constructing proofs illustrating the relationships among quadrilaterals and other polygonal forms.

e. applying properties of polygons to tessellations of the plane.

f. constructing proofs utilizing the elementary properties of circles.

g. constructing proofs utilizing Euclid's concepts of area and volume.

Competency 5: The student will demonstrate an understanding of transformations in geometry by

a. calculating coordinate transformations in the plane

b. demonstrating translations, rotations, and other linear transformations in the plane.

Competency 6: The student will demonstrate an understanding of non-Euclidean geometry by

a. identifying equivalent forms of Euclid's Fifth Postulate.

b. identifying the criteria and models for hyperbolic geometry.

c. identifying the criteria and models for spherical geometry.

Competency 7: The student will demonstrate an understanding of fractal geometry by

a. identifying the principles of self-similarity.

b. generating fractal curves.

Competency 8: The student will demonstrate an understanding of projective geometry by

a. investigating the history of projective drawing.

b. identifying 1-point, 2-point, and 3-point perspectives.

c. identifying the axiomatic basis of projective geometry.

d. identifying applications of projective geometry.