Miami Dade College

Course Competencies Template - Form 112

GENERAL INFORMATION	
Name: Dr. Susan Neimand	Phone #: (305) 237-6152
Course Prefix/Number: MTG 3214	Course Title: Euclidean Geometry
Number of Credits: 4	
Degree Type	☐ B.A. ☒ B.S. ☐ B.A.S ☐ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 3/10/08	Effective Year/Term: 20081
☒ New Course Competency ☐ Revised Course Competency	
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☐ No	
The above course links to the following Learning Outcomes: ☐ Communication ☒ Numbers / Data ☐ Critical thinking ☒ Information Literacy ☒ Cultural /Global Perspective ☐ Social Responsibility ☐ Ethical Issues ☒ Computer / Technology Usage ☐ Aesthetic / Creative Activities ☐ Environmental Responsibility	
Course Description (limit to 50 words or less, **must correspond with course description on Form 102**): This course encompasses a range of geometry topics and pedagogical ideas for the teaching of Geometry, including properties of shapes, defined and undefined terms, postulates and theorems, logical thinking and proofs, constructions, patterns and sequences, the coordinate plane, axiomatic nature of Euclidean geometry and basic topics of some non-Euclidean geometries.	
Prerequisite(s): MAC 1147	Corequisite(s):

Course Competencies: (for further instruction/guidelines go to: http://www.mdc.edu/asa/curriculum.asp)

Competency 1: The student will be able to demonstrate knowledge of logical reasoning skills and an understanding of the structure of axiomatic systems of geometry by:

1. Identifying the features of axiomatic systems, including undefined terms, defined terms, postulates, and theorems.
2. Utilizing an inductive thinking process to observe data, recognize patterns in the data, and make conjectures about the patterns in the data.
3. Exploring and applying logical sequences and sequences in found in nature (such as Fibonacci and the golden ratio).
4. Explaining and presenting examples of the concepts of set-inclusion and non-inclusion, conditional statements, compound statements and their negations, equivalence or non-equivalence of statements, valid or invalid arguments.
5. Stating the converse, inverse, and contrapositive of a statement.
6. Creating and explaining truth tables.
7. Utilizing logical reasoning to distinguish between the validity and the truth of an argument.
8. Applying deductive logic to construct proofs of theorems.
9. Constructing direct proofs (two-column form, flow chart form, paragraph form) and indirect proofs.
10. Using a variety of problem solving strategies (drawing diagrams, making charts, writing equations, solving a simpler problem, etc.) and teaching tools (geometric shapes, technology, etc.) to solve problems involving geometric concepts.
11. Providing verbal and written justification for all construction procedures.
12. Determining whether a solution is reasonable in the context of the original situation.

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Competency 2: The student will be able to demonstrate knowledge of points, lines, angles and planes by:

1. Finding the lengths and midpoints of line segments in a two-dimensional coordinate system.
2. Copying and bisecting segments, using compass and straight edge, patty paper, or a drawing program (such as *Geometer's Sketchpad*).
3. Constructing parallel and perpendicular lines to a given line, using compass and straight edge, patty paper, or a drawing program.
4. Classifying angles.
5. Constructing congruent angles, using compass and straight edge, patty paper, or a drawing program
6. Bisecting angles, using compass and straight edge, patty paper, or a drawing program.
7. Identifying and applying relationships between two angles such as vertical, adjacent, supplementary, complementary, and congruent, to geometric and real-world problems.
8. Identifying and applying relationships between angles formed by the intersection of parallel lines and a transversal to geometric and real-world problems.

Competency 3: The student will be able to demonstrate knowledge of polygons and other plane figures by:

1. Classifying figures by means of their properties.
2. Identifying convex, concave, regular, and irregular polygons.
3. Solving for unknown sides using properties of congruent or similar figures.
4. Determining the number of diagonals of convex polygons.
5. Using coordinate geometry to prove properties of congruent, regular and similar polygons.
6. Using properties of congruent and similar polygons to solve mathematical or real-world problems.
7. Determining the measure of interior and exterior angles of polygons.
8. Explaining the derivation of formulas for perimeter and area of polygons.
9. Applying the formulas for perimeter and area of polygons to solve mathematical or real-world problems.
10. Explaining how changes in one or two dimensions of a polygon affect its perimeter and its area.

Competency 4: The student will be able to demonstrate knowledge of triangles by:

1. Classifying, describing, and constructing triangles that are right, acute, obtuse, scalene, isosceles, equilateral, and equiangular.
2. Defining, identifying, and constructing altitudes, medians, angle bisectors, perpendicular bisectors, orthocenter, centroid, incenter, and circumcenter.
3. Applying properties of the orthocenter, centroid, incenter, and circumcenter of a triangle to solve problems.
4. Constructing triangles congruent to given triangles, using compass and straight edge, patty paper, or a drawing program.
5. Using properties of congruent and similar triangles to solve problems involving lengths and areas.
6. Solving real-world problems by applying theorems involving segments divided proportionally.
7. Constructing proofs related to similarity or congruency of triangles.
8. Using properties of corresponding parts of congruent triangles to construct proofs and to solve mathematical or real-world problems.
9. Applying triangle inequality theorems to mathematical and real-world situations.
10. Using coordinate geometry to prove properties of congruent, regular, and similar triangles.
11. Proving and applying (in geometric and real-life problems) the Pythagorean Theorem and its converse.
12. Solving for parts of right triangles using the Pythagorean Theorem.
13. Applying trigonometric ratios to solve mathematical and real-life problems.
14. Stating and applying the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle.

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15. Using special right triangles ($30^o - 60^o - 90^o$, $45^o - 45^o - 90^o$) and applying their properties in solving geometric and real-life problems.

Competency 5: The student will be able to demonstrate knowledge of quadrilaterals by:

1. Describing, classifying and comparing quadrilaterals: parallelograms, rectangles, squares, rhombuses, trapezoids, kites.
2. Determining area and perimeter of quadrilaterals.
3. Constructing proofs (including those involving coordinate geometry) related to similarity, congruency, or other properties of quadrilaterals.

Competency 6: The student will be able to demonstrate knowledge of circles by:

1. Identifying and defining circumference, radius, diameter, arc, arc length, chord, secant, tangent, concentric circles, central angles, inscribed angles, angles formed by the intersections of secants and tangents.
2. Calculating and explaining the value of pi.
3. Proving theorems related to circles, including related angles, chords, tangents, and secants, and applying them to solve problems.
4. Determining and applying measures of arcs and related angles (central, inscribed, and those formed by the intersections of secants and tangents).
5. Solving real-world problems using the formulas for circumference, arc length, and areas of circles and sectors.
6. Finding the equation of a circle (in center-radius form) and sketching it in the coordinate plane, when its center and its radius are given.
7. Finding the center and radius of a circle and sketching it, when its equation (in center-radius form) is given.
8. Determining the center of a circle, using compass and straight edge, patty paper, or a drawing program.
9. Constructing a circle, given three points not on a line, using compass and straight edge, patty paper, or a drawing program.
10. Constructing tangents to circles, using compass and straight edge, patty paper, or a drawing program.
11. Circumscribing and inscribing circles about and within triangles and regular polygons, using compass and straight edge, patty paper, or a drawing program.

Competency 7: The student will be able to demonstrate knowledge of transformations by:

1. Recognizing and performing rigid transformations or isometries (reflections, rotations, translations) on plane figures.
2. Identifying shapes that tessellate and performing tessellations.
3. Calculating coordinate transformation in the Cartesian plane.

Competency 8: The student will be able to demonstrate knowledge of solids by:

1. Describing and making regular and non-regular polyhedra and sketching the net for a given polyhedron.
2. Sketching three-dimensional geometric objects by hand.
3. Explaining and using formulas for the lateral area, surface area and volume of solids such as prisms, pyramids, right circular cylinders, right circular cones.
4. Explaining and using formulas for the surface area and volume of spheres.
5. Describing the relationship between faces, edges, and vertices of polyhedra (Euler's formula)

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6. Identifying and using properties of congruent and similar solids.
7. Determining how changes in dimensions affect the surface area and volume of common geometric solids.

Competency 8: The student will be able to demonstrate knowledge of the historical background, development, and foundation of geometry by:

1. Citing historical events in geometry and identifying individuals who contributed to the development of geometry.
2. Identifying the contributions of Euclid to the development and systemization of mathematical thought.
3. Identifying the contributions of Saccheri, Bolyai, Lobachevsky, Poincare, and Riemann in the historical development on non-Euclidean geometries.
4. Describing, visually and verbally, topics from spherical geometry and hyperbolic geometry.
5. Describing, visually and verbally, topics from topology (e.g., Mobius strip, Kline bottle).

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