Department of Mathematics   **Course No. MA626**
Title of Course: Geometry and Measurement   **New: Fall 2013**

I.   Catalog Description and Credit Hours of Course:
This course is designed to develop an understanding of the teaching and learning of geometry and measurement. Emphasis will be given to how children think about and learn these concepts and how they fit into an elementary mathematics curriculum. (3)

II.   Co-requisite:
MA616 Internship in Geometry and Measurement

III.   Purposes and Objectives of the Course:
This course will focus on the content and complexities of teaching and assessing geometry and measurement in an elementary setting. Candidates will develop expertise related to geometry and measurement content and as well as adaptive reasoning skills that will support elementary teachers and enhance student learning in grades K-5. Candidates will examine the learning trajectories children exhibit as they develop geometry and measurement concepts and skills. Course content will include geometric properties and relationships, visualization and spatial reasoning, adaptive reasoning, and measurement in multiple dimensions, and transformational and coordinate geometries, geometric constructions and modeling.
The learner will:
A. Develop a deeper understanding of the topics in geometry and measurement that are taught in grades 1-6 through exploration of geometric constructions and modeling; utilization of technology and manipulatives; and adaptive reasoning and proofs;
B. Develop an understanding of the ways in which children learn geometry and measurement concepts, including the van Hiele model for geometric learning as a framework (and/or Vygotsky's Zone of Development);
C. Develop multiple ways to assess students' understanding of geometry and measurement concepts;
D. Develop strengths in diagnosing students' misconceptions, helping students move beyond these misconceptions and facilitate conceptual understanding of geometry and measurement concepts;
E. Develop strategies for asking questions of students that will facilitate their mathematical understanding of geometry and measurement;
F. Develop methods of supporting their students' and colleagues' mathematical understanding of geometry and measurement;
G. Use the Common Core State Standards for Mathematics and the Learning Progressions documents to guide the creation of lessons and the assessment of students in geometry and measurement.
H. Develop in themselves the mathematical practices described in the Standards for Mathematical Practice from the Common Core State Standards for Mathematics in the context of geometry and measurement.

IV. Student Learning Outcomes:

A. Student will develop plans demonstrating constructions and modeling for guiding geometric understanding of primary students.

B. Student will demonstrate the development of core mathematical ideas in geometry and measurement across grade levels.

C. Student will demonstrate ways to use geometry and measurement to investigate other mathematical concepts.

V. Course Outline:

Topics	Class Hours
A. Overview of Geometry and Measurement and Data domains of Common Core State Standards for Mathematics	3
B. Common Core Learning Progressions for Geometry and Measurement and Data domains of Common Core State Standards for Mathematics	3
C. Properties and Relationships of Geometric Figures	3
a. Draw, construct and describe geometrical figures	
b. Relationships among figures	
D. Transformational Geometry	3
a. Transformations	
b. Similarity	
c. Congruence	
E. Coordinate Geometry	3
a. Graphing points	
b. Use coordinate geometry to solve real-world problems	
F. Geometric Measurement	9
a. Measurement as iteration of a unit	
b. Measurement conversions	
c. Perimeter as attribute of plane figures	
d. Concepts of area and relationship to multiplication and addition	
e. Concept of volume and relationship to multiplication and addition	
f. Real world and mathematical problems involving area, surface area, and volume	
g. Pythagorean Theorem	
G. Spatial Reasoning and Visualization	3
H. Geometric Constructions	6
I. Geometric Modeling	6
J. Geometric Reasoning and Proofs	6
Total Hours	45

VI. Textbook:

"Developing Mathematical Ideas: Geometry. Examining Features of Shapes: Casebook. Schifter, Bastable, and Russell; Dale Seymour Publications, 2002.

"Developing Mathematical Ideas: Geometry. Measuring Space in One, Two and Three Dimensions: Casebook. Schifter, Bastable, and Russell; Dale Seymour Publications, 2002.

Additional Resources:
"Discovering Geometry: An Investigative Approach." Serra, Michael; Key Curriculum Press, 2003.

"Foundations of Mathematics for Teachers." Killion, et al., Kendall Hunt, 2009.

"Looking at Geometry: Activities Integrating Math and Science. Grades 6-9." Erickson, Sheldon; AIMS Education Foundation, 2003.

VII. Basis of Student Evaluation:

    A. Evidence of Participation and Preparation   20%
- Case discussions
- Journal

    B. Classwork   20%
- Math Problem Sets
- Quizzes

        Journal/Article Reflections/Writing Assignment

    C. Final Reflection Project   30%
- Collaborative Structured Interview

    D. Tests   30%

IX. Grading Scale
90% - 100% = A
80% - 89% = B
70% - 79% = C
0% - 69% = F

The weight of the evaluation criteria may vary according to each instructor and will be communicated at the beginning of the course.

X. Academic Policy Statement:
Students will be expected to abide by the University Policy for Academic Honesty regarding plagiarism and academic honesty. Refer to:
http://www6.semo.edu/judaffairs/code.html

XI. Student with Disabilities Statement:
If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.