

**University of Arkansas – Fort Smith**  
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**Fort Smith, AR 72913**  
**479-788-7000**

### **General Syllabus**

#### **Math 38173 Mathematics Pedagogy For Spatial Relations**

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite: MATH 37703 College Geometry

Effective Catalog: 2018~2019

## **I. Course Information**

### **A. Catalog Description**

Designed for pre-service or in-service secondary mathematics teachers. Covers selected mathematics topics, technological resources, and methods of teaching relevant to the secondary mathematics curriculum with an emphasis on engaging students in concepts ranging from basic spatial relations to rigorous proof in secondary geometry. Candidates will also engage in mathematics education research and study literacy-related strategies as they relate to the mathematical content.

### **B. Additional Description**

**Organizing Theme (Conceptual Framework):** Professionals United to Ensure Continuous Learning and Success. The educator is an instructional leader who uses reflective decision-making; focuses on best practices; and has a thorough knowledge of students, a strong content and pedagogical knowledge, a commitment to the profession, and a desire to be a continuous learner.

## **II. Student Learning Outcomes**

### **A. Subject Matter**

Upon completion of the course the student will be able to:

1. Measure and apply the ideas of measurement to solve problems in a variety of types of middle level and algebra problems.
2. Apply, explain, and analyze the various ways of solving geometric problems.
3. Solve non-routine mathematics problems related to secondary geometry.
4. Design engaging mathematical tasks for the students' conceptual development of geometric concepts.

#### Pedagogical Subject Matter:

Upon completion of the course the following competencies associated with the Arkansas Principles for Licensure of Beginning Teachers and the National Council of Teachers of Mathematics Program Standards will be satisfied by the candidate. Students will be able to:

1. Understand the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches, create learning experiences that make these aspects of subject matter meaningful for students, and link the discipline(s) to other subjects. *APLBT Principle 1; NCTM 8.1, 8.2*
2. Plan curriculum appropriate to the students, to the content, and to course objectives. *APLBT Principle 2; NCTM 8.2, 8.4, 8.7*
3. Plan instruction based upon human growth and development, learning theory, and the needs of students. *APLBT Principle 3; NCTM 8.6*
4. Exhibit human relations skills which support the development of human potential. *APLBT Principle 4; NCTM 7.1, 7.2, 7.3, 7.4, 7.5, 7.6*
5. Work collaboratively with school colleagues, parents/guardians, and the community to support student learning and well being. *APLBT Principle 5.*
6. Use multiple strategies, including listening to and understanding the ways students think about mathematics, to assess students' mathematical knowledge. *NCTM 8.3*
7. Participate in professional mathematics organizations and use their print and on-line resources. *NCTM 8.5*
8. Demonstrate the ability to lead classes in mathematical problem solving and in developing in-depth conceptual understanding, and to help students develop and test generalizations. *NCTM 8.8*
9. Develop lessons that use technology's potential for building understanding of mathematical concepts and developing important mathematical ideas. *NCTM 8.9*

#### **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 analyze ways of engaging quantity as it is connected to spatial understanding. These will include the ideas of dimension, fractal, area, and volume.

##### **Communication Skills (written and oral)**

Students will develop instructional methods in which open communication about mathematical ideas is an expected norm of the learning community. Students will

plan and teach lessons requiring the ability to express ideas effectively in written and oral form

### **III. Major Course Topics**

The following topics will be covered as they relate to the NCTM content strands of *Geometry* and *Measurement* as they are incorporated from the middle school to the early high school curriculum and the developmental needs of students in these age groups:

- A. Arkansas Math Standards
- B. Teaching Effective Lessons
  - 1. Motivational Techniques
  - 2. Classroom Discourse
  - 3. Questioning Features
  - 4. Strategies for Teaching Effective Lessons
- C. Using Technology to Enhance Mathematics Instruction
  - 1. Using Geometer's Sketchpad
  - 2. Teaching Geometry with Geometer's Sketchpad
  - 3. Calculators
- D. Using Manipulatives to Enhance Mathematics Instruction
  - 1. Planning Lessons using Manipulatives
  - 2. Teaching Using Manipulatives
  - 3. Teaching Using Manipulatives Combined with Technology
- E. Assessment
  - 1. Making Instructional Decisions
  - 2. Data-driven Instruction
  - 3. Evaluating Student Achievement
- F. Current Trends/Topics in Mathematics Education
  - 1. Growth Mindset
  - 2. Mathematical Mindsets
  - 3. Edulastic
- G. Geometric Mathematics Content
  - 1. Lines and Angles
  - 2. Transformations, Symmetry, and Tessellations
  - 3. Triangles
  - 4. Congruence
  - 5. Quadrilaterals
  - 6. Polygons
  - 7. Circles
  - 8. Area
  - 9. Pythagorean Theorem
  - 10. Similarity
  - 11. Trigonometry