

Prepared by the Department of Mathematics

Date of Departmental Approval: February 3, 2014

Date Approved by Curriculum and Programs: February 19, 2013

Effective: Fall 2014

1. **Course Number:** MAT121
Course Title: Mathematics for Elementary and Early Childhood Educators II
2. **Description:** This course is designed for students planning to teach Elementary and/or Early Childhood Education. Students develop an understanding of the mathematical content of geometry, measurement, statistics, and probability at the deep level required for successful early childhood and elementary school teaching in ways that are meaningful to pre-service elementary and early childhood educators. Topics include: Two- and Three-dimensional Geometry; Measurement; Data Analysis; Single Variable Statistics; Probability. (4 contact hours)
3. **Student Learning Outcomes (instructional objectives, intellectual skills):**
Upon successful completion of this course, students are able to do the following.
 - Effectively communicate mathematical concepts in geometry, measurement, probability, and statisticsUnderstanding and applying concepts of geometry:
 - Classifying and analyzing polygons using attributes of sides and angles, including real-world applications
 - Classifying and analyzing three-dimensional figures using attributes of faces, edges, and vertices
 - Analyzing and applying geometric transformations (e.g., translations, rotations, reflections, dilations); relate them to concepts of symmetry, similarity, and congruence; and using these concepts to solve problems
 - Matching three-dimensional figures and their two-dimensional representations (e.g., nets, projections, perspective drawings)
 - Recognizing and applying connections between algebra and geometry (e.g., the use of coordinate systems, the Pythagorean Theorem)Understanding and applying concepts of measurement:
 - Estimating and calculating measurements using customary, metric, and nonstandard units of measurement
 - Using unit conversions and dimensional analysis to solve measurement problems
 - Deriving and use formulas for calculating the lengths, perimeters, areas, volumes, and surface areas of geometric shapes and figures
 - Determining how the characteristics (e.g., area, volume) of geometric figures and shapes are affected by changes in their dimensions
 - Solving a variety of measurement problems (e.g., time, temperature, rates, average rates of change) in real-world situationsUnderstanding descriptive statistics:
 - Using measures of central tendency (e.g., mean, median, mode) and range to describe and interpret real-world data
 - Selecting appropriate ways to present data and communicate statistical information (e.g., tables, graphs, line plots, Venn Diagrams)
 - Use technology to construct tables and graphs for statistical inference
 - Analyzing and interpreting various graphic and non-graphic data representations (e.g., frequency distributions, percentiles)
 - Comparing different data setsUnderstanding and applying basic concepts of probability:
 - Calculating the probabilities of simple and compound events and of independent and dependent events
 - Recognizing and applying the concept of conditional probability
 - Recognizing the difference between experimentally and theoretically determined probabilities in real-world situations
 - Applying knowledge of combinations and permutations to the computation of probabilities
4. **Credits:** 3 credits
5. **Satisfies General Education Requirement:** Mathematics/Quantitative Reasoning

6. **Prerequisite:** MAT120
7. **Semesters Offered:** Fall, Spring, Summer
8. **Suggested General Guidelines for Evaluation:** Students will be assessed on their ability to correctly complete homework assignments, quizzes, and/or exams on the mathematical content described above. They will also be assessed on their ability to complete small projects which demonstrate their deep understanding of these mathematical concepts in ways that are meaningful to pre-service elementary teachers. Both theoretical and pedagogical research papers with respect to geometry and measurement, as well as probability and statistics, will be assigned.
9. **General Topical Outline:**

MAT121: Mathematics for Elementary and Early Childhood Teachers II

- I. Geometric Figures
 - A. Figures in the Plane
 - B. Curves and Polygons in the Plane
 - C. Figures in Space
 - D. Networks
- II. Measurement: Length, Area, and Volume
 - A. Measurement Process
 - B. Perimeter
 - C. Area
 - D. The Pythagorean Theorem
 - E. Surface Area
 - F. Volume
- III. Transformations, Symmetries, and Tilings
 - A. Rigid Motions and Similarity Transformations
 - B. Patterns and Symmetries
 - C. Tilings and Escher-like Designs
- IV. Congruence, Constructions, and Similarity
 - A. Congruent Triangles
 - B. Constructing Geometric Figures
 - C. Similar Triangles
- V. Statistics: The Interpretation of Data
 - A. Organizing and Representing Data
 - B. Measuring the Center and Variation of Data
 - C. Statistical Inference
 - D. Misleading Statistics
- VI. Probability
 - A. Experimental Probability
 - B. Principles of Counting
 - C. Permutations and Combinations
 - D. Theoretical Probability