# MAT 125 Syllabus

**MAT 125: Explorations in Geometry, Probability, and Statistics for Educators (*3hr, 3cr*)**

**Course Description**: This course covers topics in geometry, probability, and statistics using relevant and appropriate technology. Geometry in one, two, and three dimensions is discussed. Topics include: measurement, length, areas, volume, angles, transformation, congruence, and constructions. Introductory topics from probability and statistics include notions of sample space, success, descriptive data measures, and elements of experimental design.

**Prerequisites**: Departmental Permission

**Note**: Material covered in this class will help teachers/teacher candidates prepare for a leadership position as elementary mathematics specialist.

**Instructor:** Your instructor will provide contact information, office hours and meeting times for your section.

## Course Format and Grading

**Expectations:** This course covers topics in geometry, probability, and statistics using relevant and appropriate technology. Geometry in one, two, and three dimensions is discussed. Topics include measurement, length, areas, volume, angles, transformation, congruence, and constructions. Introductory topics from probability and statistics include notions of sample space, success, descriptive data measures, and elements of experimental design.
This course uses the problem-solving approach to teaching and learning mathematics concepts. Students are encouraged to ask questions. Class participation is essential. You are strongly encouraged to take good notes and do not miss class. Bring your concerns and challenges to the instructor's attention early on in the course so that they can address them effectively.

**Homework**: Homework will be assigned in class. Solutions to most problems from the previous session will be reviewed and discussed in class. To be successful in this course, it is essential that you devote a lot of time to your homework.

**Grades:** Your grade will be made up of 70% exams and 30% assignments that include homework.

## Text, Materials, and Accommodating Disabilities

**References:**


• Beckmann, S. (2018). Mathematics for elementary teachers (5th ed). Pearson.
• Billstein, R., Libeskind, S., & Lott, J. W. (2016). A problem-solving approach to Mathematics for elementary school teachers (12th ed). Pearson.

• Sonnabend, T. (2010). Mathematics for teachers: an interactive approach for grades k-8 (4th ed). Brooks/Cole Cengage Learning.

**Materials**: Physical and Virtual Manipulatives; Learning Tools
**Calculator**: Texas Instruments

**Accommodating Disabilities**: Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more info, contact the Office of Student Disability Services, Shuster Hall, Room 238, 718-960-8441.

**Course Objectives and Content:**
***Course Objectives:** This course meets all of the overall objectives for a CUNY common core Quantitative Reasoning course; these objectives and how they are met in this course are detailed below.

At the end of this course, students will be able to:

**SLO 1.** Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.

**SLO 2**. Represent quantitative problems expressed in natural language in a suitable mathematical format.

**SLO 3**. Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.

**SLO 4**. Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.

**SLO 5**. Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.

**SLO 6**. Apply mathematical methods to problems in other fields of study.

***Course Topics**

There is flexibility in the order and time allotted to each of the topics below, but all topics must be covered by the instructor and understood by the student. Historical development and perspective will be embedded within the topics where appropriate.

1. Core Concepts
    - Points, lines, planes, parallel, perpendicular
    - Principles of Euclidean Geometry

2. Basic Geometric figures and Measurement

- 1-Dimension
  - Lines, line segments, rays
  - Distance
- 2-Dimensions
  - Angles
  - Polygons, circles, arcs
  - Area and Surface area
- 3-Dimensions
  - Polyhedral solids, cylinders, cones, spheres
  - Volume
- Classification, Identification
- Construction

3. Transformations

- Rigid: Translations, reflections, rotations, glide reflections
- Non-rigid: Dilation

4. Congruence, Symmetry and Similarity

5. Coordinate Geometry

6. Measures of Center : Mean, Median, Mode, Interquartile range

7. Measures of Variation and Relative Standing: Standard deviation, Variance, Range, Percentile, Quartile

8. Representing and Categorizing Data

9. Basic Concepts of Probability
- Empirical and theoretical probability
- Conditional probability
- Probability distribution
- Normal distribution

10. Elements of Experimental Design

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***See Sample Final Exam and Scoring Rubric with SLOs and Topics alignment***

**Professional Standards**

**(**Specific content and objectives will include the following standards from **NCTM CAEP Mathematics Content for Elementary Mathematics Specialist (Addendum to the NCTM CAEP Standards 2012)**

**C.3. Geometry and Measurement**

To be prepared to support the development of student mathematical proficiency, all elementary mathematics specialists should know the following topics related to geometry and measurement with their content understanding and mathematical practices supported by appropriate technology and varied representational tools, including concrete models:

**Professional Standards**
**(**Specific content and objectives will include the following standards from **NCTM CAEP Mathematics Content for Elementary Mathematics Specialist (Addendum to the NCTM CAEP Standards 2012)**

**C.3. Geometry and Measurement**
To be prepared to support the development of student mathematical proficiency, all elementary mathematics specialists should know the following topics related to geometry and measurement with their content understanding and mathematical practices supported by appropriate technology and varied representational tools, including concrete models:

C.3.1 Core concepts including angle, parallel, and perpendicular, and principles of Euclidean geometry in two and three dimensions
C.3.2 Transformations including dilations, translations, rotations, reflections, glide reflections; compositions of transformations; and the expression of symmetry and regularity in terms of transformations.
C.3.3 Congruence, similarity and scaling, and their development and expression in terms of transformations
C.3.4 Basic geometric figures in one, two, and three dimensions (line segments, lines, rays, circles, arcs, polygons, polyhedral solids, cylinders, cones, and spheres) and their elements (vertices, edges, and faces)
C.3.5 Identification, classification into categories, visualization, two- and three-dimensional representations, and formula rationale and derivation (perimeter, area, and volume) of two- and three-dimensional objects (triangles; classes of quadrilaterals such as rectangles, parallelograms, and trapezoids; regular polygons; rectangular prisms; pyramids; cones; cylinders; and spheres)
C.3.6 Geometric measurement and units (linear, area, surface area, volume, and angle), unit comparison, and the iteration, additivity, and invariance related to measurements 3 NCTM CAEP Mathematics Content for Elementary Mathematics Specialist (2012)
C.3.7 Geometric constructions, axiomatic reasoning, and making and proving conjectures about geometric shapes and relations
C.3.8 Coordinate geometry including the equations of lines and algebraic proofs (e.g., Pythagorean Theorem and its converse)

C.3.9 Historical development and perspectives of geometry and measurement including contributions of significant figures and diverse cultures

**C.4. Statistics and Probability**

To be prepared to support the development of student mathematical proficiency, all elementary mathematics specialists should know the following topics related to statistics and probability with their content understanding and mathematical practices supported by appropriate technology and varied representational tools, including concrete models:
C.4.1 Statistical variability and its sources and the role of randomness in statistical inference
C.4.2 Construction and interpretation of graphical displays of univariate and bivariate data distributions (e.g., box plots and histograms), summary measures (mean, median, mode, interquartile range, and mean absolute deviation) and comparison of distributions of univariate data, and exploration of categorical (discrete) and measurement (continuous) data
C.4.3 Empirical and theoretical probability for both simple and compound events
C.4.4 Random (chance) phenomena and simulations
C.4.5 Historical development and perspectives of statistics and probability including contributions of significant figures and diverse cultures