

Youngstown State University
Department of Mathematics and Statistics
Course Syllabus for Mathematics 3768

Title: Integrated Algebra/Geometry for Middle School Teachers 2

Credit: 4 s.h.

Description: An integrated, conceptual, and function-centered approach to the foundations of algebra, geometry, and trigonometry for pre-service middle childhood mathematics specialists. Emphasis on multiple approaches and representations, problem solving, and communication of mathematical reasoning. Includes inquiry based laboratory experiences. Not applicable to the mathematics major.

Prerequisite: Level 5 on the Mathematics Placement Test or 1504 and 2665 for 3767 (or consent of the course coordinator), 3767 for 3768. Students who begin the concentration area late should seek advice from the course coordinator.

Texts: College Geometry, Musser, G. L. and Trimpe, L. E., Prentice Hall, 1994 for M3768, and

Academic Content Standards for K-12 Mathematics, Ohio Department of Education for both courses.

Goals: In this course future middle childhood mathematics specialists significantly extend their mathematics education beyond that traditionally required of K-8 generalists. In particular:

1. The conceptual and skill objectives for students in this course might be thought of as those which would well prepare them to teach Honors Geometry in the eighth or ninth grade. Implicit in this statement is the recognition that being well prepared to teach such a class implies a good understanding of mathematics related to, but well beyond, that which would typically comprise an Honors Geometry course.
2. Students will extend the mathematical thinking objectives developed in the Foundations of Middle School Mathematics sequence in a variety of ways. New tools of problem-solving, reasoning and the oral and written communication of mathematical reasoning will be developed that are appropriate for the more sophisticated mathematical content of this sequence. In particular, students will be expected to write clear and convincing proofs.
3. Students will learn how to use dynamical geometry software, such as Geometer's Sketchpad or Cabri Geometry, to illustrate results, to explore geometric concepts and to discover new relationships.

Topics: The primary focus of this course is a thorough treatment of geometry based on general principles and careful reasoning. Both synthetic and coordinate approaches will be taken to geometry.

- a. Review of geometric measurement. Length, perimeter, area, surface area, and volume of triangles, parallelograms, regular polygons, circles, prisms, pyramids, cylinders, cones, and spheres. Much of this should be familiar from M2665 and will be covered quickly in M3768.
- b. Synthetic geometry of lines, angles, and triangles. Vertical angles, parallel lines and transversals. Congruence of triangles, and theorems concerning their derived parts such as medians, altitudes, and angle bisectors. Constructions with straightedge and compass. Concurrency of perpendicular bisectors and angle bisectors.
- c. Synthetic geometry of quadrilaterals. Parallelograms, rhombi, kites, trapezoids, and rectangles. The distinction between definitions and properties; proving theorems with similar conclusions but different sets of hypotheses.
- d. Results about similarity and scale transformations. Using similar triangles both to prove theorems within geometry and in applications of geometry to other subjects. Trigonometric ratios and their applications to physics.
- e. Circles and their derived parts such as diameters, chords, radii, tangent lines. The relationship between inscribed and central angles.
- f. Analytic geometry. Formulas for distance and midpoints; equations of lines (parallel and perpendicular) and circles; applications to medians and altitudes; analytic proofs in geometry, including the concurrency of medians and altitudes.
- g. Transformational geometry. Translations, reflections, rotations, and similarity transforms from synthetic and analytic points of view. Introduction to complex arithmetic and the geometry of multiplication by i . Introduction to the circular functions and their use in calculating the precise result of a rotation.

Assessment: Students will be assessed through a variety of means including tests, quizzes, homework, oral presentations and demonstrations, and written projects. The specific mix of assessment tools will be left to the instructor. Students will be expected to:

1. Demonstrate their ability to solve standard and inverse problems related to the mathematics covered in the course.
2. Demonstrate their ability to represent fundamental mathematical concepts and ideas in a variety of ways using symbols, diagrams, pictures, charts, etc.
3. Demonstrate their ability to connect the mathematics covered in the course to applications of mathematics and to related topics within mathematics.

4. Demonstrate their ability to reason with the mathematical ideas of the course by finding patterns, making explanations and, very heavily emphasized in M3768, writing proofs.

Last day to Withdraw with a W: Friday, March 24, 2006

Students with Disabilities: In accordance with University procedure, if you have a documented disability and require accommodations to obtain equal access in this course, please contact the Office of Equal Opportunity and Disability Services at the beginning of the semester or when given an assignment for which an accommodation is required. Students with disabilities must verify their eligibility through the Office of Disability Services in Beeghly Hall, room 3310, (330-941-1372) intake procedure.

Semester: Spring 2006

Term Ends: May 14, 2006