

MATH 353
Euclidean and non-Euclidean Geometries (3 units)

Course Outline

Course Objectives: The purpose of this course is to teach Euclidean and Non-Euclidean Geometry, emphasizing the axiomatic development of geometry. The main outcomes are:

1. The student will understand the importance of undefined terms, definitions and axioms.
2. The student will understand what a MODEL of a set of axioms is and what it can tell you about axioms and theorems.
3. The student will understand the basic forms that a proof can take, such as a proof by contradiction, proof by cases and other types of direct proofs.
4. The student will be able to prove theorems from axioms, definitions and previous theorems.
5. The student will understand the differences between Euclidean Geometry and Non-Euclidean Geometries.
6. The students will get a brief introduction to Geometric Transformations and how geometry can be built from Group Theory.

Topics	# of Weeks
Chapter 1: Euclid's Elements, van Hiele Model of Geometric Thought	0.5
Chapter 2: Axiomatic Systems and Incidence Geometry	1.0
Chapter 3: Theorems, Proofs, and Logic	1.0
Chapter 4: Set Notation and the Real Numbers	0.5
Chapter 5: The Axioms of Plane Geometry	1.5
Chapter 6: Neutral Geometry	2.0
Chapter 7: Euclidean Geometry	2.0
Chapter 8: Hyperbolic Geometry	2.0
Chapter 9: Area	0.5
Chapter 11: Constructions	0.5
Chapter 12: Transformations	1.0
Exams	1.5

Textbook: Foundations of Geometry by Gerard A. Venema

Notes: Assign lots of problems showing that various results from Euclidean geometry are equivalent in Neutral geometry to the Parallel Postulate. Assign constructions with Straightedge and Compass and give an Introduction to Geometer's SketchPad, if time permits.

Adopted: May, 2007