

**NVCC COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 250 - COLLEGE GEOMETRY (3 CR.)**

Course Description

Presents topics in Euclidean and non-Euclidean geometries chosen to prepare individuals for teaching geometry at the high school level. Studies Euclid's geometry and its limitations, axiomatic systems, techniques of proof, and Hilbert's geometry, including the parallel postulates for Euclidean, hyperbolic and elliptic geometries. Lecture 3 hours per week.

General Course Purpose

This course is designed to fulfill Virginia's demand for a college level geometry course as part of the State's certification requirement for teaching mathematics at the secondary school level. The course should give the student understanding of the following:

- A. axiomatic systems in general
- B. valid and invalid techniques of proof
- C. relationships among Hilbert's axioms
- D. parallel axioms of Euclid, Lobachevsky and Riemann

Entry Level Competencies

Prerequisite: MTH 174 - "Calculus with Analytic Geometry II" or consent of the division.

Course Objectives

As a result of the learning experiences provided in this course, the student should be able to:

- A. define an axiomatic system and identify its parts
- B. determine whether a proof is valid or invalid
- C. supply the proper justifications, given a proof without justifications
- D. prove theorems, given a list of the available axioms and theorems
- E. construct simple models for the axiomatic systems discussed
- F. utilize appropriate software in solving geometric problems

Major Topics To Be Included

- A. Introductory topics: historic overview of Euclidean geometry
- B. Logic and Methods of Proof
 - 1. Reduction Ad Absurdum proofs
 - 2. Negation
 - 3. Quantifiers
 - 4. Implication
 - 5. Law of Excluded Middle
- C. Hilbert's Axioms
 - 1. Axioms of Incidence
 - 2. Axioms of Betweenness
 - 3. Axioms of Parallelism (Euclidean)
 - 4. Alternate Axioms of Parallelism (Hyperbolic and elliptic)
- D. Neutral Geometry
 - 1. Geometry without a parallel postulate

2. Saccheri-Legendre Theorem
 3. Angle Sum of a Triangle
- E. Euclidean Geometry
1. Equivalence of parallel postulates
 2. Sum of the angles of a triangle
 3. Independence of the parallel postulate
- F. Utilize dynamic geometry software
1. To perform standard compass and straightedge constructions
 2. Manipulate computer constructions to make conjectures about relationships