ROWAN UNIVERSITY
Department of Mathematics

Syllabus

Math 01.310 College Geometry

CATALOG DESCRIPTION:

Math 01.310 College Geometry 4 s.h.

(Prerequisites: C- or better in all of Math 01-230 Calculus III, Math 01-210 Linear Algebra, Math 03150 Discrete Math, and Phil 09-130 Introduction to Symbolic Logic)

This geometry course will use both synthetic and analytic approaches to study advanced concepts in Euclidean geometry, to introduce Non-Euclidean geometry, to explore the basics of Transformational geometry and Higher Dimensional geometry, and to trace the historical development of geometry. Computer use will be emphasized throughout the course.

OBJECTIVES:

This geometry course will use both synthetic and analytic approaches to study advanced concepts in Euclidean geometry, to introduce Non-Euclidean geometry, to explore the basics of Transformational geometry, and Higher Dimensional geometry. Computer use will be emphasized throughout the course. This course is designed primarily for prospective secondary school mathematics teachers. Thus its purpose therefore is to further the student understanding of axiomatic systems, to familiarize her/him with the differences and similarities between Euclidean and Non-Euclidean geometries, to trace the historical development of geometry, and to introduce selected advanced topics in the study of geometry.

COURSE OUTLINE:

I. Foundations of Geometry (Points, Lines, Segments, & Angles) via an axiomatic approach.

A. Historical Overview

B. An introduction to Axioms and Proof

C. Incidence Axioms

D. Betweeness, Segments, Rays, & Angles

E. Plane Separation Postulate, Angle Measure

II. Euclidean Geometry of Triangles, Quadrilaterals, and Circles via an axiomatic approach.

A. Congruence Relations

B. Similarity Relations

C. Quadrilaterals (including Ptolemy & Brahmagupta)

D. Circle Theorems

III. Alternative Concepts for Parallelism: Non-Euclidean Geometries

A. Historical Background of Non-Euclidean Geometries

B. Hyperbolic Geometry (in the Beltrami-Poincare Half-Plane Model)

C. Other Models for Hyperbolic Geometry

D. Spherical Geometry (Lenart Spheres)

IV. Transformational Geometry

A. Plane Transformations

B. Reflections, Translations, Rotations, Dilations & other transformations

C. Tessellations

D. Coordinate Characterizations

V. Higher Dimensional Geometry

A. Orthogonality & Parallelism in Space

B. Prisms, Pyramids, Cones, Cylinders, & Spheres

C. Volume and Surface Area in E3

D. Coordinates, Vectors, & Isometries in E3

VI. Fractal Geometry

VII. Convexity (Optional)

VIII. Projective Geometry (Optional)

POSSIBLE TEXTS:

*Kay, David C. College Geometry: A Discovery Approach. Addison-Wesley, 2nd Edition

Cederberg, Judith N. A Course in Modern Geometries. New York: Springer-Verlag, 1989.

Posamentier, Alfred S. Excursions in Advanced Euclidean Geometry. Menlo Park, CA: Addison-Wesley Publishing Company, 1984.

Smart, James. Modern Geometries, Fifth Edition. Monterey, CA: Brooks/Cole, 1998.

Sved, Marta. Journey into Geometries. Washington, D.C.: Mathematical Association of America, 1991.

Wallace, E. and West, S. Roads to Geometry, Second Edition. Upper Saddle River, NJ: Prentice Hall, 1998.