OFFICIAL SYLLABUS

Math 435, Foundations for Euclidean and Non-Euclidean Geometry

(Adopted - Spring 2004; Committee: Drs. J. Bryden, M. Hasty, C. Lu, J. Parish)

Catalog Description: Points, lines, planes, space, separations, congruence, parallelism and similarity, non-Euclidean geometries, independence of the parallel axiom. Riemannian and Bolyai-Lobachevskian geometries. Prerequisites: 250, 321, and either 320 or 350, or consent of instructor.

Course Description:

A. Euclidean Geometry.
   (1) The axioms of Euclidean Geometry.
   (2) Isometry, congruence, SSS, SAS, and ASA.
   (3) Parallel lines.
   (4) Pons Asinorum, The Star Trek lemma.
   (5) Similar Triangles, power of the point.
   (6) Medians, Centroid.
   (7) Incircle, Excircles, Circumcircle, the Law of Cosines, the Law of Sines
   (8) The Euler Line, the Nine Point circle.

B. Constructions using a compass and straightedge.
   (1) The Rules.
   (2) Some examples, Basic results.
   (3) The Algebra of constructible lengths.
   (4) The Regular Pentagon, other constructible figures.
   (5) Trisecting an arbitrary angle.

C. Hyperbolic Geometry.
   (1) Models. Results from Neutral Geometry.
   (2) Parallel and Ultraparallel lines.
   (3) Review of complex numbers. The Poincare upper half plane model.
   (4) Vertical (Euclidean) lines.
   (5) Isometris.
   (6) Inversion in the circle.
   (7) Fractional linear transformations. The cross ratio.
   (8) Translations, rotations, and reflections.
   (9) Lengths, the area of triangles.
   (10) The axioms of Hyperbolic Geometry.

D. Elliptic Geometry.
   (1) Introduction to Spherical Geometry.
   (2) The area of triangles
   (3) The geometry of spherical triangles.
   (4) The axioms.

Textbook: A survey of classical and modern geometries, with computer activities, by Arthur Baragar, Prentice Hall, 2001.

Sections to be covered in the textbook:

1. Chapter 1, Euclidean Geometry: sections 1.1 – 1.13
2. Chapter 3, Constructions using a compass and straightedge: sections 3.1-3.7
3. Chapter 6: Hyperbolic Geometry: sections 6.1, 2, and 4.
4. Chapter 7: The Poincare models of Hyperbolic Geometry: sections 7.1 – 13
5. Chapter 10: Spherical Geometry: sections 10.1, 10.3, 10.7, and 10. 8.

Any instructor should cover all of the material specified; additional sections are optional.