Spring 2011

MATH 352 — NON–EUCLIDEAN GEOMETRIES (3)

Course Description: Hyperbolic, other non–Euclidean geometries.

Pre: Math 351 or consent.

Content: There are several possible approaches to this course that cover different content but some of the content should be covered by any approach. These are:

(1) Hyperbolic geometry presented axiomatically or from the perspective of transformation groups.
(2) A presentation of the Klein model or the Poincaré model of hyperbolic geometry.
(3) Another non–Euclidean geometry, preferably one which has hyperbolic geometry as a subgeometry.

These topics can be supplemented by one or more of the following. The first four offer routes to the study of hyperbolic geometry.

(1) An introduction to Klein's Erlanger Programm.

(2) Projective geometry.

(3) Möbius geometry.

(4) Lorentzian geometry with connections to special relativity.

(5) Affine geometry.

(6) Elliptic geometry.

No guides to how much time should be spent on particular topics have been given since there are so many approaches to this course.

Possible Texts:

- Marvin J. Greenberg, *Euclidean and Non-Euclidean Geometry: Development and History,* 4^{th} *Edition*, W. H. Freeman and Company. (This gives an axiomatic approach to hyperbolic geometry.)
- Michael Henle, *Modern Geometries: Non–Euclidean, Projective and Discreter,* 2^{nd} *Edition*, Prentice Hall. (This presents the Erlanger Progamm and hyperbolic geometry as a subgeometry of Möbius geometry.)
- Patrick J. Ryan, *Euclidean and Non–Euclidean Geometry: An Analytic Approach*, Cambridge University Press. (This presents a transformations group approach to geometry.)

Course and program objectives: The development of the ability to formulate definitions, present examples and counterexamples, as well the ability to write direct proofs, indirect proofs and proof by cases should be emphasized.