Math 139 – Plane Analytic Geometry
Course Syllabus

Course description: Beginning course in plane analytic geometry including the straight line, the circle, parabola, hyperbola, and the transformation of coordinates.

Credit hours: 3

Course Prerequisites and Corequisites: MTH 133 and MTH 138 or the equivalent.

Course outline:	Approximate time spent
Introduction to plane analytic geometry	20%

- **Introduction to plane analytic geometry** — 20%
  - Points in the Cartesian plane
    - Distance formulas
    - Point of division formulas
  - Analytic descriptions of lines
    - Inclination
    - Slope
    - Angle from one line to another
  - Graphs of curves
    - Points of intersection of curves
    - Equation of a locus of points
- **Vectors in the plane** — 5%
  - Geometric and component representations of vectors
  - Dot products and angles between vectors
  - Applications of vectors in geometry and physics
- **Lines** — 10%
  - Point-slope and two-point forms
  - Slope-intercept and intercept forms
  - General form
  - Distance from a point to a line
  - Families of lines
- **Conic sections** — 25%
  - Analytic definitions of the conic sections
  - Circles
  - Parabolas
  - Ellipses
  - Hyperbolas
- **Coordinate transformations** — 15%
  - Translation of axes
  - Rotation of axes
  - The general second degree equation
- **Curve sketching** — 15%
  - Domain, symmetry, intercepts, asymptotes
  - Graphs of polynomials
  - Graphs of rational functions

Approximate time spent

- **Polar coordinates and parametric equations**   10%
    - o Introduction to polar coordinates in the plane
    - o Conversion between rectangular and polar coordinates
    - o Graphs of polar equations
    - o Introduction to parametric equations of curves in the plane

Student Learning Outcomes (SLO): At the end of MTH 139, a student who has studied and learned the material should be able to:

1. Solve problems involving lengths and distances in the plane, including midpoint and point-of-division formulas.
2. Demonstrate understanding of the notions of slope and inclination of lines, including angles between lines, parallel lines, and perpendicular lines.
3. Recognize the relationship between equations in two variables and graphs in the plane and use the equations to find pertinent information such as points of intersection, and intercepts.

4. Perform arithmetical and geometric operations involving vectors in the plane.
5. Use vectors to solve geometric and physical problems.
6. Sketch graphs of and discuss relevant features of curves in the plane determined by certain equations (including lines, circles, parabolas, ellipses, hyperbolas, polynomial functions, rational functions, and features such as slope, inclination, center, radius, vertices, foci, axes, eccentricity, intercepts, asymptotes).
7. Determine equations of curves when given information that determines the curves.
8. Perform translations and rotations of the coordinate axes to eliminate certain terms from equations.
9. Model real world situations with equations of conics.
10. Use the polar coordinate system, relate it to the rectangular coordinate system, and graph equations using polar coordinates.
11. Sketch graphs in the plane determined by parametric equations by direct sketching as well as elimination of the parameter to obtain a rectangular equation.

There are no specific program learning outcomes for this major addressed in this course. It is a general education core curriculum course and/or a service course.

Date of document: 08/27/2010