Course Title: Plane Curves & Analytic Geometry

Course Code: MATH-102

Course Type: Major Math

Prerequisites: Single Variable Calculus

Credit Hours: 3 (3 + 0)

Course Objectives:
After completion of this course, the students will be able to:

- Analyze and classify conic sections, and represent curves using polar coordinates and parametric equations.
- Master the concepts and properties of conic sections, including circles, parabolas, ellipses, and hyperbolas.
- Apply analytic geometry to three-dimensional space, utilizing various coordinate systems and equations of lines and planes.

Course Contents:

Plane Curves: Conic section and quadratic equations, Classifying conic section by eccentricity, Translation and rotation of axis, Properties of circles, parabolas, ellipses, and hyperbolas. Polar coordinates, Conic sections in polar coordinates, Polar curves and their sketching, Tangents and normal, Pedal equations, Parametric representations of curves.

Vectors and Three-dimensional Space: Three-dimensional coordinate systems, Vectors in plane and space, Dot product, Cross product, Vector-valued functions and space curves, Derivative and integral of vector- valued functions.

Analytic Geometry of Three Dimensions: Rectangular coordinates system in a space, Cylindrical and spherical coordinate system, Direction ratios and direction cosines of a line, Equation of straight lines and planes in three dimension, Cylinders and quadric surfaces.

Recommended Books:

1. Anton, H., Bevens, I. and Davis, S., *Calculus*, John Wiley & Sons, Inc., 12th edition, 2022.
2. Edward, C.H., *Calculus and Analytic Geometry*, Prentice Hall College Div. 3rd edition, 1990.
3. Hallett, D. H. and Gleason, A. M., *Calculus: Single and Multivariable*, Wiley, 8th edition, 2020.
4. Mendelson, E. and Ayres, F., *Calculus, Schaum's outlines series*, McGraw-Hill, 4th edition, 1999.
5. Thomas, G. B. and Finney, R. L., *Calculus*, Addison Wesley Publishing Company, 11th Edition, 2005.

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