Module Code:	Math - 103
Module title:	Mathematics A – II (Plane curves & Analytic Geometry)
Name of Scheme:	BS Chemistry (4 Years)
Semester :	2nd
Module Type:	General
Module Rating:	3 Credits

1. Introduction of the Course:

This is a beginning course in plane analytic geometry emphasizing the correspondence between geometric curves and algebraic equations. This correspondence makes it possible to reformulate problems in geometry as equivalent problems in algebra, and vice versa. Curves studied include straight lines, circles, parabolas, ellipses, and hyperbolas. Coordinate transformations, polar coordinates, and parametric equations are also studied. The course assumes a sound background in algebra, geometry, and trigonometry.

2. Course Objectives:

The course is designed:

1. To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
2. To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
3. To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
4. To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
5. To interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
6. To recognize the limitations of mathematical and statistical models.
7. To develop the view that mathematics is an evolving discipline, interrelated with human culture, and understand its connections to other disciplines.

3. Course Contents

1. Plane Analytics Geometry
   - Conic section and quadratic equations.
   - Classifying conic section by eccentricity.
   - Translation and rotation of axis.
   - Properties of circle, parabola, ellipse, hyperbola.
   - Polar coordinates, conic sections in polar coordinates.
   - Graphing in polar coordinates.
   - Tangents and normal, pedal equations, parametric representations of curves
2. Applications of Integration.

- Asymptotes.
  Relative extrema, points of inflection and concavity.
- Singular, points, tangents at the origin
- Graphing of Cartesian and polar curves.
- Area under the curve, area between two curves
- Arc length and intrinsic equations
- Curvature, radius and centre of curvature.
- Involute and evolute, envelope.

3. 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 dimensions.
   - Shortest distance between skew lines.
   - Equation of sphere, cylinder, cone, ellipsoids, paraboloids, hyperboloids.
   - Quadric and ruled surfaces.
   - Spherical trigonometry. Direction of Qibla.

4. Teaching-learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar/ Workshop

5. Learning Outcome:

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.

6. **Assessment Strategies**:

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
5. Tests

7. <u>Recommended Readings</u>:

1. Thomas, Calculus, 11 th Edition. Addison Wesley publishing company, 2005.
2. H. Anton, I. Bevens, S. Davis, Calculus, 8 th Edition, John Wiley & Sons, Inc. 2005.
3. Hughes-Hallett, Gleason, McCallum, et al, Calculus Single and Multivariable, 3rd Edition. John Wiley & Sons, Inc. 2002.
4. Frank A. Jr, Elliott Mendelson, Calculus, Schaum's outlines series, 4th edition,
5. 1999.
6. C.H. Edward and E.D Penney, Calculus and Analytics Geometry Prentice.
7. Hall, Inc. 1988.
8. E. W. Swokowski, Calculus and Analytic Grometry PWS Publishers, Boston, Massachosetts, 1983.

9. Dennis G. Zill & Patric D. Shanahan, Complex Analysis, Jones & Barlett Publishers, 2003.