Semester*	**: II**
Course Type	**:** DSC
Course Code**	**:** MATDSC151
Name of the Course	**:** Analytical Geometry
Learning level***	**:** 199
Credits	**:** 3
Contact Hours	**:** 50
Total Marks	**:** 100
End Semester Marks	**:** 70
Internal Marks	**:** 30

Course Objective

The main objective of this course is to introduce orthogonal transformation, pair of straight lines, some basic idea of circles, parabola, hyperbola, ellipse, determination of pole and polar *w.r.t.* to them. This course further explains the shortest distance and its equation, definition of sphere, great circle and related problems. It also describes cone and cylinder under various conditions.

Unit – I

Change of origin, invariants in orthogonal transformation, pair of straight lines, bisector of angles between pair of straight lines.

Unit – II

Orthogonal circles, radial axis, radical centre of three circles, circles through intersection of two circles, circles through intersection of a circle and a straight line, condition of tangency of a straight line to a circle, parabola, ellipse and hyperbola.

Unit – III

Definition, equation of polar of a point with respect to a circle, parabola, ellipse and hyperbola, determination of the pole of a straight line with respect to a circle, parabola, ellipse and hyperbola, polar equation of a conic in the form $\frac{1}{r} = 1 + e\cos\theta$, equation of chord and tangent, related problems.

Unit – IV

Shortest distance and equation of shortest distance line, general equation of a sphere, sphere through origin and having intercepts on the axes, section of a sphere by a plane, great circle, sphere through a given circle, the curve of intersection of two spheres, tangent plane to a sphere at a given point on it, condition of tangency of a given plane to be a tangent plane to a sphere.

Unit – V

Cone with vertex at a given point and a given curve as base, equation of a right circular cone with vertex is at a point other than origin, cylinder, equation of a cylinder, equation of a right circular cylinder, related examples.

Textbook:

1. J.G. Chakraborty and P.R. Ghosh, Advanced Analytical Geometry, 14th ed., U.N. Dhur and sons, 1987.

Reference books:

1. S.L. Loney, The Elements of Coordinate Geometry, 17th ed., Arihant Publication (India), 2023.
2. B. Das, Analytical Geometry with Vector Analysis, 1st rev. ed., Orient Book Company, 2018.

Course Learning Outcome

After completion of the course, learners will be able to

1. Know about transformation of co-ordinate axes, pair of straight lines, angle between pair of straight lines, orthogonal circles, radical axis, parabola, hyperbola and ellipse.
2. Know about how to determinate the pole and polar *w.r.t.* circle, parabola, hyperbola, ellipse and polar form of conics.
3. Know about spheres, formula to find shortest distance and great circles, etc.
4. Know about definition of cone, right circular cone, cylinder, right circular cylinder and its related problems.