MATH-II TRIGONOMERTY AND ANALYTICAL GEOMETRY

Course Code: SH 105

Lecturer: 3 **Year: I**
Tutorial: 2 **Part: II**
Practical: **Course Code: 3**

Course Objective:

- To develop students' ability to visualize and understand geometric shapes, figures, and spatial relationships in two and three dimensions.
- To acquire knowledge in coordinate transformations, conic sections, general equations of the second degree, planes, 3D lines, spheres, and spherical trigonometry.
- To improve analytical and problem-solving abilities for real-world engineering applications.

Credit Hours	Teaching Schedule Hours/Week			Evaluation Scheme				
				Internal Evaluation		Final Evaluation		Total
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	100
3	3	2	-	40	-	60	-	

Course Description:

Unit 1: Transformation of Coordinates **[5 Hours]**

1.1 Translation and rotation of axes
1.2 Combination of translation and rotation of axes
1.3 Invariants
1.4 Removal of the first-degree terms
1.5 Removal of xy −terms

Unit 2: General Equation of Second Degree **[8 Hours]**

2.1 General equation of second degree and the associated conics
2.2 Nature of the conic
2.3 Axis and Latus rectum of the parabola
2.4 Centre of a conic
2.5 Lengths and position of the axes of central conic $ax^2 + 2hxy + by^2 = 1$
2.6 Equations of tangent and normal
2.7 Equations of Chord of contact and Polar
2.8 Equation of Diameters and Conjugate Diameters

Unit 3: Conics in polar forms **[7 Hours]**

3.1 Introduction to Polar Coordinates
3.2 Polar Equation of a conic
3.3 Equation of Directrix of a conic

3.4 Equation of chord joining two points of a conic
3.5 Chord of contact of a point
3.6 Equations of tangent and normal
3.7 Equation of the asymptotes of a conic
3.8 Pole and equation of Polar of a point

Unit 4: Plane **[6 Hours]**

4.1 Equation of plane in different forms
4.2 Angle between two planes
4.3 Plane through three points
4.4 Plane through the intersection of two planes

Unit 5: Straight line in 3D **[6 Hours]**

5.1 General equation of a straight line
5.2 Equation of a straight line in a symmetrical form
5.3 Transformation from general form to the symmetrical form
5.4 Angle between the line and a plane
5.5 Coplanar Lines
5.6 Shortest distance

Unit 6: Sphere **[6 Hours]**

6.1 General Equation of a Sphere
6.2 Equation of a sphere on the line joining two given points as a diameter
6.3 Intersection of two spheres
6.4 Sphere through a given circle
6.5 Equation of a tangent plane and condition of tangency

Unit 7: Spherical Trigonometry **[7 Hours]**

7.1 Great circle and small circle
7.2 Axis and pole of a circle
7.3 Properties of poles
7.4 Spherical radius, Secondaries
7.5 Spherical angle and its measurement
7.6 Length of arc of a small circle
7.7 Spherical triangle, Polar triangle and their properties
7.8 Fundamental formulae with proofs

Text Books:

1. Analytical Geometry (Two Dimensional) by M.R. Joshi and Jeevan Kafle, Sukunda Pustak Bhawan, Kathmandu
2. A Text Book of Three Dimensional Geometry by Y.R. Sthapit and B.C Bajracharya, Sukunda Pustak Bhawan, Kathmandu
3. Spherical Trigonometry and Spherical Astronomy by B. Singh and H. D. Pandey, Pragati Prakashan, Meerut. India

Reference Books:

1. Geometry of Three Dimensional Co-ordinates by P. K. Jain and Khalil Ahmad, Wiley Eastern Ltd. New Delhi
2. A Text Book of Spherical Trigonometry and Spherical Astronomy by D. S. Pandey and S. K. D. Dubey Swastik Publication, India

Evaluation Scheme:

The final evaluation will have questions from all the units. The marks distribution for all the units will be as follows:

Units	Topics	Scheduled Hours	Marks
1	Transformation of Coordinates	5	7
2	General Equation of Second Degree	8	11
3	Coins in polar forms	7	9
4	Plane	6	8
5	Straight line 3D	6	8
6	Sphere	6	8
7	Spherical Trigonometry	7	9
Total		**45 Hours**	**60 Marks**

Note: The marks distribution shown in the table above might be subjected to minor changes.