# UNIVERSITY OF MADRAS

## B.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td>Title of the Course</td><td colspan="6">ANALYTICAL GEOMETRY (Two & Three Dimensions)</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE M3</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">134C2A</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td>--</td><td colspan="2">5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Necessary skills to analyze characteristics and properties of two-and three-dimensional geometric shapes.<br>• To present mathematical arguments about geometric relationships.<br>• To solve real world problems on geometry and its applications.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Polar and pole, conjugate points and conjugate lines-diameters – conjugate diameters of an ellipse.- semi diameters-conjugate diametersof hyperbola. Hours 15<br><br>Chapter 7: Sections: 7.2, 7.3 , Chapter 8 Section 8.2 – 8.5.</td></tr>
<tr><td colspan="6">UNIT-II: Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal. Equations of the asymptotes of a hyperbola. Hours 15<br><br>Chapter 10 : Sections : 10.1 – 10.8.</td></tr>
<tr><td colspan="6">UNIT-III: The plane – Transformation to the normal form – Determination of a plane under given conditions - System of Planes – Two sides of a plane - Length of the perpendicular from a point to a plane – Joint equation of two planes – Orthogonal projection on a plane.<br>Chapter 2: Sections : 2.3 –2.9. Hours 15</td></tr>
<tr><td colspan="6">UNIT-IV: Representation of line – line and a plane - co-planar lines – constants in the equations of a straight line – the shortest distance Between two skew lines- Length of the perpendicular from a point to a line - intersection of three planes.<br>Chapter 3: Sections: 3.1 to 3.8. Hours 15</td></tr>
<tr><td colspan="6">UNIT-V: Equation of a sphere – Definition – the sphere through four given points - Section of a sphere by a plane - equation of a circle - tangent plane - angle of intersection of two spheres- condition for the orthogonality of two spheres - radical plane.<br><br>Chapter 6: Sections: 6.1 – 6.8. Hours 15</td></tr>
<tr><td></td><td colspan="6">Total Hours:75</td></tr>
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| **Extended Professional Component is a part of internal component only, Not to be included in the External Examination question paper)** | Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved<br><br>(To be discussed during the Tutorial hour) |
| **Skills acquired from this course** | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill |
| **Recommended Text** | **1.** Analytical Geometry of 2D by P.Duraipandian- Muhil Publishers for **Unit 1 and Unit 2**<br>**2.** Analytical Solid Geometry of 3D by Shanthi Narayan and Dr.P.K. Mittal- S.Chand & Co. Pvt.Ltd.- for **Unit 3** to **Unit 5** |
| **Reference Books** | 1. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.<br>2. Analytic Geometry with Calculus, Robert C. Yates, Prentice Hall, Inc., New York, 1961.<br>3. Algebra and Trigonometry with Analytic Geometry, Earl W. Swokowski and Jeffery A. Cole, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010.<br>4. Analytical Geometry of Three Dimensions, William H. McCrea, Dover Publications, Inc, New York, 2006.<br>5. Calculus and Analytic Geometry,John F. Randelph, Wadsworth Publishing Company, CA, USA, 1969.<br>6. Analytic Geometry and Calculus with Vectors, Ralph Palmer Agnew, McGraw-Hill Book Company, Inc. New York, 1962. |
| **Website and e-Learning Source** | https://nptel.ac.in<br>https://www.mathhelp.com/ |

**Course Learning Outcome (for Mapping with POs and PSOs)**

Students will be able to

**CLO 1:** Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola

**CLO 2:** Find the polar equations of straight line and circle, equations of chord, tangent and normal and to find theasymptotes of hyperbola

**CLO 3:** Explain in detail the system of Planes

**CLO 4:** Explain in detail the system of Straight lines

**CLO 5:** Explain in detail the system of Spheres

| | POS | | | | | | PSOS | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 2 | 2 | 2 | 1 | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 2 | 2 | 1 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 2 | 1 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 1 |