UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

CORE-II: DIFFERENTIAL CALCULUS

<table>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE M2</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">134C1B</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td colspan="2">Lecture
4</td><td>Tutorial
1</td><td>Lab Practice
--</td><td colspan="2">Total
5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• The basic skills of differentiation, successive differentiation, and their applications.
• Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT-I: Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative – Standard Results – Fractional Expressions – Trigonometrical Transformation – Formation of Equations Involving Derivatives – Leibnitz Formula for n^{th} Derivative of a Product (Without proof) Hours 15

Chapter 3 Sections 1.1 – 1.6 and Section 2.1</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-II: Partial Differentiation: Partial Derivatives – Successive Partial Derivatives – Function of a Function Rule – Total Differential Coefficient – A special case – Implicit Functions. Hours 15

Chapter 8 Sections 1.1 – 1.5</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit III: Partial Differentiation (Continued): Homogeneous Functions – Partial Derivatives of a Function of Two Variables – Maxima And Minima of Functions of Two Variables – Lagrange's Method of Undetermined Multipliers. Hours 15

Chapter 8: Sections 1.6, 1.7, Sections: 4 and 5</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-IV: Envelope: Method of Finding Envelope – Another Definition of Envelope – Envelope of Family of Curves Which are Quadratic in the Parameter. Hours 15

Chapter: 10 Sections: 1.1 – 1.4</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-V: Curvature: Definition of a Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Coordinates, p - r equations; pedal equation of a curve.
Chapter: 10 Sections: 2.1–2.7. Hours 15</td></tr>
<tr><td colspan="2"></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. (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	Calculus Volume I -S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Publishers Pvt. Ltd. 2015
Reference Books	1. Introduction to Calculus and Analysis ,R. Courant and F. John, (Volumes I & II), Springer- Verlag, New York, Inc., 1989. 2. Calculus, T. Apostol, Volumes I and II. 3. Calculus and mathematical analysis, S. Goldberg.
Website and e-Learning Source	https://nptel.ac.in https://mathhelp.com

Course Learning Outcome (for Mapping with PLOs and PSOs)

Students will be able to

CLO 1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula

CLO 2: Find the partial derivative and total derivative coefficient

CLO 3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers

CLO 4: Find the envelope of a given family of curves

CLO 5: Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	-	-	-	3	2	1
CLO3	3	2	3	2	-	-	3	2	1
CLO4	3	2	3	2	1	-	3	2	1
CLO5	3	2	3	2	1	-	3	2	1