

**UNIVERSITY OF MADRAS**  
**B.Sc. DEGREE PROGRAMME IN PHYSICS**  
 SYLLABUS WITH EFFECT FROM 2023-2024

Year: I

Semester: I

<b>Title of the Course</b>		<b>MATHEMATICS – I</b> (Common to B.Sc Physics with CA, Chemistry, Computer Science, ECS, Data Science, Artificial Intelligence, Software Applications & BCA)					
<b>Paper Number</b>		<b>ELECTIVE COURSE I</b>					
<b>Category</b>	Elective	<b>Year</b>	I	<b>Credits</b>	3	<b>Course Code</b>	137E1A
		<b>Semester</b>	I				
<b>Instructional Hours per week</b>		<b>Lecture</b>	<b>Tutorial</b>	<b>Lab Practice</b>	<b>Total</b>		
		4	1	--	5		
<b>Pre-requisite</b>		12 <sup>th</sup> Standard Mathematics					
<b>Objectives of the Course</b>		<ul style="list-style-type: none"> <li>• Students gain knowledge about the basic concepts of Algebra, Theory of Equations.</li> <li>• They also gain the basic knowledge in Matrices, Trigonometry and Differential Calculus.</li> </ul>					
<b>Course Outline</b>		<b>UNIT-I: Summation of series:</b> Binomial series -Exponential series - Logarithmic series -Simple Problems. <span style="float: right;"><b>Hours: 15</b></span>					
		<b>Chapter 2: Sections: 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3.</b>					
		<b>UNIT II: Matrices:</b> Symmetric– Skew-Symmetric–Hermitian– Skew-Hermitian –Orthogonal and Unitary matrices– Cayley-Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem.  <b>Chapter 4: Sections: 4.1.1 –4.1.6, 4.5.2 and 4.5.3. Hours: 15</b>					
		<b>Unit III: Numerical Methods:</b> Newton’s method to find a root approximately. <b>Finite Differences:</b> Interpolation: Operators, $\Delta$ , $\nabla$ , E, $E^{-1}$ difference tables. Interpolation formulae: Newton’s forward and backward interpolation formulae for equal intervals, Lagrange’s interpolation formula. <span style="float: right;"><b>Hours:15</b></span> <b>Chapter 3: Sections 3.4.1. Chapter 5: Sections: 5.1 and 5.2.</b>					
		<b>Unit IV: Trigonometry:</b> Expansions of $\sin^n\theta$ , $\cos^n\theta$ in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series sines and cosines of multiples of “ $\theta$ ” - Expansions of $\sin\theta$ , $\cos\theta$ and $\tan\theta$ in a series of powers of “ $\theta$ ” – Hyperbolic and inverse hyperbolic functions . <span style="float: right;"><b>Hours:15</b></span> <b>Chapter 6: Section 6.1 – 6.3</b>					
		<b>Unit V: Differential Calculus:</b> Successive differentiation, n th derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems  <b>Chapter 1, Section 1.1 to 1.3.1. Hours: 15</b>					
		<b>Total Hours:75</b>					

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<b>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</b>	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
<b>Skills acquired from this course</b>	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
<b>Recommended Text</b>	Allied Mathematics, Volume I and Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications <b>Volume I: Unit I – IV, Volume II – Unit V</b>
<b>Reference Books</b>	1. Ancillary Mathematics by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai 2. Allied Mathematics by A. Singaravelu 3. Allied Mathematics by P.R. Vittal
<b>Website and e-Learning Source</b>	1. <a href="http://www.themathpaage.com">http://www.themathpaage.com</a> 2. <a href="http://nptel.ac.in">http://nptel.ac.in</a>

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

Students will be able to

**CLO 1:** Understand the concepts of Summation of Series.

**CLO 2:** Understand the concepts of Cayley Hamilton Theorem and inverse matrices.

**CLO 3:** Understand the concepts of finite differences.

**CLO 4:** Understand the knowledge about expansions, hyperbolic and inverse hyperbolic functions.

**CLO 5:** Understand the concept of Leibnitz theorem and functions of two variables

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	2	3	1	3	1	1	3	1	1
CLO 2	3	2	1	3	1	1	3	1	1
CLO 3	3	2	1	3	1	1	3	1	1
CLO 4	3	3	1	3	1	1	3	1	1
CLO 5	3	2	1	3	1	1	3	1	1