UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">LINEAR ALGEBRA
(Common to B.Sc Maths with Computer Applications)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE M13</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">334C6A</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td>--</td><td>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">• Vector Spaces, linear dependence and independence of vectors. Dual spaces, Inner product and norm – orthogonalization process.
• Linear transformations. Various operators on vector spaces</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT-I: Vector spaces – Subspaces – Linear Combinations and Linear span – System of linear equations – Elementary Matrices
Chapter: 1 Sections:1.1–1.4. Hours: 15</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-II: Linear Dependence and Linear independence – Bases - Dimensions – Homogenous Equations – Non-homogenous equations Row reduced – Echelon form. Hours: 15
Chapter 1: Sections :1.5,1.6., Chapter 2: Section: 2.7
Chapter 3: Section 3.4</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-III: Linear transforms, null spaces and ranges – Matrix representation of a linear transformation – Invertibility and isomorphisms – Dual spaces. Hours: 15
Chapter 2: Sections :2.1 –2.4 and 2.6.</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT – IV: Eigen values, Eigen vectors, Diagonalizability – Invariant subspaces – Cayley – Hamilton theorem. Hours: 15
Chapter 5: Sections:5.1,5.2 and 5.4.</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-V: Inner Products Space:Inner Products and norms Gram-Schmidt Orthogonalization Process – Orthogonal complements.
Chapter 6: Sections:6.1,6.2. Hours: 15</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)	**Total Hours: 75** 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	Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5th edition (2018) Pearson
Reference Books	1. Topics in Algebra,I.N.Herstein, Wiley EasternLtd. Second Edition, 2006. 2. University Algebra, N.S.Gopalakrishnan, New Age International Publications, Wiley Eastern Ltd. 3. First course in Algebra, John B.Fraleigh, Addison Wesley. 4. Linear Algebra and its Applications, David C. Lay, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007. 5. Introduction to Linear Algebra, S. Lang, 2nd Ed., Springer, 2005. 6. Linear Algebra and its Applications, Gilbert Strang, Thomson, 2007.
Website and e-Learning Source	https://nptel.ac.in https://www.mathhelp.com/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Acquire a detailed knowledge about vector spaces and subspaces

CLO 2: Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis

CLO 3: Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces

CLO 4: Find the Eigen values and Eigen vectors, to apply the concepts for diagonalisation

CLO5: Explain about Inner product and norms and to apply Gram Schmidt Orthogonalization Process to problems on inner product spaces

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