



**Mathematics Paper II**  
**Linear Algebra**  
**[CORE COURSE]**

<b>Semester: II</b>	<b>Credits: 2</b>	<b>Subject Code: BS22004</b>	<b>Lectures: 40</b>
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**Course Outcomes:**

**At the end of this course, the learner will be able to:**

- Apply computational techniques and algebraic skills essential for the study of systems of linear equations.
- Set up equations based on real life situations and solve system of linear equations.
- Describe  $R^2$  and  $R^3$  spaces, as well as conceptually extend these results to higher dimensions.
- Explain the concept/theory in linear algebra.
- Apply computational techniques and algebraic skills essential for
- Study of eigenvalues and eigenvectors, orthogonality and diagonalization. (Computational and Algebraic Skills).
- Recognize the basic applications of the chosen topics and their importance in the modern science and search engines.
- Explain applicability of Linear algebra.

<b>Unit 1: Introduction</b>	<b>2</b>
<ul style="list-style-type: none"> <li>• Matrix Operations</li> <li>• The Inverse of a Matrix</li> <li>• Characterizations of Invertible Matrices</li> </ul>	

<b>Unit 2: Linear Equations-I</b>	<b>8</b>
<ul style="list-style-type: none"> <li>• Systems of Linear Equations</li> <li>• Row Reduction and Echelon Forms</li> <li>• Vector Equations</li> <li>• The matrix equation <math>AX=B</math></li> <li>• Solution Sets of Linear Systems.</li> </ul>	

<b>Unit 3: Linear Equations-II</b>	<b>8</b>
<ul style="list-style-type: none"> <li>• Matrix Factorizations [Lu decomposition]</li> <li>• Linear Independence and Dependence</li> <li>• Introduction to Linear Transformation</li> <li>• The matrix of Linear Transformation</li> <li>• Dimension and Rank</li> </ul>	

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<b>Unit 4: Vector Spaces</b>	<b>12</b>
<ul style="list-style-type: none"><li>• Vector spaces</li><li>• Subspaces, Subspaces of <math>\mathbb{R}^n</math>.</li><li>• Null Spaces, Column Spaces and Linear Transformations.</li><li>• Linearly Independent Sets ; Bases</li><li>• Coordinate Systems</li><li>• The dimension of a Vector Space</li><li>• Rank</li></ul>	

<b>Unit 5: Eigenvalues and Eigenvectors</b>	<b>10</b>
<ul style="list-style-type: none"><li>• Eigenvalues and Eigenvectors</li><li>• The characteristic equation</li><li>• Diagonalization</li><li>• Eigenvectors and Linear Transformations</li><li>• Cayley Hamilton theorem(without proof)</li><li>• Applications</li></ul>	

**Recommended Text Books:**

- David C. Lay, Steven R. Lay JudiJ.McDonald *Linear Algebra and its Application*, Pearson Publication, Fifth Edition, 2016.  
Unit 1: Chapter 2: Sec. 2.1, 2.2, 2.3  
Unit 2: Chapter 1: Sec. 1.1, 1.2, 1.3, 1.4, 1.5  
Unit 3: Chapter 2: 2.5,2.8, 2.9, Chapter 1: 1.7, 1.8, 1.9  
Unit 4:Chapter 4: Sec.4.1, 4.2, 4.3,4.4, 4.5, 4.6  
Unit 5: Chapter 5: Sec. 5.1, 5.2, 5.3, 5.4

**Reference Books:**

- Gilbert Strang, *Introduction to Linear Algebra*, Wellesley- Cambridge Press, Fifth Edition
- Howard Anton, *Elementary Linear Algebra with supplemental Applications*, Wiley Student Edition, Fourth edition.

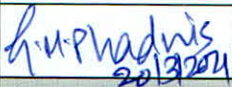
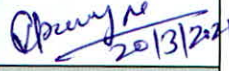
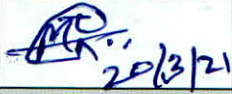
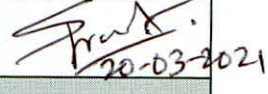

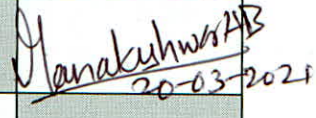

**E-Resources:**

- <https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/>
- <https://swayam.gov.in/>
- <https://nptel.ac.in/>

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Chairperson (HoD)	Ms. Gitanjali Phadnis	<i>G.M. Phadnis</i>



St. Mira's College for Girls, Pune  
(SY B.SC(CS) 2021-2024)

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