

Part A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Class: B.Sc. Sem. V	Year: 2024 Session: 2024-2025
1	Course Code	MSC-5	
2	Course Title	Linear Algebra	
3	Course Type	Discipline Specific Course (DSC)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: <ul style="list-style-type: none"> ➤ Understand vector spaces, subspaces, basis, dimension and their properties. ➤ Learn about properties of linear transformation and isomorphism theorems. ➤ Understand the concept of linear transformations. ➤ Understand the concept of Inner product spaces and their properties. 	
5	Credit Value	Theory & Tutorial: 4	
6	Total Marks	Maximum Marks : 100 (Ext. 80 + Int. 20)	Minimum Passing Marks : 40

Part B: Content of the Course		
UNIT	Topics	No. of Hours
I	Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.	15
II	Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation.	15
III	Eigen values and eigenvectors of a linear transformation. Cayley Hamilton theorem. Diagonalisation. Annihilator of a sub space. Bilinear, Quadratic and Hermitian forms.	15
IV	Inner Product Spaces: Cauchy Schwarz inequality. Orthogonal complements. Orthogonal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.	15

Part C - Learning Resource

Text Books, Reference Books, Other Resources

1. I. M. Gel'fand (1989). *Lectures on Linear Algebra*. Dover Publications.
2. Kenneth Hoffman & Ray Kunze (2015). *Linear Algebra* (2nd edition). Prentice-Hall.
3. Serge Lang (2005). *Introduction to Linear Algebra* (2nd edition). Springer India.
4. Gilbert Strang (2014). *Linear Algebra and its Applications* (2nd edition).
5. Nathan Jacobson (2009). *Basic Algebra I* (2nd edition). Dover Publications.
6. Nathan Jacobson (2009). *Basic Algebra II* (2nd edition). Dover Publications.

E-resources: <https://onlinecourses.nptel.ac.in>
<https://cpqp.inflibnet.aci.in>
<https://swayam.gov.in>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Comprehensive Evaluation (CCE): 20 Marks

Semester End Exam (SEE): 80 Marks

**Internal
Assessment:**
Continuous
Comprehensive
Evaluation(CCE)

Internal Test -02 of 10 Marks each
Assignment/Seminar-01 Of 10 Marks

Better marks out of
two test + obtained
marks in Assignment
shall be considered
against 20 marks

**Semester End
Exam (SEE)**

Paper-Two Section-A&B

Section-A: Objective and short answer type question-1x10+3x10= 40 Marks

Section-B: Descriptive answer type question Module wise- 10x4 =40 Marks

Amendment or Modification shall may be made by course coordinator as per situation or directed by
the department/Examination cell/NEP-20 Scheme coordinator

Name and signature of convener & member of BOS:

