LINEAR ALGEBRA

Total marks: 100(Theory: 75, Internal Assessment: 25)
5 Periods (4 lectures +1 students' presentation),

(1st Week)

Fundamental operation with vectors in Euclidean space $\mathbf{R}^n$, Linear combination of vectors, Dot product and their properties, Cauchy–Schwarz inequality, Triangle inequality, Projection vectors
Sections 1.1, 1.2 [1]

(2nd Week)

Some elementary results on vector in $\mathbf{R}^n$, Matrices: Gauss–Jordan row reduction, Reduced row echelon form, Row equivalence, Rank
Sections 1.3 (Pages 31 to 40), 2.2 (Pages 98 to 104), 2.3 (Pages 110 to 114, Statement of Theorem 2.3) [1]

(3rdWeek)

Linear combination of vectors, Row space, Eigenvalues, Eigenvectors, Eigenspace, Characteristic polynomials, Diagonalization of matrices
Sections 2.3 (Pages 114 to 121, Statements of Lemma 2.7 and Theorem 2.8), 3.4 [1]

(4th Week)

Definition and examples of vector space, Some elementary properties of vector spaces, Subspace
Sections 4.1, 4.2 (Statement of Theorem 4.3) [1]

(5thWeek)

Span of a set, A spanning set for an eigenspace, Linear independence and linear dependence of vectors
Sections 4.3 (Statement of Theorem 4.5), 4.4 [1]

(6thWeek)

Basis and dimension of a vector space, Maximal linearly independent sets, Minimal spanning sets, Application of rank: Homogenous and nonhomogenous systems of equations
Section 4.5 (Statements of Lemma 4.11 and Theorem 4.13) [1]
Section 6.6 (Pages 289 to 291) [2]

(7thWeek)

Coordinates of a vector in ordered basis, Transition matrix, Linear transformations: Definition and examples, Elementary properties

Section 6.7 (Statement of Theorem 6.15) [2]

Section 5.1 (Statements of Theorem 5.2 and Theorem 5.3) [1]

(8thWeek)

The matrix of a linear transformation, Linear operator and Similarity

Section 5.2 (Statements of Theorem 5.5 and Theorem 5.6) [1]

(9thWeek)

Application: Computer graphics- Fundamental movements in a plane, Homogenous coordinates, Composition of movements

Sections 8.8 [1]

(10th Week)

Kernel and range of a linear transformation, Dimension theorem

Sections 5.3 [1]

(11thWeek)

One to one and onto linear transformations, Invertible linear transformations, Isomorphism: Isomorphic vector spaces (to $\mathbf{R}^n$)

Sections 5.4, 5.5 (Pages 356 to 361, Statements of Theorem 5.14 and Theorem 5.15) [1]

(12th Week)

Orthogonal and orthonormal vectors, Orthogonal and orthonormal bases, Orthogonal complement, Projection theorem (Statement only), Orthogonal projection onto a subspace, Application: Least square solutions for inconsistent systems

Section 6.1 (Pages 397 to 400, Statement of Theorem 6.3), 6.2 (Pages 412 to 418, 422, Statement of Theorem 6.12), 8.12 (Pages 570 to 573, Statement of Theorem 8.12) [1]

REFERENCES:

[1] S. Andrilli and D. Hecker, Elementary Linear Algebra, Academic Press, 4/e (2012)

[2] B. Kolman and D.R. Hill, Introductory Linear Algebra with Applications, Pearson Education, 7/e (2003)