# 20SH2104 - APPLIED LINEAR ALGEBRA

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| Course Category: | Basic Science | Credits: | 2 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 2-0-0 |
| Prerequisite: | Intermediate Mathematics | Sessional Evaluation:  Univ. Exam Evaluation:  Total Marks: | 40  60  100 |
| Objectives: | * To learn handling of linear system of equations using matrix as a tool. * Understanding basic concepts of linear algebra to illustrate its power and utility through applications to computer science and Engineering. * To visualize of vectors in n-space which is useful in representing data * apply the concepts of vector spaces, linear transformations, matrices and inner product spaces in engineering. * solve problems in inner product spaces& Gram Schmidt orthogonal process. * To introduce matrix decompositions methods that reduce a matrix into constituent parts which make. | | |

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| Course Outcomes | Upon successful completion of the course, the students will be able to: | |
| CO1 | the abstract concepts of matrices and system of linear equations using decomposition methods |
| CO2 | the basic notion of vector spaces and subspaces |
| CO3 | apply the concept of vector spaces using linear transforms which is used in computer graphics and inner product spaces |
| CO4 | applications of inner product spaces in cryptography |
| CO5 | Use of wavelet in image processing. |
| CO6 | Theory of vector space in representing data. |
|  | Matrix operations in solving system of linear equations. |
|  | Matrix decomposition in solving system of equations |
| Course Content | UNIT-I  **Similarity and Diagonalization:**  Definition of similarity of matrices, diagonalization of matrices and its computation, eigenvalue decomposition of matrices, computation of powers of diagonalizable matrices.  UNIT-II  **Vector Spaces:**  Vector Spaces, Subspaces- Definition and Examples, Linear independence of vectors, Bases and dimension, Linear Span, Field-Definition  UNIT-III  **Vector space in:**  System of linear equations, row space, Column space and null space. relation between rank and nullity, consistency theorem, basis from a spanning set and independent set.  UNIT-IV  **Linear Transformations and applications:**  Linear transformations – Basic properties-invertible linear transformation - matrices of linear transformations - vector space of linear transformations – change of bases – similarity - Kernel and range, properties  UNIT-V  **Inner Product Spaces:**  Dot products and inner products – the lengths and angles of vectors – matrix representations of inner products- Cauchy-Schwarz inequality - Gram-Schmidt orthogonalisation.  UNIT-VI  **Matrix Factorization:**  LU decomposition, QR Decomposition and Projection - orthogonal projections | |
| Text Books &  References  Books | **TEXT BOOKS:**   1. Introduction to Linear Algebra, 5th Edition, Gilbert Strang, 2. Gilbert Strang Linear Algebra and It’s Applications, 4th edition, Cengage Learning, 3. Stephen Boyd, Lieven Vandenberghe, Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares, Cambridge University Press, 2018 4. W. Keith Nicholson, Linear Algebra with applications, 4th edition, McGraw-Hill, 2002.   **REFERENCE BOOKS:**   1. Higher Engineering Mathematics - H.K. Dass, Er. RajnishVerma, S. Chand Publication, New Delhi. 2. Engineering Mathematics -III - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad, S. Chand Publication, New Delhi 3. Special functions and complex variables (Engineering Mathematics-III) – Shahnaz Bathul, PHI, New Delhi. | |