(MT-272) - Linear Algebra And Geometry

Course Outline:

1. **Linear Algebra:**
    1. Linearity and linear dependence of vectors.
    2. Basis Vector.
    3. Dimension of a vector space.
    4. Field matrix and type of matrices (singular, non- singular, symmetric, non- symmetric, upper, lower, diagonal tri-diagonal matrix).
    5. Rank of a matrix using row operations and special method, echelon and reduced echelon forms of a matrix.
    6. Determination of consistency of a system of linear equation using rank, transitions matrix.
2. **Euclidean Spaces and Transformation:**
    1. Geometric representation of vector.
    2. Norm of vector.
    3. Euclidean inner product projections and orthogonal projections.
    4. Euclidean n spaces n properties Cauchy-Schwarz inequality.
    5. Euclidean transformations.
    6. Apply geometric transformations to plane figure composition of transformations.
3. **Application of linear Algebra:**
    1. Leontief Economic models.
    2. Electrical Networks
    3. Scaling, Translation, Rotation, and projection etc.
4. **Eigen values & Eigen Spaces**
    1. Interpret eigenvectors and eigenvalues of a matrix in terms of transformation it represents.
    2. Convert a transformation into a matrix eigen value problem.
    3. Find the eigenvalues and eigenvectors of order not more than 3×3 matrices algebraically.
    4. Determine the modal matrix for a given matrix, reduce a matrix to diagonal (form and Jordan form, state the Cayley-Hamilton theorem and use it to find powers and the inverse of a matrix.
    5. Understand a simple numerical method for finding the eigenvectors of a matrix.
    6. Use appropriate software to compute the eigenvalues and eigenvectors of a matrix.
    7. Define quadratic form and determine its nature using eigenvalues.
5. **Solid Geometry:**
    1. Coordinate Systems in three dimensions.
    2. Direction cosines and ratios, vector equation of a straight line, plane and sphere.
    3. Curve tracing of a function of two and three variables.
    4. Surfaces of revolutions.
    5. Transformations (Cartesian to polar & cylindrical).

Suggested Assessment:

Theory (100%)

- Sessional (20%)
- Quiz (12%)
- Assignment (8%)
- Midterm (30%)
- Final Term (50%)

Laboratory (100%)

Text and Reference Books:

1. Howard Anton, Elementary Linear Algebra, 11th Edition, ISBN: 9781118473504
2. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, ISBN: 9780980232776

3. Sheldon Axler, Linear Algebra Done Right, 3rd Edition, ISBN: 9783319110790
4. David C. Lay and Steven R. Lay, Linear Algebra and Its Applications, 5th Edition, ISBN: 9780321982384
5. Bernard Kolman and David Hill, Elementary Linear Algebra with Applications, 9th Edition, ISBN: 9780132296540
6. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, ISBN: 9780470458365
