



MANGALORE UNIVERSITY

DEPARTMENT OF MATHEMATICS

MSC MATHEMATICS

MTH 402	Linear Algebra -I	4 Credits (48 hours)
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Course Outcome: Students will have the knowledge and skills to explain the fundamental concepts of Matrix Operations, vector spaces, Linear Operators, Eigenvectors, The characteristic polynomial, Jordan form, the concepts Orthogonal matrices and Rotations, The matrix exponential, which is use to solve differential equations arsing in the fields like physics, chemistry, economics and also in biology. This course is a foundation for next course in Linear algebra.

Course Specific Outcome:At the end of the course students will have the knowledge and skills

- To develop techniques to work with matrices, Jordan form etc.
- To enhance one's skills in applying matrices to solve differential equations.
- To acquaint knowledge in the theory of vector spaces
- To acquaint knowledge in the theory of linear transformations.

Unit I - Matrix Operations:

Recapitulation of the basic operations, Block multiplication, Matrix units, **Row reduction**, The matrix transpose, Permutation matrices, **Determinants**, Other formulas for Determinant, The Cofactor matrix.

(12 Hours)

Unit II - Vector Spaces:

Subspaces of \mathbb{R}^n , Fields, **Vector Spaces, Bases and dimension**. **Computing with bases**, Directsums, Infinite Dimensional spaces.

(12 Hours)

Unit III - Linear Operators:

The dimension formula, The matrix of a linear transformation, Linear Operators, Eigenvectors, The characteristic polynomial, Triangular and Diagonal forms. Jordan form.

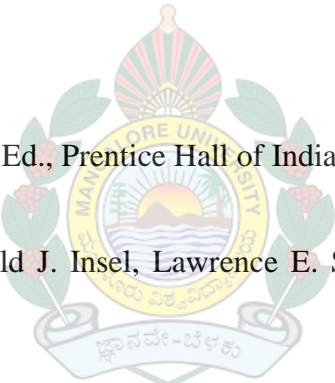
(18 Hours)

Unit IV - Applications of Linear Operators:

Orthogonal matrices and Rotations, Cayley-Hamilton Theorem, The matrix exponential.

(6 Hours)

References

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- [1] Michael Artin, *Algebra*, 2nd Ed., Prentice Hall of India, 2013.
- [2] Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra*, 4th Ed., Prentice Hall of India, 2014.
- [3] K. Hoffmann and R. Kunz, *Linear Algebra*, 2nd Ed., Prentice Hall of India, 2013.
- [4] Serge Lang, *Linear Algebra*, Addison Wesley, London, 1970.
- [5] Larry Smith, *Linear Algebra*, 3rd Ed., Springer Verlag, 1998.
- [6] Gilbert Strang, *Linear Algebra and its Applications*, 4th Ed., Cengage Learning, 2006.
- [7] S. Kumaresan, *Linear Algebra - A Geometric Approach*, PHI, 2003.