

Course Name	:	LINEAR ALGEBRA, DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
Course Code	:	MA 2302
Credits	:	4
L T P	:	3-0-2
Total No. of Lectures	:	42

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**Course Objectives:**

At the end of the semester, the students should be able to

1	Learn the various concepts associated with real vector spaces and theory of matrices
2	Learn the methods to solve ordinary differential equations of various types.
3	Learn the various concepts of vector calculus and their applications to problems.

	Lecture wise breakup	No. of Lectures
1	<b>ALGEBRA</b> Vector spaces over reals, Linear dependence, Basis, Dimension, Co-ordinates with respect to a basis, Change of basis, Subspace, Linear transformation $R^n \rightarrow R^m$ , Range space and Rank, Null space and Nullity, Rank and Nullity relation, Matrix representation of a linear transformation, Similar matrices, Invertible linear transformation, Eigenvalues and eigenvectors, Cayley Hamilton theorem, Diagonalization of a matrix.	16
2	<b>ORDINARY DIFFERENTIAL EQUATIONS</b> First order exact differential equations, Integrating factor, Orthogonal trajectories, Second and Higher order Linear Differential Equations with constant coefficients, Differential Operators, Methods of Variation of Parameters and Undetermined Coefficients, Euler Cauchy Equation, Wronskian.	12
3	<b>VECTOR CALCULUS</b> Gradient, Divergence and Curl – their physical interpretation, Line, Surface and Volume integrals, Green's theorem in the plane, Stoke's theorem, Divergence theorem, Applications to Science and Engineering.	14

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*Course Outcomes:*  
At the end of the semester, the students are able to

1	Solve the various problems related to real vector spaces and theory of matrices
2	Solve ordinary differential equations of various types
3	Apply various concepts of vector calculus to problems.

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*Text Books:*

1	Introductory Linear Algebra with Applications, Kolman, B. and Hill, D.R., 7 <sup>th</sup> edition, Pearson Education	2001
2	Advanced Engineering Mathematics, Kreyszig, 8 <sup>th</sup> edition, John Wiley and Sons.	2005

*Reference Books:*

1	Differential Equations, S. L. Ross, John Wiley and Sons, India	2004
2	Advanced Engineering Mathematics, Wylie and Barrett, 6 <sup>th</sup> edition, Mc Graw Hill.	2003
3	Differential Equations, Frank Ayers, SI edition, Mc Graw Hill.	1972

*Practical / Lab work to be performed using Mathematica/ Matlab*

1. Perform basic Matrix operations.
2. Find rank, eigenvalues and eigenspace of matrices.
3. Check diagonalizability of matrices.
4. Solve ordinary differential equation.
5. Plotting of second order solution family of differential equation.
6. Plotting of third order solution family of differential equation.
7. Plotting of vector fields.
8. Find Gradient, Divergence and Curl.
9. Computation of line integrals and surface integrals.
10. Verify Green's theorem in the plane, Stoke's theorem, Divergence theorem.

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