

Course Code	Course Title	Category	L	T	P	C
MA23111	LINEAR ALGEBRA & CALCULUS	BS	3	1	0	4
Common to I sem. B.E. –Computer Science and Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering, Biomedical Engineering and B.Tech. – Information Technology						

Objectives:

- To introduce the matrix techniques and to explain the nature of the matrix.
- To collect the matrix algebra techniques and the concepts of basis and dimension in vector spaces.
- To construct normalization of vectors and ortho-normal vectors.
- To understand techniques of calculus which are applied in the Engineering problems.
- To apply the techniques of Integration in finding area and volumes.

UNIT-I	MATRICES	12
Matrices - Eigenvalues and eigenvectors - Diagonalization of matrices using orthogonal transformation - Cayley-Hamilton Theorem(without proof)-Quadratic forms- Reduction to canonical form using orthogonal transformation- Numerical computation of Eigen value using Power method.		
UNIT-II	LINEAR TRANSFORMATION	12
Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range space and dimension theorem (without proof).		
UNIT-III	INNER PRODUCT SPACES	12
Inner product and norms - Gram Schmidt orthonormalization process - QR Factorization-Singular value decomposition.		
UNIT-IV	FUNCTIONS OF SEVERAL VARIABLES	12
Partial differentiation–Total derivative–Change of variables–Jacobians–Partial differentiation of implicit functions– Taylor’s series for functions of two variables–Maxima and minima of function of two variables–Lagrange’s method of undetermined multipliers.		
UNIT-V	MULTIPLE INTEGRALS	12
Double integrals–Change of order of integration–Area enclosed by plane curves–Triple integrals–Volume of solids– Numerical computation of double integrals-trapezoidal rule.		
Total Contact Hours:60		

Course Outcomes:

On completion of the course, students will be able to

- Demonstrate the matrix techniques in solving the related problems in engineering and technology.
- Apply the concepts of basis and dimension in vector spaces to the solution of related complex engineering problems.
- Construct orthonormal basis by the concepts of normalization in inner products and to analyse complex engineering problems.
- Interpret the problems in Engineering and Technology using the principles of mathematical calculus.
- Evaluate multiple integrals to conduct investigations of complex problems.

SUGGESTED ACTIVITIES

- Problem solving sessions
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

1.	Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	T Veerarajan , Linear Algebra and Partial Differential Equations, Mc Graw Hill Education,2019.
3.	Friedberg, A.H., Insel, A.J. and Spence, L., Elementary Linear Algebra, a matrix approach,2 nd edition, Pearson, 2014.
4.	T Veerarajan, Engineering Mathematics –I , McGraw Hill Education, 2018.
5.	Introduction to linear algebra, 5th Edition, Gilbert Strang, 2016. Wellesley Publishers.

Reference Books(s) / Web links:

1.	Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
2.	Erwin Kreyszig , " Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3.	Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 2006.
4.	Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Thomson Learning, 2020.
5.	Williams, G, “Linear Algebra with Applications”, Jones & Bartlett Learning, First Indian Edition, New Delhi, 2017.