

MATRICES AND CALCULUS**B.Tech. I Year I Sem**

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	TOTAL
23MA101	Basic Sciences	3	1	0	4	40	60	100
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil			Total Classes:64			

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

1. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of Eigen values and Eigen vectors and to reduce the quadratic form to canonical form
3. Geometrical approach to the mean value theorems and their application to the mathematical problems and evaluation of improper integrals using Beta and Gamma functions.
4. Partial differentiation and finding maxima and minima of function of two or more variables.
5. Evaluation of multiple integrals and their applications

Course outcomes: The student will be able to

1. Solve the system of Linear equations in various engineering problems
2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.

3. Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions
4. Find the extreme values of functions of two variables with/without constraints.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT - I: Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: linearly dependent and linearly independent solutions, Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method, L-U decomposition method

UNIT - II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT - III: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series, Maclaurin's series. Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)

Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Areas and volumes (by double integrals).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5 th Editon, 2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delh

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	PO12
CO-1	3	2	2	-	-	-	-	-	-	-	-	-
CO-2	3	2	2	-	-	-	-	-	-	-	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	-
CO-4	2	3	3	-	-	-	-	-	-	-	-	-
CO-5	2	3	2	-	-	-	-	-	-	-	-	-
CO	2.6	2.6	2.2	-	-	-	-	-	-	-	-	-

