

## MA1101BS: LINEAR ALGEBRA & CALCULUS

### B.Tech. I Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		CI A	SEE	TOTAL
MA1101BS	Basic Sciences	3	1	0	4	30	70	100
		Contact Classes: 48				Tutorial Classes: 16	Practical Classes: Nil	

#### Course Objectives: To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
4. Concept of Fourier Series.
5. Concept of nature of the series.
6. Geometrical approach to the mean value theorems and their application to the mathematical problems
7. Evaluation of surface areas and volumes of revolutions of curves.
8. Evaluation of improper integrals using Beta and Gamma functions.
9. Partial differentiation, concept of total derivative
10. Finding maxima and minima of function of two and three variables.

#### Course Outcomes: After learning the contents of this paper the student must be able to

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigen values and Eigen vectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Analyse the nature of sequence and series.
5. Solve the applications on the mean value theorems.
6. Evaluate the improper integrals using Beta and Gamma functions
7. Find the extreme values of functions of two variables with/ without constraints.

#### UNIT-1: Matrices

Matrices: Introduction. Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration method, **LU Decomposition Method.**

## **UNIT-2: Eigen values and Eigen vectors**

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

## **UNIT-3: Fourier series**

Definition of periodic function, Fourier expansion of periodic function in  $(0,2\pi)$  and  $(-\pi,\pi)$ . Determination of Fourier coefficients – Fourier series of even and odd functions – Half – Range Fourier Sine and Cosine expansions.

## **UNIT-4: Calculus**

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

## **UNIT-5: Multivariable calculus (Partial Differentiation and applications)**

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

### **TEXTBOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

### **REFERENCES:**

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010