Linear Algebra & Calculus
(Common to all branches)

Course Code	23BS1101	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	All Branches	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	NIL
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Interpret** the basic concepts of Linear algebra and Calculus. L2
CO2	**Apply** the echelon form to obtain the solution of system of linear equations and eigen vectors of a matrix. L3
CO3	**Apply** the concepts of calculus to find the series expansion and extremum of a given function, area enclosed by plane curves and volume of the solids. L3
CO4	**Analyze** the solution set of linear system of equations and nature of the quadratic forms. L4
CO5	**Analyze** the behavior of functions using mean value theorems, extremum of the given function and limits of integration for functions of several variables. L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2											1	
CO2	3											1	
CO3	3											1	
CO4		3						1	1			1	
CO5		3						1	1			1	

Syllabus		
Unit No.	**Contents**	**Mapped CO**
1	**Matrices:** Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.	CO-1,2,4

2	**Eigen values, Eigen vectors 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 OrthogonalTransformation.	CO-1,2,4
3	**Calculus** Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.	CO – 1,3,5
4	**Partial differentiation and Applications (Multivariable calculus)** Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.	CO – 1,3,5
5	**Multiple Integrals (Multi variable Calculus)** Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and tripleintegrals).	CO – 1,3,5

Learning Resources
Text Books
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Ed. 2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley, 2018, 10th Ed.
Reference Books
1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Ed. 2. R.K. Jain and S. R.K. Iyengar, Alpha Science International Ltd., 2021 Advanced Engineering Mathematics, 5th Ed.(9threprint). 3. Glyn James, Pearson publishers, 2018, Advanced Modern Engineering Mathematics, 5th Ed. 4. M. Greenberg, Pearson publishers, Advanced Engineering Mathematics, 9th Ed. 5. Higher Engineering Mathematics, H.K Das, Er. Rajnish Verma, S. Chand Publications, 2014, 3rd Ed. (Reprint2021).

E-Resources

1. https://nptel.ac.in/courses/111/108/111108157/
2. https://youtu.be/xDSejIvZmg4
3. https://nptel.ac.in/courses/111104125