	DPG Institute of Technology and Management **Sector 34, Gurugram HR 122004**
	Lesson Plan
	Course Name: Mathematics-I (Calculus and Linear Algebra)
	Faculty Name: DR. RITU BHATIA

No. of Lecture Hours/Week	**4(3L+1T)**	**Exam Hours**	**03 Hours**
Total No. of Lecture Hours	**52**	**Exam Marks**	**70**
Course Code:	**25BSC-MATH-103H**		

Course Objectives:

1. To enable students to understand and apply mathematical tools from calculus and linear algebra that are essential for solving engineering problems.
2. To introduce students to foundational calculus concepts such as mean value theorems, Taylor and Maclaurin series, curvature, and special functions.
3. To build a strong understanding of matrix algebra, equipping students to handle systems of linear equations.
4. To understand the structure of vector spaces, subspaces, basis, and dimension, and apply these concepts to analyze linear transformations and their matrix representations and familiarize students with concepts such as eigenvalues, eigenvectors, and inner product spaces.

Lecture No.	**Topics to be covered**	**Teaching Methodology**	**Class Activity/ Event**	**Remark/ CO**
Unit-1				
1.	Introduction to Indeterminate forms	Chalk &Talk		
2.	L' Hospital rule for finding limits	PPT/Smart board		
3.	Maxima and Minima of function	Chalk &Talk		
4.	Rolle's theorem and Lagrange's Mean Value theorem	Chalk &Talk		CO1
5.	Taylor's and Maclaurin's theorems with remainders	Chalk &Talk	Quiz/MCQ	
6.	Curvature and radius of curvature	Chalk &Talk		
7.	Evolutes and Involutes	Chalk &Talk		
8.	Evaluation of definite and improper integrals	Chalk &Talk		

9.	Application of definite integrals	Chalk &Talk	Group Discussion	
10.	Surface area and volume of revolution	Chalk &Talk		
11.	Beta and Gamma function	NPTEL https://youtu.be/LLX0UjUGL5w?si=M4ItPVE1hY2BqWXa		
12.	Properties of Beta and Gamma function	Smart Board		
13.	Doubt Session	Chalk &Talk		
14.	Class Test			
Unit-2				CO2
15.	Introduction to Matrices and Vectors	Chalk &Talk		
16.	Addition and scalar multiplication and Matrix multiplication	Chalk &Talk		
17.	Solution of system of linear equations	Chalk &Talk		
18.	Matrix method for solving linear equations	Chalk &Talk		
19.	Gauss Elimination method for solving linear equations	Chalk &Talk		
20.	Rank of a matrix	Chalk &Talk	Assignment	
21.	Gauss Jordan Method for finding inverse of matrix	PPT /Smart Board		
22.	Determinant and properties of determinant	Chalk &Talk		
23.	Numericals on determinant	Chalk &Talk		
24.	Cramer's rule for finding solution of linear equations	Chalk &Talk	Quiz	
25.	Doubt Session	Chalk &Talk		
26.	Class Test			
Unit-3				CO3
27.	Introduction to vector space	Chalk &Talk		
28.	Examples of Vector Space	PPT		

29.	Sub space and its examples	Chalk &Talk		
30.	Linear independence and dependence of vectors	Chalk &Talk		
31.	Definition of Basis and Dimension	NPTEL https://www.youtube.com/watch?v=ijdG7JK1CuE		
32.	Linear mapping and inverse of linear map	Chalk & Talk		
33.	Range and kernel of a linear map	Flip Class		
34.	Rank and nullity	Chalk & Talk		
35.	Rank nullity theorem	Chalk & Talk	Students Presentation	
36.	Matrix associated with a linear map	Chalk & Talk		
37.	Composition of linear maps	Chalk & Talk		
38.	Doubt Session	Chalk & Talk		
39.	Class Test			
Unit-4				
40.	Matrix and types of matrices	PPT		
41.	Symmetric and skew-symmetric matrices	Chalk & Talk		
42.	Orthogonal and Unitary matrices	Chalk &Talk		CO4
43.	Eigen values and eigen vectors	Chalk &Talk		
44.	Numericals on eigen values and eigen vectors	Chalk &Talk	Group Discussion	
45.	Diagonalization of matrices	Chalk &Talk		
46.	Inner product spaces	Chalk &Talk		
47.	Gram Schmidt orthogonalization	NPTEL https://www.youtube.com/watch?v=DbAdBzWnTD8		
48.	Different examples	Chalk &Talk		
49.	Doubt Session	Chalk & Talk		
50.	Class Test			
	Content Beyond Syllabus			
51.	Eigen values and eigen vectors	PPT		
52.	Surface area and volume	PPT and NPTEL video		

Reference/Text Books:

1. Reena Garg, AICTE's Prescribed Textbook: Mathematics-I (Calculus and Linear Algebra),Khanna Book Publishing Co.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4. D. Poole, Linear Algebra: A Modern Introduction, Brooks Cole.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
8. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East– West Press Private limited.

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Define the concepts and terminology of calculus including curvature, beta and gamma functions, linear differential and integral calculus to notions of evolutes, maxima, minima, volume and surface area of solid of revolution and understand the significance and contribution of various theorems and methods such as Rolle's Theorem, Lagrange's mean value Theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's Theorems.
CO2	Understand the concept of matrices, rank of matrix, normal form, solution of system of linear equations. Gauss elimination method.
CO3	Define vector spaces and sub-spaces, basis and dimension of vector spaces, Rank-Nullity Theorem, linear transformation, Matrix associated with linear map.
CO4	Evaluate eigenvalues, eigenvectors of matrix, eigen bases and Diagonalization, inner product spaces and Gram-Schmidt orthogonalization process.

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1		1	1				1	2	3	2	1	2
CO2	2	1	3	2	2		1		2	2	2	3	2	2	2
CO3	2	1	3	2	2		1		2	2	2	3	2	2	2
CO4	2	1	3	2	2		1		2	2	2	3	2	2	2

Signature of Staff In-charge

Dr. Ritu Bhatia

Signature of HOD

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