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

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-101H**		

Course Objectives:

1. To provide students with a clear understanding of calculus concepts, and their applications in solving engineering problems.
2. To introduce students to the theory of sequences and series, including convergence tests and Fourier series.
3. To help students grasp the fundamentals of multivariable differential calculus, including partial derivatives, extrema, and vector calculus concepts.
4. To develop the ability to solve problems involving matrices, including determinants, rank, inverse, and systems of linear equations and familiarize students with matrix concepts such as eigenvalues, eigenvectors and diagonalization.

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				
15.	Introduction to sequence and series	Chalk &Talk		
16.	Convergence and divergence of the sequences	NPTEL https://youtu.be/vfg1mmsSMMM?si=DnmC7zojdzflc4uW		
17.	Power series and Taylor's series	Chalk &Talk		CO2
18.	Numericals on power series and Taylor' series	Chalk &Talk	Assignment	
19.	Series for exponential and logarithmic function.	Smart Board		
20.	Series for trigonometric function	Smart Board		
21.	Numericals on Fourier series	Chalk &Talk		
22.	Half range sine and cosine series	Chalk &Talk		
23.	Parseval's theorem	Chalk &Talk		
24.	Doubt Session	Chalk &Talk		
25.	Class Test			
Unit-3				
26.	Limit and continuity of a function	Chalk &Talk		CO3
27.	Partial derivatives	PPT		

28.	Total derivatives	Chalk &Talk		
29.	Tangent plane and Normal line	Chalk &Talk		
30.	Maxima, minima and saddle point	NPTEL https://youtube.com/playlist?list=PLtKWB-wrvn4nA2h8TFxzWL2zy8O9thfy&si=9Z_BATbXYwo01fDU		
31.	Lagrange multipliers	Chalk & Talk		
32.	Gradient, Curl and Divergence	Flip Class		
33.	Directional derivatives	Chalk & Talk	Students Presentation	
34.	Doubt Session	Chalk & Talk		
35.	Class Test			
Unit-4				
36.	Matrix and types of matrices	PPT		
37.	Symmetric and skew-symmetric matrices	Chalk & Talk		
38.	Orthogonal and Unitary matrices	Chalk &Talk		
39.	Solution of system of linear equations	Chalk &Talk		
40.	Matrix method and Gauss Elimination method	Chalk &Talk	Quiz	CO4
41.	Gauss Jordan Method for finding inverse of matrix	PPT		
42.	Rank of a matrix	Chalk &Talk		
43.	Rank-nullity theorem	Chalk &Talk		
44.	Determinant and properties of determinant	Chalk &Talk	Group Discussion	
45.	Eigen values and eigen vectors	Chalk &Talk		
46.	Cayley-Hamilton theorem	Chalk &Talk		
47.	Diagonalization of matrices	Chalk &Talk		
48.	Orthogonal transformation	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		

Reference/ Text Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.

2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.

3. Veera Rajan T., Engineering Mathematics for first year, Tata McGraw-Hill Publishing Company Limited.

4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.

5. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.

6. P. Sivaramakrishna Das and C. Vijyakumari, Engineering Mathematics, Pearson Education.

7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course Outcomes:

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

CO1:	Define the concepts and terminology of calculus including maxima and minima, curvature, evolute and involutes, Beta and Gamma functions and integral calculus to evaluate surface area and volume of solid of revolutions. Understand the significance and contribution of various concepts/ theorems/ methods such as Rolle's Theorem, Lagrange's mean value Theorem, Cauchy's mean value Theorem, Taylor's and Maclaurin's Theorem with remainder.
CO2:	Classify and justify the nature of sequence and series, Power series, Fourier series, Half range and cosine series, convergence of sequence and series, Various test for convergence.
CO3:	Understand Euler's Theorem, Lagrange's method of undetermined multipliers, gradient, directional derivatives, curl and divergence, maxima and minima of functions, partial derivatives, total derivative.
CO4:	Understand the concept of matrix and determinants, rank of a matrix, normal form, eigenvalues and eigenvectors, the solution of system of linear equations and evaluate eigenvalues and eigenvectors of a matrix and Cayley Hamilton Theorem.

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

Dr. Simpi Mehta