

Program	B.Tech.				
Year	1	Semester		1	
Course Name	Matrices and Calculus				
Code	NBS4101				
Course Type	BSC	L	T	P	Credit
Pre-Requisite	10+2 Mathematics	3	1	-	4
Course Objectives	<p>The general objectives of the course are to introduce:</p> <p>The concepts of matrix algebra, methods of solving system of linear equations and determine Eigen values and Eigen vectors of a matrix.</p> <p>The concepts of the Eigen values and Eigen vectors of Hermitian, Unitary and Normal matrices differ from those of general matrices.</p> <p>The concepts of derivatives of functions (one and several variables) and their applications.</p> <p>The concepts of multiple integration, Beta, Gamma functions and their applications.</p> <p>The concepts of vector calculus to expose students to mathematical applications.</p>				
Course Outcomes:					
CO1	To demonstrate ability to manipulate matrices, to find rank and to solve the system of linear equations, Eigen values, Eigenvectors and use them in application of engineering problems.				
CO2	To find nth derivative by using Leibnitz theorem and apply partial derivatives to study Extrema & Expansion of functions of two variables.				
CO3	To evaluate double integrals by changing variables, changing order and triple integration to find the area and volume of given region, solve double and triple integrations and apply it to calculate line, surface and volume integrals.				
CO4	To calculate line integrals along piecewise smooth paths, interpret such quantities as work done by a force. Apply Green's theorem to evaluate line integrals along simple closed contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and Divergence theorem to give physical interpretation of the divergence of a vector field.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	<b>Matrices:</b> Type of Matrices, Elementary row and column transformation, Rank of matrix, Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors, Application of matrices to engineering problems.	15	CO1
2	<b>Differential Calculus:</b> Leibnitz theorem, Partial differentiation, Euler's theorem, Expansion of function of several variables, Jacobian, Extrema of functions of several variables, Lagranges method of multipliers (simple applications)	15	CO2
3	<b>Multiple Integrals:</b> Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Application to area, volume, Dirichlet integral and applications.	15	CO3
4	<b>Vector Calculus:</b> Point function, Gradient, divergence and	15	CO4



	curl of a vector and their physical interpretations, Line, surface and volume integrals, Statement and problems of Green's, Stoke's and Gauss divergence theorems (without proof).		
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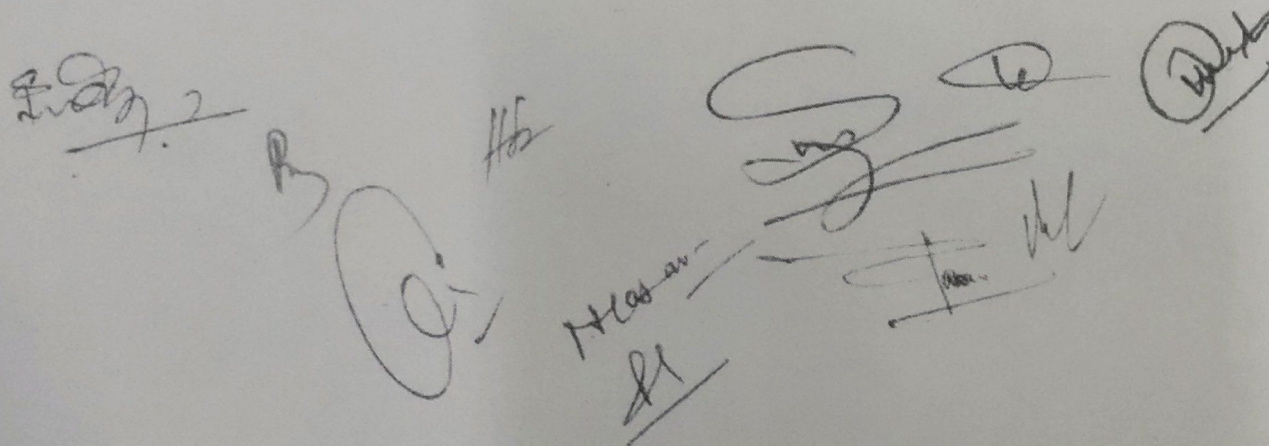
### Suggested Readings

- 1.B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
- 2.B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
- 3.E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.

### Online Resources

- 1.<https://nptel.ac.in/courses/122104018>
- 2.[https://onlinecourses.nptel.ac.in/noc23\\_ma88/preview](https://onlinecourses.nptel.ac.in/noc23_ma88/preview)

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


 A collection of handwritten signatures and initials in black ink. On the left, there is a signature that appears to be 'Raj'. In the center, there are several initials, including 'H5' and a large 'G'. To the right, there are more signatures, one of which is circled. At the bottom center, there is a signature that looks like 'Hassan' with 'SI' written below it.