BLOW UP SYLLABUS

Course Name: Calculus and Linear Algebra: CSE Stream

Course Code: 1BMATS101 (Effective from the academic year 2025-26)

Topics	**Topics To be Covered**	**Remarks**
Module-1: Calculus		
Partialdifferentiation,totalderivative, differentiationofcompositefunctions,Jacobian, Statement of Taylor'sandMaclaurin'sseriesexpansionfortwovariables. Maxima and minima for the function of two variables.	Discussion restricted to Jacobian. No verification on properties of Jacobian that is $JJ^{1} = 1$. No restriction on other topics.	In the Semester End Examination (SEE), under the expansion of functions as series, the question paper will restrict problems only to Maclaurin's series expansion, and not on Taylor's series expansion.
Module-2: Vector Calculus (8Hours Theory) + (4Hours Tutorials)		
Scalarandvectorfields,Gradient,directionalderivatives,divergence and curl-physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Introduction to polar coordinates and polar curves. Curvilinear coordinates:Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality.	Only the introduction to Polar Coordinates and Polar Curves is included in the syllabus; problem-solving based on this topic is not prescribed.	
Module-3: System of Linear Equations, Eigenvalues and Eigenvectors (8Hours Theory) + (4Hours Tutorials)		
Elementaryrow transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of system of	The study of Modal Matrix and	

linear equations: Gauss elimination method, Gauss Jordan method. Applications: Traffic flow. Eigenvalues and Eigenvectors, diagonalization of the matrix, modal matrix.	Diagonalization of a Matrix is restricted to matrices of order 2×2only.	
Module-4: Vector Space **(8Hours Theory) + (4Hours Tutorials)**		
Vectorspaces:definitionandexamples, subspace: definition and examples. Linear Combinations, linearspan,linearlyindependentanddependent sets, basis and dimension, row space and column space of a matrix, Coordinates vector, inner products and orthogonality.	This module is restricted to R^n, Euclidean space.	
Module-5: LinearTransformation (8Hours Theory + 4Hours Tutorial)		
Definition and examples, algebraof linear transformations, matrix of alinear transformation. Singular, non-singular linear transformations and invertible linear transformations. Rankandnullityoflineartransformations,Rank-Nullitytheorem.	No restriction.	

Suggested Learning Resources: (Textbook/Reference Book):

Textbooks:

1. B.S.Grewal, HigherEngineeringMathematics,KhannaPublishers,44th Ed., 2021.
2. GilbertStrang, LinearAlgebraanditsApplications,CengagePublications,4thEd.,2022.
3. Seymour Lipschutz and Marc Lipson, Linear Algebra, Schaum's outlines series, 4th Ed., 2008.

Reference books:

1. V.Ramana,HigherEngineeringMathematics"McGraw-HillEducation,11thEd., 2017
2. N. PBaliandManishGoyal, ATextbookofEngineeringMathematics,Laxmi Publications, 10th Ed., 2022.
3. JamesStewart, Calculus,CengagePublications,7thEd., 2019.
4. David Poole, Linear Algebra, a modern introduction, Cengage publishers, 4th Ed., 2014.
5. DavidCLay, LinearAlgebraanditsApplications,PearsonPublishers, 4thEd., 2018.
6. GarethWilliams, LinearAlgebrawithapplications,JonesBartlettPublishersInc.,6th Ed., 2017.

Web links and Video Lectures (e-Resources):

- http://academicearth.org/
- VTUe-ShikshanaProgram
- VTUEDUSATProgram
- https://nptel.ac.in/courses/111106135
- https://nptel.ac.in/courses/111105160
- https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/

https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/