

BLOW UP SYLLABUS Differential Calculus and Linear Algebra

for First year Civil Engineering (1BMATC201) (Effective from the academic year 2025-26)

Topics	Topics To be Covered	Remarks
Module-1: Integral Calculus		
Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.	No Change	
Module-2: Partial Differential Equations (PDE)		
Formation of PDEs by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Method of Separation of variables. Application of PDE: Derivation of one-dimensional heat equation and wave equation.	No Changes	
Module-3: Vector Calculus		
Scalar and vector fields. Gradient, directional derivative, divergence and curl -physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Vector Integration: Line integrals, work done by a force and flux, Statements of Green's theorem and Stoke's theorem, problems without verification.	No Change	--
Module-4: Numerical Methods- 1		
Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods, problems. Interpolation: Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula. Numerical integration: Trapezoidal, Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rules.	No change	---
Module-5: Numerical Methods- 2		
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method and Adams-Bashforth predictor-corrector method.	No Changes	

Suggested Learning Resources: (Textbook/Reference Book):

Textbooks:

1. **B.S. Grewal**, HigherEngineeringMathematics, KhannaPublishers,44th Ed., 2021.
2. **E.Kreyszig**, AdvancedEngineeringMathematics,JohnWiley&Sons,10th Ed.,2018.
3. **GilbertStrang**, LinearAlgebraanditsApplications,CengagePublications,4th Ed.,2022.

Reference books:

1. **B.V.Ramana**, HigherEngineeringMathematics,McGraw-HillEducation,11th Ed., 2017
2. **Srimanta Pal & Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. **N. P.BaliandManishGoyal**, ATextbookofEngineeringMathematics,Laxmi Publications,10th Ed.,2022.
4. **H.K.DassandEr.RajnishVerma**, HigherEngineeringMathematics,S.Chand Publication, 3rd Ed., 2014.
5. **DavidClay**, LinearAlgebraanditsApplications, PearsonPublishers, 4th Ed., 2018.