

ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

I Semester: ST																													
Course Code	Category	Hours / Week			Credits	Maximum Marks																							
BSTB06	Elective	L	T	P	C	CIA	SEE	Total																					
		3	0	0	3	30	70	100																					
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil			Total Classes: 45																								
I. COURSE OVERVIEW: Numerical methods provide a way to solve problems quickly and easily compared to analytic solutions. Whether the goal is integration or solution of complex differential equations, there are many tools available to reduce the solution of what can be sometimes quite difficult analytical math to simple algebra. Analysis, modeling and solution of realistic engineering problems. Learning outcome 1 looks at algebraic methods, including polynomial division, exponential, trigonometric and hyperbolic functions, arithmetic and geometric progressions in an engineering context and expressing variables as power series.																													
II. COURSE OBJECTIVES: The student will try to learn: I. Formulation of the mathematical model of the problem to solve civil engineering problems II. Partial differential equations with closed form or numerical solution in structural mechanics using numerical methods. III. The applications of mathematical tools and statistical methods for the solution of the problems related to structures.																													
III. COURSE OUTCOMES: <table><tr><td colspan="3">After successful completion of the course, students should be able to:</td></tr><tr><td>CO 1</td><td>Solve algebraic equations.</td><td>Apply</td></tr><tr><td>CO 2</td><td>Obtain numerical solution of ordinary and partial differential equations.</td><td>Apply</td></tr><tr><td>CO 3</td><td>Develop integration method/s for structural analysis.</td><td>Apply</td></tr><tr><td>CO 4</td><td>Carry out interpolations and curve fitting</td><td>Analyze</td></tr><tr><td>CO 5</td><td>Obtain solution of Eigen value problems and Fourier series for structural analysis.</td><td>Analyze</td></tr><tr><td>CO 6</td><td>Apply iterative and transformation methods in structural engineering</td><td>Apply</td></tr></table>									After successful completion of the course, students should be able to:			CO 1	Solve algebraic equations.	Apply	CO 2	Obtain numerical solution of ordinary and partial differential equations.	Apply	CO 3	Develop integration method/s for structural analysis.	Apply	CO 4	Carry out interpolations and curve fitting	Analyze	CO 5	Obtain solution of Eigen value problems and Fourier series for structural analysis.	Analyze	CO 6	Apply iterative and transformation methods in structural engineering	Apply
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IV. SYLLABUS																													
UNIT-I	FUNDAMENTALS OF NUMERICAL METHODS						Classes: 09																						
Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting; Interpolation and extrapolation Solution of Nonlinear Algebraic and Transcendental Equations																													
UNIT-II	ELEMENTS OF MATRIX ALGEBRA:						Classes: 09																						
Solution of Systems of Linear Equations, Eigen Value Problems.																													

UNIT-III	NUMERICAL DIFFERENTIATION & INTEGRATION	Classes: 09
<p>Numerical integration (Trapezoidal and Simpson's rule) for determining shear, moment and deflection in beams</p> <p>Gauss Quadrature formula for Numerical integration (Trapezoidal and Simpson's rule), Solution of ordinary and Partial Differential Equations.</p>		
UNIT-IV	FINITE DIFFERENCE SCHEME	Classes: 09
<p>Implicit & Explicit scheme, solution using Explicit method, Stability analysis of Explicit and Implicit scheme</p>		
UNIT-V	COMPUTER ALGORITHMS	Classes: 09
<p>Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network.</p>		
Text Books:		
<ol style="list-style-type: none"> 1. Atkinson K. E., "An Introduction to Numerical Analysis", J. Wiley and Sons, 1989. 2. Stevan C. Chopra, Raymond P. Canal, "Numerical Methods for Engineers" McGraw Hill Book Company. April 2009. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Scheid F, "Theory and Problems of Numerical Analysis", McGraw Hill Book Company, (Shaum Series), 1988. 2. Sastry S. S, "Introductory Methods of Numerical Analysis", Prentice Hall of India, 1998 		
Web References:		
<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/105105043/ 2. https://www.class-central.com/course/nptel-numerical-methods-finite-difference-approach-10003 		
E-Text Books:		
<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/103101111/downloads/Lecture-notes/Unit_6_Solving_ODE-IVPs.pdf 		