ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

I Semester: ST								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BSTC07	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total 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:

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

IV. SYLLABUS:

MODULE-I: UNDAMENTALS OF NUMERICAL METHODS (09)

Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting**;** Interpolation and extrapolation Solution of Nonlinear Algebraic and Transcendental Equations

MODULE-II: ELEMENTS OF MATRIX ALGEBRA (09)

Solution of Systems of Linear Equations, Eigen Value Problems

MODULE-III: NUMERICAL DIFFERENTIATION & INTEGRATION (09)
Numerical integration (Trapezoidal and Simpson's rule) for determining shear, moment and deflection in beams

Gauss Quadrature formula for Numerical integration (Trapezoidal and Simpson's rule), Solution of ordinary and Partial Differential Equations.

MODULE-IV: FINITE DIFFERENCE SCHEME (09)
Implicit & Explicit scheme, solution using Explicit method, Stability analysis of Explicit and Implicit scheme

MODULE-V: COMPUTER ALGORITHMS (09)
Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network.

V.TEXT BOOKS:

1. AtkinsonK. E., "An Introduction to Numerical Analysis", J. Wiley and Sons, 1989.
2. StevanC.Chopra, Raymond P.Canal, "Numerical Methods for Engineers", McGraw Hill Book Company. April, 2009.

VI. REFERENCE BOOKS:

1. ScheidF, "Theory and Problems of Numerical Analysis" , McGraw Hill Book Company, (ShaumSeries), 1988.
2. Sastry S. S, "Introductory Methods of Numerical Analysis", Prentice Hall of India, 1998.

VII. WEB REFERENCES:

1. http://nptel.ac.in/courses/105105043/
2. https://www.class-central.com/course/nptel-numerical-methods-finite-difference-approach-10003

VIII. E-TEXT BOOKS:

1. https://nptel.ac.in/courses/105/105/105105043/