

Subject :Engineering Analysis

Class : Third year

Hours : 2hr (Theoretical) , 1hrs (Practical)

Objectives :

The student must know the advanced theories in mathematics & its applications in construction engineering .

Week	Syllabus
1&2	Ordinary differential equations ,liner differential equations , homogeneous linear equations of the second order , general solution . basis initial value problem , homogeneous linear differential equations of arbitrary order n , equations of order n with constant coefficients , non homogeneous equations solving by the method of undetermined coefficient .
3&4&5	Applications of O.D.E of undetermined coefficient method in: beam & column , beam-column, beam on elastic foundation , modeling : forced oscillation (dynamics analysis) .
6	Singular function : unit step function , unit impulse function ,unit moment function .
7&8	Applications of O.D.E of integration method in beams .
9&10&11	Fourier series ,Eular formulas , fourier series for any period (2L) , odd and even functions , Half –rang expansion , applications of fourier series in construction engineering .
12&13&14&15	Partial differential equations , one dimensional wave equation , free longitudinal vibration of beam, free transverse vibration of beam, one dimensional heat equation , consolidation equation , two dimensional Laplace equation .

16&17& 18&19	Numerical methods , numerical methods in non linear equations , solution of equations by iteration :fixed- point method , Newton – Raphson method Interpolation: ,linear interpolation , quadratic interpolation, Newtons forward difference formula , Newtons backward difference formula, lagrangian interpolation , numerical integration & differentiation .
20&21&22	Numerical methods in linear algebra , system of linear equations , Gauss elimination , Lu factorization , Choleskys method , Gauss Jordan elimination ,inverse matrix by elimination method , system of linear equations solution by iteration: ,Gauss - Seidel Iteration , Jacobi method iteration , Eigen value & Eigen vector .
23&24	Numerical methods for differential equation , Euler method , Modified Euler method , Runge Kutta method -4th order .
25&26&27& 28&29&30	Application of engineering analysis and numerical methods in Matlab program

References:

- 1. Advanced engineering mathematics / Erwin kreyszig**
- 2. Applied mathematics for engineering & physicists / pipes & harvill**
- 3. Numerical methods for engineers / S.C. Chapra & R. P. Canale**