NPTEL Video Course - Aerospace Engineering - NOC:Computational Science in Engineering

Subject Co-ordinator - Prof. Ashoke De

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Linear Algebra: Introduction
Lecture 2 - Linear Algebra: Introduction (Continued...)
Lecture 3 - Linear Algebra: Permutation Matrix, Existence of Solution
Lecture 4 - Linear Algebra: Permutation Matrix, Existence of Solution (Continued...)
Lecture 5 - Linear Algebra: Linear Independence, Basis Vector and Dimensions
Lecture 6 - Linear Algebra: Null Space, Column Space, Row Space, Introduction to Orthogonal System
Lecture 7 - Linear Algebra: Orthogonal System, Projection, Determinant
Lecture 8 - Linear Algebra: Orthogonal System, Projection, Determinant (Continued...)
Lecture 9 - Linear Algebra: Properties of Determinant, Cramer's Rule, Introduction to Eigen Values
Lecture 10 - Linear Algebra: Eigen Values, Eigen Vectors, SVD
Lecture 11 - Linear Algebra: Eigen Values, Eigen Vectors, SVD (Continued...)
Lecture 12 - ODE: Introduction to ODEs, Initial Value Problem, Separation of Variables
Lecture 13 - ODE: Solution of Exact ODEs, First Order Linear Systems
Lecture 14 - ODE: Solution of Second Order Linear ODEs
Lecture 15 - ODE: Existence and Uniqueness of Solution, Non-Homogeneous System
Lecture 16 - ODE: Higher Order Linear ODEs, Variation of Parameters, System of ODEs
Lecture 17 - ODE: Linear Systems, Superposition for Homogeneous Systems
Lecture 18 - Fourier Analysis, Orthogonality of Trigonometric Systems, Euler's Formula
Lecture 19 - Parseval's Theorem, Fourier Integrals, Laplace Transforms
Lecture 20 - PDE: Introduction to PDEs, Solution of PDEs using Characteristics Curve
Lecture 21 - PDE: First Order PDEs, Dilation Invariant Solution of Differential Equations
Lecture 22 - PDE: Solution of Linear PDEs
Lecture 23 - PDE: Separation of Variables, Eigenvalue Problem, Poisson Integral Representation
Lecture 24 - PDE: Boundary Conditions, Solution of 2D systems
Lecture 25 - Introduction to Numerical Methods, Mathematical Models, Errors
Lecture 26 - Errors, Numerical Differentiation, Stability
Lecture 27 - Roots of Equations: Graphical Method, Bi-Section Mehtod, False-Position Method
Lecture 28 - Secant Method, Brent's Method, Multipoint Iteration Method, Derative Free Method
Lecture 29 - Complex Roots, Birge-Vieta Method, Bairstow's method

Lecture 30 - Solution of Linear Algebric Equations, Gauss Elimination Method
Lecture 31 - Direct Methods: Gauss Elimination, Gauss-Jordan, Crout's Method, Cholesky Method, Iterative Meth
Lecture 32 - Extrapolation Method, Eigenvalue Problem, Jacobi Method, Householder's Method for Symmetric Matr
Lecture 33 - Interpolation: Taylor's Series, Lagrange and Newton Interpolation, Iterated Interpolation, Hermi
Lecture 34 - Piecewise and Spline Interpolation, Bivariate Interpolation, Least Square Approximation, Uniform
Lecture 35 - Numerical Differentiation and Intergration, Methods Based on Finite Differences, Methods based o
Lecture 36 - Numerical Integration: Newton-Cotes Method, Gaussian Integration Methods, Lobatto Integration Me
Lecture 37 - Double Integration: Trapezoidal Rule, Simpson's Rule, Solution of ODEs: Difference Equation, Sir
Lecture 38 - Runge-Kutta Methods, Euler-Cauchy Method, Multi-step Methods, Predictor-Corrector Methods
Lecture 39 - System of Differential Equations, Stability Analysis, Solution of Boundary Value Problem: Shooti
Lecture 40 - Numerical Approach to Solution of PDEs: Heat Conduction Equation, Convergence and Stability