NPTEL Video Course - Mechanical Engineering - Computational Fluid Dynamics (Dr. K.M. Singh)

Subject Co-ordinator - Dr. K.M. Singh

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - General Introduction
Lecture 2 - CFD
Lecture 3 - Conservation Laws and Mathematical Preliminaries
Lecture 4 - Mass Conservation
Lecture 5 - Momentum Equation
Lecture 6 - Momentum Equation
Lecture 7 - Navier-Stokes Equation and its Simplified Forms
Lecture 8 - Energy and Scalar Transport Equations
Lecture 9 - Scalar Transport, Mathematical Classification and Boundary Conditions
Lecture 10 - Finite Difference Method
Lecture 11 - Finite Difference Approximation of First Order Derivatives
Lecture 12 - Finite Difference Approximation of Second Order Derivatives - 1
Lecture 13 - Finite Difference Approximation of Second Order Derivatives - 2
Lecture 14 - Approximation of Mixed Derivatives and Multi-Dimensional F.D. Formulae
Lecture 15 - Implementation of Boundary Conditions and Finite Difference Algebraic System
Lecture 16 - Applications of FDM to Scalar Transport Problems - 1
Lecture 17 - Applications of FDM to Scalar Transport Problems - 2
Lecture 18 - Application of FDM to Advection-Diffusion and Computer Implementation Aspects
Lecture 19 - Computer Implementation of FDM for Steady State Heat Diffusion Problems - 1
Lecture 20 - Computer Implementation of FDM for Steady State Heat Diffusion Problems - 2
Lecture 21 - Computer Implementation of FDM for Steady State Heat Diffusion Problems - 3
Lecture 22 - Solution of Discrete Algebraic Systems
Lecture 23 - Direct and Basic Iterative Methods for Linear Systems
Lecture 24 - Accelerated Iterative Methods for Linear Systems
Lecture 25 - Two Level and Multi-Level Methods for First Order IVPs - 1
Lecture 26 - Two Level and Multi-Level Methods for First Order IVPs - 2
Lecture 27 - Application to Unsteady Transport Problems
Lecture 28 - Introduction to Finite Volume Method
Lecture 29 - Finite Volume Interpolation Schemes

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Lecture 30 - Application of FVM to Scalar Transport
Lecture 31 - Introduction to Finite Element Method
Lecture 32 - Finite Element Shape Functions and Numerical Integration - 1
Lecture 33 - Finite Element Shape Functions and Numerical Integration - 2
Lecture 34 - Application of FEM to Scalar Transport
Lecture 35 - Special Features of Navier-Stokes Equations
Lecture 36 - Time Integration Techniques for Navier-Stokes Equations
Lecture 37 - Implicit Pressure Correction Methods
Lecture 38 - SIMPLEC, SIMPLER and Fractional Step Methods
Lecture 39 - Turbulent Flows
Lecture 40 - Reynolds Averaging and RANS Simulation Models
Lecture 41 - RANS Turbulence Models and Large Eddy Simulation
Lecture 42 - Introduction to Grid Generation
Lecture 43 - Aspects of Practical CFD Analysis
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