

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mechanical Engineering - NOC:Computational Fluid Dynamics

Subject Co-ordinator - Prof. S. Chakraborty

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to CFD  
Lecture 2 - Classification of partial differential equations  
Lecture 3 - Examples of partial differential equations  
Lecture 4 - Examples of partial differential equations (Continued...)  
Lecture 5 - Nature of the characteristics of partial differential equation  
Lecture 6 - Euler-Lagrangian equation  
Lecture 7 - Approximate Solutions of Differential Equations  
Lecture 8 - Variational formulation  
Lecture 9 - Example of variational formulation and introduction to weighted residual method  
Lecture 10 - Weighted residual method (Continued...)  
Lecture 11 - Point Collocation method, the Galerkin's method and the 'M' form  
Lecture 12 - Finite element method (FEM) of discretization  
Lecture 13 - Finite element method of discretization (Continued...)  
Lecture 14 - Finite difference method (FDM) of discretization  
Lecture 15 - Well posed boundary value problem  
Lecture 16 - Finite volume method (FVM) of discretization  
Lecture 17 - Illustrative examples of finite volume method  
Lecture 18 - Illustrative examples of finite volume method (Continued...)  
Lecture 19 - Basic rules of finite volume discretization  
Lecture 20 - Implementation of boundary conditions in FVM  
Lecture 21 - Implementation of boundary conditions in FVM (Continued...)  
Lecture 22 - 1-D Unsteady state diffusion problem  
Lecture 23 - 1-D Unsteady state diffusion problem (Continued...)  
Lecture 24 - Consequences of Discretization of Unsteady State Problems  
Lecture 25 - FTCS scheme  
Lecture 26 - CTCS scheme (Leap frog scheme) and Dufort-Frankel scheme  
Lecture 27 - Part 1  
Lecture 28 - Solution to linear algebraic equations (Continued...)  
Lecture 29 - Elimination methods

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- Lecture 30 - Gaussian elimination and LU Decomposition methods
- Lecture 31 - Illustrative example of elimination method
- Lecture 32 - Tri-Diagonal Matrix Algorithm (TDMA)
- Lecture 33 - Elimination Methods
- Lecture 34 - Elimination Methods
- Lecture 35 - Iteration methods
- Lecture 36 - Generalized analysis of Iteration method
- Lecture 37 - Further discussion on Iterative methods
- Lecture 38 - Illustrative examples of Iterative methods
- Lecture 39 - Gradient Search based methods
- Lecture 40 - Steepest descent method (Continued...)
- Lecture 41 - Conjugate gradient method
- Lecture 42 - Convection diffusion equation
- Lecture 43 - Central difference scheme applied to convection-diffusion equation
- Lecture 44 - Upwind scheme
- Lecture 45 - Illustrative examples
- Lecture 46 - Exact solution of 1-D steady state convection diffusion equation (Continued...)
- Lecture 47 - Exponential scheme
- Lecture 48 - Generalized convection diffusion formulation
- Lecture 49 - 2-D convection diffusion problem
- Lecture 50 - False (numerical) diffusion scheme and the QUICK scheme
- Lecture 51 - Discretization of Navier Stokes equation
- Lecture 52 - Discretization of Navier Stokes equation (Continued...)
- Lecture 53 - Concept of staggered grid
- Lecture 54 - SIMPLE algorithm
- Lecture 55 - Salient features of SIMPLE algorithm
- Lecture 56 - Illustrative examples on the use of SIMPLE algorithm
- Lecture 57 - SIMPLER algorithm
- Lecture 58 - Illustrative examples of SIMPLER algorithm
- Lecture 59 - What is there in implementing a CFD Code
- Lecture 60 - Some representative case studies