

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

NPTEL Video Course - Aerospace Engineering - Introduction to CFD

Subject Co-ordinator - Prof. M. Ramakrishna

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Introduction, Why and how we need computers
- Lecture 2 - Representing Arrays and functions on computers
- Lecture 3 - Representing functions - Box functions
- Lecture 4 - Representing functions - Polynomials and Hat functions
- Lecture 5 - Hat functions, Quadratic and Cubic representations
- Lecture 6 - Demo - Hat functions, Aliasing
- Lecture 7 - Representing Derivatives - finite differences
- Lecture 8 - Finite differences, Laplace equation
- Lecture 9 - Laplace equation - Jacobi iterations
- Lecture 10 - Laplace equation - Iteration matrices
- Lecture 11 - Laplace equation - convergence rate
- Lecture 12 - Laplace equation - convergence rate Continued
- Lecture 13 - Demo - representation error, Laplace equation
- Lecture 14 - Demo - Laplace equation, SOR
- Lecture 15 - Laplace equation - final, Linear Wave equation
- Lecture 16 - Linear wave equation - Closed form and numerical solution, stability analysis
- Lecture 17 - Generating a stable scheme and Boundary conditions
- Lecture 18 - Modified equation
- Lecture 19 - Effect of higher derivative terms on Wave equation
- Lecture 20 - Artificial dissipation, upwinding, generating schemes
- Lecture 21 - Demo - Modified equation, Wave equation
- Lecture 22 - Demo - Wave equation / Heat Equation
- Lecture 23 - Quasi-linear One-Dimensional. wave equation
- Lecture 24 - Shock speed, stability analysis, Derive Governing equations
- Lecture 25 - One-Dimensional Euler equations - Attempts to decouple
- Lecture 26 - Derive Eigenvectors, Writing Programs
- Lecture 27 - Applying Boundary conditions
- Lecture 28 - Implicit Boundary conditions
- Lecture 29 - Flux Vector Splitting, setup froms averaging

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- Lecture 30 - Roes averaging
- Lecture 31 - Demo - One Dimensional flow
- Lecture 32 - Accelerating convergence - Preconditioning, dual time stepping
- Lecture 33 - Accelerating convergence - Intro to Multigrid method
- Lecture 34 - Multigrid method
- Lecture 35 - Multigrid method - final, Parallel Computing
- Lecture 36 - Calculus of Variations - Three Lemmas and a Theorem
- Lecture 37 - Calculus of Variations - Application to Laplace Equation
- Lecture 38 - Calculus of Variations - Final and Random Walk
- Lecture 39 - Overview and Recap of the course