

NOC: Foundation of Computational Fluid Dynamics - Video course

COURSE OUTLINE

This is an introductory course in CFD. In this course, students will be exposed to basics of CFD. Students will gain knowledge on FD/ FV strategy, formulation of the problem and solution techniques. Students at the end of the course will get to experience a simple and sample working CFD code and thus develop confidence.

COURSE DETAIL

Week. No	Topics
1.	Module1: Introduction Module 2: Review of basic equations and importance of terms Module 3: Non-dimensionalization / Vorticity Transport equation Module 4: classification of equations Module 5: examples of different equations and the solution nature Module 6: Different boundary conditions Module 7: Description of CFD results with examples
2.	Module 1: Taylor's series expansion Module 2: CD / FD / BD for first & second derivative Module 3: Higher derivative, mixed derivative Module 4: FD formula for non-uniform mesh Module 5: order of accuracy, Truncation error Module 6: consistency, conservative, and convergence
3.	Module 1: Stability, CFL criteria Module 2: Stability, CFD criteria contd. Module 3: Classification of grid Module 4: examples for each type Module 5: Finite Difference / Finite Volume Strategy Module 6: FD / FV strategy contd. Module 7: Explanation with model equation



NP-TEL

NPTEL

<http://nptel.ac.in>

Mechanical Engineering

Pre-requisites:

Basic fluid mechanics, Numerical Techniques / methods, some programming skills

Coordinators:

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4.	<p>Module 1: Building FV strategy for diffusion term in NS equation</p> <p>Module 2: About convection terms and FV approach for it</p> <p>Module 3: different types of Interpolation to obtain flux</p> <p>Module 4: FV strategy for other terms in NS equation in 1D</p> <p>Module 5: Complete assembly and explanation</p> <p>Module 6: Extension to 2D and 3D</p>
5.	<p>Module 1: Time advancement: Explicit / Implicit / Semi-implicit</p> <p>Module 2: Pressure velocity coupling</p> <p>Module 3: Arrangement of primitive variables</p> <p>Module 4: SIMPLE</p> <p>Module 5: Variants of SIMPLE and MAC</p> <p>Module 6: Other coupling method</p>
6.	<p>Module 1: Matrix inversion – Direct, Iterative procedure</p> <p>Module 2: Direct solver / Iterative solver</p> <p>Module 3: Iterative solver</p> <p>Module 4: Iterative solver</p> <p>Module 5: Iterative solver</p> <p>Module 6: Mention about few other solver</p>
7.	<p>Module 1: Results checking, relaxation parameter</p> <p>Module 2: Post processing – explanation with examples</p> <p>Module 3: Demonstrating with heat equation</p> <p>Module 4: Demonstrating with heat equation</p> <p>Module 5: Demonstrating with 2D NS equation</p> <p>Module 6: Demonstrating with 2D NS equation</p> <p>Module 7: Demonstrating with 2D NS equation</p>