CFD Online Resources

FDM for Advection-Diffusion Eq

- Link: https://www.iist.ac.in/sites/default/files/people/parabolic.pdf

FDM for Advection-Diffusion and NS Eqs

- Chapter 12 & 13 from Introduction to Theoretical and Computational Fluid Dynamics by C Pozrikidis

CFD Video Lectures by Milovan Peric

- Key Features: Classical CFD, Fractional-Step Methods
- Link: https://www.youtube.com/@MilovanPericCFD/videos

CFD Video Lectures by Sandip Mazumder

- Key Features: FVM, Collocated Grid
- Link: https://www.youtube.com/@sandipmazumder171/playlists
- FDM vs FVM vs FEM

CFD Video Lectures by Tony Saad

- Key Features: Python Coding
- Link: https://www.youtube.com/playlist?list=PLEaLl6Sf-KlCvBLrYFwt5h_LgedJyN59n

CFD Video Lectures - YouTube

- Key Features: SIMPLE, PISO, Collocated Grid (Rhie-Chow), FVM
- Link: https://www.youtube.com/@fluidmechanics101/playlists

CFD Video Lectures by Gautam Biswas

- Key Features: Finite Difference, SAMPLE Algorithm, MAC Grid
- Link: https://nptel.ac.in/courses/112104030

CFD Video Lectures by Amaresh Dalal

- Key Features: Finite Difference, SAIMPLE Algorithm, MAC Grid
- Link: https://nptel.ac.in/courses/112103289

CFD Video Lectures by Kameswararao Anupindi

- Key Features: Collocated Grid
- Link: https://nptel.ac.in/courses/112106294

CFD Python: the 12 steps to Navier-Stokes equations

- Key features: NS Solver, Projection Method, Finite Difference, Staggered Grid
- Link: https://jose.theoj.org/papers/10.21105/jose.00021

Projection Methods for Incompressible Navier-Stokes Equations

- Link 1: https://youtu.be/JBmS--3L2eQ?t=3
- Link 2: https://youtu.be/BQLvNLgMTQE?t=120
- Link 3: https://youtu.be/AZytQtIELcc?t=3621
- Link 4: https://youtu.be/ChYJ4fAdWBI?t=207
- Link 5: https://youtu.be/RSncu1io0VA

Projection Methods + FDM/FVM

- Thesis 1: A Navier-Stokes Solver for Single- and Two-Phase Flow
- Thesis 2: Parallel Numerical Simulation of Navier-Stokes-Equations on GPUs
- Thesis 3: Motion of particles and swimmers using Fluid Particle Dynamics
- Thesis 4: Computational fluid-structure interaction with the moving immersed boundary method
- Chapter 12 & 13 from Introduction to Theoretical and Computational Fluid Dynamics by C Pozrikidis
- Gretar Tryggvason CFD Notes
- Chapter 3 from Direct Numerical Simulations of Gas–Liquid Multiphase Flows
- Thesis 5: The immersed boundary projection method and its application to simulation and control of flows around low-aspect-ratio wings
- Thesis 6: Development of an Immersed Boundary Method for the Simulation of Moving Bodies at Fluid-Fluid Interfaces

A guide to writing your first CFD solver

- Link: https://www.montana.edu/mowkes/research/source-codes/GuideToCFD.pdf

cuIBM: Projection-based Immersed Boundary Method in Python

- Key Features: Projection Method, Finite Difference, Staggered Grid, CUDA
- Link: https://github.com/barbagroup/CFDPython
- Paper: Validation of the cuIBM code for Navier-Stokes equations with immersed boundary methods

IBAMR Code

- Key Features: Finite Difference, Projection Method, Staggered (MAC) Grid, Adaptive Mesh Refinement
- Link: https://ibamr.github.io/about
- Papers of Boyce E. Griffith

Immersed Boundary Method by Charles S. Peskin

- Peskin invented Immersed Boundary Method
- Link: https://math.nyu.edu/~peskin/ib_lecture_notes/index.html

IB2d Code: Immersed Boundary Method Code in Matlab/Python

- Key Features: Projection Method, Finite Difference
- Link: https://nickabattista.wixsite.com/home/ib2d
- Projection Method: https://github.com/nickabattista/Holy_Grail
- Paper: Suite-CFD: An Array of Fluid Solvers Written in MATLAB and Python

FDM + IBM + Python + GPU

- Paper: A Python-based flow solver for numerical simulations using an immersed boundary method on single GPUs
- Thesis 1: Low-Reynolds-number aerodynamic effects in unsteady flow environments
- Thesis 2: A numerical study on the aerodynamic forces and the wake stability of flapping flight at low Reynolds number

Gerris/Basilisk Code: FVM + IBM

- Link 1: http://basilisk.fr/sandbox/huet/README
- Link 2: https://github.com/eessmann/GISS

FDM + IBM for Flexible Swimmers

- Key Features: Pseudo-Compressibility Method, Staggered MAC Discretization
- Presentation: Immersed boundary simulations of worm-like swimmers in the inertial regime
- Thesis: Meso-swimmer suspensions: immersed boundary simulations of hydrodynamic interactions between worm-like swimmers

Staggered vs Collocated

- Finite Volume Method in CFD with OpenFOAM and Matlab [Chapter 15 Fluid Flow Computation: Incompressible Flows]