

5 th Semester	RCH5D003	COMPUTATIONAL FLUID DYNAMICS	L-T-P 3-0-0	3 CREDITS
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Module I:**(12 hr)**

Governing equations of fluid flow. Finite difference, finite volume, and finite element methods. Laplace equation. Diffusion equation or Wave Equation. Application of finite volume method to fluid flow problems.

Module II:**(10 hr)**

Pressure correction techniques: Gauss Siedel and Gauss Jordan. Introduction to multigrid methods. Boundary conditions, Structured and unstructured mesh. Introduction to CAD systems and different standards used for DATA exchange.

Module III:**(8 hr)**

Governing equations for turbulent flow, Rotating machinery, Combusting flow, Multiphase flow.

Module IV:**(10 hr)**

Simple internal flows: T-Junction, Driven Cavity, Manifold, and Valves. External Flows: Flow over Ahmed Body, Car-Reacting Flow in a Gas Burner, and Multiphase Flow in an Air Lift Reactor.

Book:

1. Introduction to Computational Fluid Dynamics, P Niyogi, S K Chakrabratty, and M K Laha, Pearson.
2. Fundamentals of Computational Fluid Dynamics, T K Sengupta, University Press.
3. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, 2nd ed. by H Versteeg and W Malalasekra, Pearson.
4. Computational Fluid Dynamics: The Basics with Applications, J D Anderson, McGraw-Hill.

Digital learning resources:

1. Computational Fluid Dynamics by Prof. Sreenivas Jayanti, Department of ChemicalEngineering, IIT Madras
Link: <https://nptel.ac.in/courses/103/106/103106119/>
2. Computational Fluid Dynamics by Dr. K. M. Singh, Department of Mechanicaland Industrial Engineering, IITRoorkee
Link: <https://nptel.ac.in/courses/112/107/112107080/>