# Computational Fluid Dynamics (CFD) Training Course

Professional Development Training Course Outline

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|---|---|---|---|
| **Category** | General Training | **Duration** | 5 Days |
| **Base Fee** | $1,500 USD | **Delivery Mode** | Online / On-site Hybrid |

## Course Introduction

Computational Fluid Dynamics (CFD) Training Course is designed to equip learners with advanced skills in fluid flow simulation, heat transfer analysis, turbulence modeling, and multiphase flow prediction using industry-standard numerical methods. This course bridges the gap between theoretical fluid mechanics and real-world engineering applications across aerospace, automotive, energy, HVAC, marine, and manufacturing industries. With growing adoption of AI-driven simulation, digital twin technology, and high-performance computing (HPC), CFD expertise has become a critical skill for modern engineers and researchers.

This training focuses on mastering CFD software tools, meshing techniques, solver setup, boundary conditions, post-processing, and validation techniques. Participants gain hands-on experience solving complex engineering problems involving aerodynamics, combustion, thermal systems, and fluid-structure interaction (FSI). The course emphasizes industry-relevant projects, enabling learners to develop simulation-driven design capabilities that improve efficiency, reduce prototyping costs, and enhance product performance.

## Programme Curriculum

**Computational Fluid Dynamics (CFD) Training Course**

**Introduction**

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**Course Duration**

5 days

**Course Objectives**

1. Master fundamentals of fluid mechanics and Navier–Stokes equations
2. Develop expertise in CFD preprocessing and geometry cleanup
3. Apply advanced mesh generation techniques
4. Understand turbulence modeling
5. Perform accurate heat transfer and thermal analysis simulations
6. Simulate compressible and incompressible flow systems
7. Implement boundary conditions and solver settings optimization
8. Gain proficiency in ANSYS Fluent / OpenFOAM workflows
9. Conduct multiphase flow and cavitation analysis
10. Apply aerodynamic optimization for automotive & aerospace systems
11. Perform CFD validation and experimental correlation
12. Integrate AI-assisted CFD and parametric design optimization
13. Build capability in industrial-scale digital twin simulation models

**Target Audience**

1. Mechanical Engineering Students
2. Aerospace Engineering Professionals
3. Automotive Design Engineers
4. HVAC and Thermal System Engineers
5. Energy and Power Plant Engineers
6. Research Scholars in Fluid Dynamics
7. Manufacturing Process Engineers
8. Simulation & CAE Analysts

**Course Modules**

**Module 1: Fundamentals of CFD & Governing Equations**

- Introduction to fluid mechanics principles
- Continuity, momentum, and energy equations
- Navier–Stokes formulation
- Dimensional analysis and similarity laws
- Introduction to discretization methods
- **Case Study:** Flow analysis over an aircraft wing section for lift and drag estimation.

**Module 2: Preprocessing & Geometry Preparation**

- CAD model cleaning and simplification
- Domain definition for CFD simulation
- Geometry defeaturing techniques
- Meshing requirements and best practices
- Software preprocessing tools overview
- **Case Study:** Car body geometry preparation for aerodynamic drag reduction study.

**Module 3: Meshing Techniques & Grid Generation**

- Structured vs unstructured meshing
- Boundary layer mesh creation
- Mesh independence study
- Grid quality metrics
- Adaptive mesh refinement techniques
- **Case Study:** Mesh optimization for wind turbine blade efficiency improvement.

**Module 4: Turbulence Modeling**

- Laminar vs turbulent flow modeling
- RANS models
- LES and DNS overview
- Wall function treatment
- Model selection criteria
- **Case Study:** Turbulent airflow simulation in HVAC duct system.

**Module 5: Heat Transfer & Thermal CFD**

- Conduction, convection, and radiation
- Conjugate heat transfer (CHT)
- Thermal boundary conditions
- Cooling system simulations
- Heat exchanger modeling
- **Case Study:** Thermal performance analysis of an electronic heat sink system.

**Module 6: Multiphase Flow & Reactive Systems**

- Volume of Fluid (VOF) method
- Eulerian and Lagrangian models
- Cavitation modeling
- Combustion and reaction modeling
- Phase interaction dynamics
- **Case Study:** Fuel injection and combustion simulation in internal combustion engine.

**Module 7: Advanced CFD Applications**

- Aerodynamics optimization
- Fluid-structure interaction (FSI)
- Rotating machinery simulation
- Porous media flow
- Industrial process simulation
- **Case Study:** Performance enhancement of centrifugal pump using CFD analysis.

**Module 8: Post-Processing, Validation & AI Integration**

- Result visualization techniques
- Pressure, velocity, and turbulence plots
- Experimental validation methods
- Error analysis and uncertainty quantification
- AI-driven CFD optimization workflows
- **Case Study:** Digital twin modeling of wind tunnel testing data for aerospace component.

### Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

**Register as a group from 3 participants for a Discount**

**Send us an email: info@fineskilltrainingcenter.org or call** *+254769199797*

***Certification***

*Upon successful completion of this training, participants will be issued with a globally- recognized certificate.*

***Tailor-Made Course***

*We also offer tailor-made courses based on your needs.*

**Key Notes**

**a.** The participant must be conversant with English.

**b.** Upon completion of training the participant will be issued with an Authorized Training Certificate

**c.** Course duration is flexible and the contents can be modified to fit any number of days.

**d.** The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

**e.** One-year post-training support Consultation and Coaching provided after the course.

**f.** Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

## Upcoming Scheduled Sessions

| Start Date | End Date | Location | Price |
|---|---|---|---|
| **23 Nov 2026** | 27 Nov 2026 | Online | $1,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $1,500 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $3,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $3,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $6,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $4,500 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $6,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $6,000 |

Ready to enroll or request a customized program? Book online or contact us:

**Register Online Now**

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com