

SOLIDWORKS Flow Simulation Professional Certification (CSWP-FLOW) Prep Course

Target Audience

This course is designed for engineers, CFD analysts, and advanced CAD professionals preparing for the **SOLIDWORKS Flow Simulation Professional Certification Exam**. It is ideal for learners with prior SOLIDWORKS modeling and simulation experience who want to demonstrate advanced competency in computational fluid dynamics (CFD), heat transfer, rotating machinery, multiphase flows, and specialized analysis techniques.

Course Outcomes

By the end of this course, participants will be able to:

- Create and manage SOLIDWORKS Flow Simulation projects.
- Perform internal and external flow analyses with proper boundary conditions.
- Generate and refine computational meshes for accuracy.
- Conduct thermal analyses including conjugate heat transfer and transient cooling.
- Apply advanced CFD techniques such as rotating reference frames, porous media, cavitation, and supersonic flow.
- Perform free surface and particle trajectory studies.
- Execute parametric studies and optimization scenarios.
- Integrate FEA load transfer with CFD workflows.
- Be fully prepared for the **SOLIDWORKS Flow Simulation Professional Certification Exam**.

Course Objectives

- Provide advanced knowledge of SOLIDWORKS Flow Simulation capabilities.
- Train learners in preprocessing, meshing, solving, and postprocessing workflows for CFD.
- Develop proficiency in handling thermal, multiphase, and rotating machinery analyses.
- Enable learners to analyze porous media, cavitation, and supersonic flows.
- Teach parametric optimization and free surface modeling aligned with certification requirements.
- Reinforce learning through case studies and exercises similar to exam problems.

Course Outline

The course comprises **48 hours** of theory and labs and is divided into **15 different chapters**. Each chapter will be followed by hands-on lab exercises to reinforce learning and gauge understanding of the topics covered.

Table of Contents

Lesson 1: Creating a SOLIDWORKS Flow Simulation Project

- Case Study: Manifold Assembly
- Problem Description
- Stages in the Process
- Model Preparation
- Internal vs. External Flow Analysis
- Manifold Analysis
- Lids and Lid Thickness
- Manual Lid Creation
- Adding Lids to Part and Assembly Files
- Checking Geometry and Internal Fluid Volume
- Invalid Contacts
- Project Wizard Setup
- Dependency and Exclude Cavities Without Conditions
- Adiabatic Wall and Roughness Settings
- Computational Domain Setup
- Mesh Creation and Load Results Option
- Monitoring the Solver and Goal Plot Window
- Warning Messages
- Post-processing Techniques
- Scaling and Changing Legend Settings
- Orientation of Legend and Logarithmic Scale
- Discussion and Summary
- Exercise: Air Conditioning Ducting

Lesson 2: Meshing

- Case Study: Chemistry Hood
- Project Description
- Computational Mesh Fundamentals
- Basic Mesh and Initial Mesh Setup
- Geometry Resolution
- Minimum Gap Size and Wall Thickness
- Result Resolution and Initial Mesh Level
- Manual Global Mesh Settings
- Control Planes for Mesh Refinement
- Summary and Discussion
- Exercises: Square Ducting, Thin Walled Box, Heat Sink, Valve Assembly

Lesson 3: Thermal Analysis

- Case Study: Electronics Enclosure
- Project Description
- Fans and Fan Curves
- Derating Considerations
- Perforated Plates and Free Area Ratio
- Discussion and Summary
- Exercises: Orthotropic Thermal Conductivity Materials, Electric Wire

Lesson 4: External Transient Analysis

- Case Study: Flow Around a Cylinder
- Problem Description
- Stages in the Process
- Reynolds Number and External Flow Setup
- Transient Analysis and Turbulence Intensity
- Adaptive Mesh Refinement
- Two-Dimensional Flow Considerations
- Computational Domain Setup
- Calculation Control Options
- Finishing and Refinement
- Solving and Saving Results
- Drag Equation and Unsteady Vortex Shedding
- Time Animation
- Discussion and Summary
- Exercise: Electronics Cooling

Lesson 5: Conjugate Heat Transfer

- Case Study: Heated Cold Plate
- Project Description
- Stages in the Process
- Conjugate Heat Transfer Principles
- Real Gases Considerations
- Goals Plot in Solver Window
- Summary and Discussion
- Exercise: Heat Exchanger with Multiple Fluids

Lesson 6: EFD Zooming

- Case Study: Electronics Enclosure
- Project Description
- EFD Zooming Concepts
- Computational Domain Refinement
- Summary and Discussion

Lesson 7: Porous Media

- Case Study: Catalytic Converter
- Problem Description
- Stages in the Process
- Associated Goals
- Porous Media Fundamentals
- Porosity and Permeability Types
- Resistance and Heat Exchange
- Specific Area Considerations
- Dummy Bodies Usage
- Design Modification
- Discussion and Summary
- Exercise: Channel Flow

Lesson 8: Rotating Reference Frames

- Case Study: Table Fan
- Problem Description
- Stages in the Process
- Rotating Reference Frame Basics
- Averaging Techniques
- Noise Prediction and Broadband Models
- Sliding Mesh Method
- Case Study: Blower Fan
- Tangential Faces of Rotors
- Time Step Considerations
- Axial Periodicity
- Summary and Discussion
- Exercise: Ceiling Fan

Lesson 9: Parametric Study

- Case Study: Piston Valve
- Problem Description
- Stages in the Process
- Parametric Analysis Setup
- Steady State Analysis
- Goal Optimization
- Input Variable Types
- Target Value Dependence Types
- Output Variable Initial Values
- Running Optimization Study
- Design Scenarios
- Multi-Parameter Optimization
- Summary and Discussion
- Exercise: Variable Geometry Dependent Solution

Lesson 10: Free Surface

- Case Study: Water Tank
- Problem Description
- Free Surface Fundamentals
- Volume of Fluid (VOF) Method
- Summary and Discussion
- Exercises: Water Jet, Dam-Break Flow

Lesson 11: Cavitation

- Case Study: Cone Valve
- Problem Description
- Cavitation Fundamentals
- Discussion and Summary

Lesson 12: Relative Humidity

- Case Study: Cook House

- Problem Description
- Relative Humidity Modeling
- Summary and Discussion

Lesson 13: Particle Trajectory

- Case Study: Hurricane Generator
- Problem Description
- Particle Trajectory Overview
- Particle Study Physical Settings
- Particle Study Wall Conditions
- Summary and Discussion
- Exercise: Uniform Flow Stream

Lesson 14: Supersonic Flow

- Case Study: Conical Body
- Problem Description
- Supersonic Flow Fundamentals
- Drag Coefficient Calculation
- Shock Waves and Flow Behavior
- Discussion and Summary

Lesson 15: FEA Load Transfer

- Case Study: Billboard
- Problem Description
- FEA Load Transfer Fundamentals
- Workflow Integration
- Summary and Discussion