SOLIDWORKS Simulation Professional Certification (CSWP-S) Prep Course

Target Audience

This course is designed for engineers, advanced CAD users, and professionals preparing for the **SOLIDWORKS Simulation Professional Certification Exam**. It is ideal for learners who already have a foundation in SOLIDWORKS Simulation Associate-level skills and want to demonstrate advanced competency in frequency, buckling, thermal, fatigue, drop test, optimization, and pressure vessel analyses.

Course Outcomes

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

- Perform frequency analysis of parts and assemblies.
- Conduct buckling analysis and interpret buckling factors of safety.
- Apply multiple load cases and submodeling techniques.
- Execute topology optimization studies with manufacturing constraints.
- Perform steady-state and transient thermal analyses, including radiation effects.
- Conduct advanced thermal stress analysis with 2D simplification.
- Carry out fatigue analysis under constant and variable amplitude loading.
- Simulate drop test scenarios with rigid and elastic floors.
- Optimize designs using static, frequency, and parametric constraints.
- Perform pressure vessel analysis with stress linearization and load case combinations.
- Be fully prepared for the **SOLIDWORKS Simulation Professional Certification Exam**.

Course Objectives

- Provide advanced knowledge of SOLIDWORKS Simulation Professional capabilities.
- Train learners in specialized analysis types beyond static stress.
- Develop proficiency in handling assemblies, connectors, and advanced boundary conditions.
- Enable learners to analyze thermal, fatigue, and drop test scenarios.

- Teach optimization and pressure vessel workflows aligned with certification requirements.
- Reinforce learning through case studies and exercises similar to exam problems.

Course Outline

The course comprises **40 hours** of theory and labs and is divided into **14 different chapters**. Each chapter will be followed by hands-on lab exercises to reinforce learning and gauge understanding of the topics covered.

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Introduction

Lesson 1: Frequency Analysis of Parts

Case Study: Tuning Fork

- Project Description
- Stages in the Process

Analysis Types

- Frequency Analysis with Supports
    - Procedure
    - Results
    - Postprocessing
- Frequency Analysis without Supports
    - Automatic Saving
    - Rigid Body Modes
    - Fundamental Frequency
    - Effect of Restraints
- Frequency Analysis with Load
    - Effects of Prestress
- Summary
- Questions

Exercises

- Exercise 1: Car Suspension Bulkhead
- Exercise 2: Blower Fan
    - Part 1: Without Load
    - Part 2: With Load
    - Design Study (optional)
- Exercise 3: Impeller

Lesson 2: Frequency Analysis of Assemblies

- Objectives
- Case Study: Engine Mount
    - Project Description
    - Stages in the Process
- All Bonded Interaction Conditions
- Procedure
- Remote Mass

- Mass Properties
- Connecting Assembly Parts
- Bonded and Free Interactions
- Discussion
- Summary
- Questions

Exercises

- Exercise 4: Particle Separator
- Exercise 5: Tuning Fork Assembly

Lesson 3: Buckling Analysis

- Objectives
- Buckling Analysis
- Linear vs Nonlinear Buckling
- Buckling Factor of Safety
- Considerations

Case Study: Particle Separator

- Project Description
- Stages in the Process
- Conclusion
- Calculating Buckling Loads
- Results Discussion
- Yield vs Buckling
- Summary
- Questions

Exercises

- Exercise 6: Stool
- Exercise 7: Cabinet

Lesson 4: Load Cases

- Objectives

- Load Cases

Case Study: Scaffolding

- Project Description
- Stages in the Process
- Initial Load Case
- Summary

Lesson 5: Submodeling

- Objectives
- Submodeling
- Parent Study

Case Study: Scaffolding

- Project Description
- Stages in the Process

Studies

- Parent Study
- Parent Load Cases
- Child Study
- Component Selection
- Submodel Fixtures
- Energy Norm Error Plot
- Summary
- Questions

Lesson 6: Topology Analysis

- Objectives
- Topology Analysis

Case Study: Rear Bike Shock Link

- Project Description
- Stages

Optimization Controls

- Goals & Constraints
    - Best stiffness-to-weight
    - Minimize displacement
    - Minimize mass
- Manufacturing Controls
    - Preserved Region
    - Thickness Control
    - De-mold Direction
    - Symmetry
- Mesh Effects
- Load Cases
- Export Smoothed Mesh
- Summary

Exercise

- Exercise 8: Topology of Stool

Lesson 7: Thermal Analysis

- Objectives
- Thermal Basics
- Heat Transfer
    - Conduction
    - Convection
    - Radiation
- Material Properties

Case Study: Microchip Assembly

- Project Description
- Stages

Analysis Types

- Steady-State Thermal
    - Interfacial Conductance
    - Insulation
    - Initial Temperature

    - Heat Flux
    - Heat Power
- Transient Thermal
    - Convective Import
    - Sensors
    - Results Comparison
    - Time Curves
- Thermostat-based Analysis
- Symmetry BC
- Summary
- Questions

Exercise

- Exercise 9: Cup

Lesson 8: Thermal Analysis with Radiation

- Objectives

Case Study: Spot Light Assembly

- Project Description
- Stages
- Steady-State Analysis
- Parameter Review
- Heat Flux Singularities
- Summary

Lesson 9: Advanced Thermal Stress (2D Simplification)

- Objectives
- Thermal Stress Analysis

Case Study: Metal Expansion Joint

- Project Description
- Stages
- Thermal Analysis
- 2D Simplification

- Prescribed Temperature
- Meshing Considerations

Structural Coupling

- Thermal Stress Analysis
- Import from Flow Simulation
- Reference Temperature
- 3D Model
- Summary
- Questions

Exercises

- Exercise 10: Microchip Assembly
- Exercise 11: Gas Tank
- Exercise 12: Thermoelectric Cooler

Lesson 10: Fatigue Analysis

- Objectives
- Fatigue Basics
- Failure Stages
- High vs Low Cycle

Methods

- S-N Curve
- Loading
- Mean Stress Correction
- Damage Factor

Case Study: Pressure Vessel

- Thermal Study
- Static Study
- Fatigue Study
- Dead Loads
- Bolts in Fatigue
- Cycle Peaks
- Summary

- Questions

Exercises

- Exercise 13: Basketball Rim
- Exercise 14: Trailer Hitch

Lesson 11: Variable Amplitude Fatigue

- Objectives

Case Study: Suspension

- Project Description
- Stages
- Rainflow Counting
- Variable Loading
- Noise Handling
- Fatigue Strength Factor
- Rainflow Matrix
- Results
- Summary
- Questions

Lesson 12: Drop Test Analysis

- Objectives
- Drop Test Analysis

Case Study: Camera

- Project Description
- Stages
- Rigid Floor Drop
- Parameters
- Dynamic Analysis
- Damping
- Solution Time
- Graphing
- Linear vs Nonlinear

- Elasto-plastic Model
- Contact Interaction
- Summary

Exercise

- Exercise 15: Clip

Lesson 13: Optimization Analysis

- Objectives
- Optimization Analysis

Case Study: Press Frame

- Project Description
- Design Requirements
- Stages
- Static + Frequency Coupling
- Design Study
- Optimization Goals
- Variables
- Constraints
- Tolerance
- Postprocessing
- Trend Graphs
- Summary

Exercises

- Exercise 16: Cantilever Bracket
- Exercise 17: Heat Sink

Lesson 14: Pressure Vessel Analysis

- Objectives

Case Study: Pressure Vessel

- Project Description
- Stages
- Stress Intensity

- Membrane & Bending Stress
- Stress Limits
- Load Case Combinations
- Stress Linearization
- Nozzle & Flange Analysis
- Summary