



 **SOLIDWORKS**  
**SOLIDWORKS Simulation**  
**Training**

**Course Outline**

**SOLID**  **PERTS**  
by solidxperience

***ENSURE YOUR SUCCESS IN 3D DESIGN WITH SOLIDWORKS***

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## SOLIDWORKS Simulation Static – 3 days (21h)

### 1. The Analysis Process

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- The analysis process
- SOLIDWORKS Simulation options
- Preprocessing
- Meshing
- Processing
- Postprocessing
- Multiple studies
- Reports
- Summary
- References

### 2. Mesh Controls, Stress Concentrations, and Boundary Conditions

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- Objectives
- Mesh Control
- Understanding the effect of Boundary Conditions

### 3. Assembly Analysis with Interactions

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- Interaction Analysis
- Study Propertiews
- Contact or bonded interaction
- Local Interaction

### 4. Symmetrical and Free Self- Equilibrated Assemblies

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- Shrink Fit Parts
- Analysis with Soft Springs

### 5. Assembly Analysis with Connectors and Mesh Refinement

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- Problem Statement
- Remote Load/Mass
- Connectors
- Mesh Control in an Assembly
- Mesh Plots

### 6. Bonded Mesh Options

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- Bonded Mesh Options
- Centrifugal Force
- Cyclical Symmetry
- Bonding Options
- Bonding Formulation

### 7. Analysis of Thin Components

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- Thin Components
- Mesh with Solid Elements
- Refined Solid Mesh
- Solid vs. Shell
- Creating Shell Elements
- Shell Elements - Mid-plane surface

### 8. Mixed Meshing - Shells & Solids

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- Mixed meshing - Solids and Shells

### 9. Beam Elements- Analysis of a Conveyor Frame

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- Beam and Truss elements

### 10. Mixed Meshing Solids, Beams & Shells

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- Mixed Meshing
- Beam Imprint

### 11. Design Study

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- Multiple load cases
- Geometry modification

*see Part 2 on next page »*

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**SOLIDWORKS Simulation Static (Part 2)****12. Thermal Stress Analysis**

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- Thermal stress analysis
- Saving model in a deformed shape

**13. Adaptive Meshing**

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- Adaptive meshing
- H-adaptivity study
- P-Adaptivity study
- H vs. P elements – summary

**14. Large Displacement Analysis**

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- Small vs. Large displacement analysis
- Small displacement linear analysis
- Large displacement non-linear analysis

**Annex**

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- Meshing Strategy
- Geometry Preparation
- Meshing Quality
- Meshing Parameters
- Meshing Steps
- Failure Diagnosis
- Tips for the Shell Elements Usage
- Requirements for Meshing
- Solvers in SOLIDWORKS Simulation
- Solver Selection
- Help and Customer Support

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## SOLIDWORKS Motion – 2 days (14h)

### 1. Introduction to Motion Simulation and Forces

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- Basic motion analysis
- Forces
- Results

### 2. Building a Motion Model and Post Processing

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- Creating local mates
- Mates
- Local mates
- Power
- Plotting kinematic results

### 3. Introduction to Contacts, Springs and Dampers

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- Contact and friction
- Contact
- Contact groups
- Contact friction
- Translational spring
- Translational damper
- Post-processing
- Analysis with friction (optional)

### 4. Advanced Contact

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- Contact forces
- STEP function
- Contact: Solid bodies
- Geometrical description of contacts Integrators
- Instability points
- Modifying result plots
- Path Mate Motor

### 5. Curve to Curve Contact

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- Contact forces
- Curve to curve contact
- Solid bodies vs. Curve to curve contact
- Solid bodies contact solution

### 6. CAM synthesis

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- Cams
- Trace path
- Exporting trace path curves

### 7. Motion Optimization

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- Motion Optimisation
- Sensors
- Optimisation analysis

### 8. Flexible Joints

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- Flexible joints
- System with Flexible Joints

### 9. Redundancies

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- Redundancies
- How to check for redundancies
- Typical redundant mechanisms

### 10. Export to FEA

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- Exporting results
- Export of load
- Direct solution in SOLIDWORKS motion

### 11. Event Based Simulation

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- Event based simulation
- Servo motors
- Sensors
- Task

### 12. Design Projects (Optional)

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- Design Project
- Self-guided problem – **Part 1**
- Self-guided problem – **Part 2**
- Problem solution – Part 1
- Creating the force function
- Force expression

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## SOLIDWORKS Simulation Professional – 2 days (14h)

*\*The "SOLIDWORKS Simulation Static" Training is required for this class.*

### 1. Frequency Analysis of Parts

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- Modal analysis basics
- Frequency Analysis with Supports
- Frequency Analysis without Supports
- Frequency Analysis with Load

### 2. Frequency Analysis of Assemblies

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- All Bonded Interaction Conditions
- Bonded and Free Interactions

### 3. Buckling Analysis

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- Buckling analysis

### 4. Load Cases

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- Load Cases

### 5. Submodeling

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- Submodeling

### 6. Topology Analysis

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- Topology Analysis
- Manufacturing Controls
- Mesh Effects
- Load Cases in Topology Studies
- Export Smoothed Mesh

### 7. Thermal Analysis

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- Thermal Analysis Basics
- Steady-State Thermal Analysis
- Transient Thermal Analysis
- Transient Analysis with time varying Load
- Transient Thermal Analysis using a Thermostat

### 8. Thermal Analysis with radiation

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- Steady State Analysis

### 9. Advanced Thermal Stress 2D Simplification

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- Thermal Analysis
- Thermal Stress Analysis
- 3D model

### 10. Fatigue Analysis

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- Fatigue
- Stress-life (S-N) based fatigue
- Thermal Study
- Thermal Stress Study
- Fatigue Terminology
- Fatigue Study
- Fatigue Study with dead load

### 11. Variable Amplitude Fatigue

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- Fatigue Study

*see Part 2 on next page »*

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## SOLIDWORKS Simulation Professional (Part 2)

### 12. Drop Test Analysis

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- Drop Test Analysis
- Rigid Floor Drop Test
- Elastic Floor/Elasto-Plastic Material
- Elasto-Plastic Material Model
- Drop Test with Contact Interaction

### 13. Optimization Analysis

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- Optimization Analysis
- Static and Frequency Analysis

### 14. Pressure Vessel Analysis

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- Pressure Vessel Analysis
- Manhole Nozzle Flange and Cover

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## SOLIDWORKS Simulation Premium – 3 days (21h)

\* The "SOLIDWORKS Simulation Static" Training is required for this class.  
\*\*The "SOLIDWORKS Simulation Professional" is required for this class.

### NON-LINEAR

#### 1. Large Displacement Analysis

- Linear static analysis
- Nonlinear static study
- Linear static study (Large displacement)

#### 2. Incremental Control Techniques

- Incremental control techniques
- Linear analysis
- Nonlinear analysis – Force control
- Nonlinear analysis – Displacement control

#### 3. Nonlinear Static Buckling Analysis

- Linear buckling
- Linear static study
- Nonlinear symmetrical buckling
- Nonlinear asymmetrical buckling

#### 4. Plastic Deformation

- Plastic deformation
- Problem statement
- Linear elastic
- Nonlinear – von Mises
- Nonlinear – Tresca's
- Stress accuracy
- Using Nonlinear Elastic Material

#### 5. Hardening Rules

- Hardening rules
- Isotropic hardening
- Kinematic hardening

#### 6. Analysis of Elastomers

- Two constant Mooney-Rivlin (1 material curve)
- Two constant Mooney-Rivlin (2 material curves)
- Two constant Mooney-Rivlin (3 material curves)
- Six constant Mooney-Rivlin (3 material curves)

#### 7. Nonlinear Interaction Analysis

- Problem statement

#### 8. Metal Forming

- Bending

### DYNAMICS

#### 1. Vibration of a Pipe

- Static analysis
- Frequency analysis
- Dynamic analysis (slow force)
- Dynamic analysis (Fast force)

#### 2. Transient Shock Analysis According to MILS- STD-810G

- Problem Description
- Run Frequency

#### 3. Harmonic Analysis of a Bracket

- Harmonic analysis of a bracket

#### 4. Response Spectrum Analysis

- Response Spectrum Analysis
- Response Spectrum

#### 5. Random Vibration Analysis According to MIL-STD-810G

- Random vibration analysis according to MIL-STD-810G

#### 6. Random Vibration Fatigue

- Material properties, S-N curve
- Random vibration fatigue options

#### 7. Nonlinear Dynamic Analysis of an Electronic Enclosure

- Linear dynamic analysis
- Nonlinear dynamic analysis

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## SOLIDWORKS Simulation Premium Composite – 1 day (7h)

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*\*\*The "SOLIDWORKS Simulation Professional" training is required for this class.*

- Introduction to Composites
- Objectives
- Composite Materials
- Composite Lamina
- Composite Laminates
- SOLIDWORKS Simulation Premium: Composites
- Composite Post Processing
- Case Study: Mountain Board
- Project Description
- Stages in the Process
- Lamina Properties
- Experimental Measurements
- Micromechanics
- Required Parameters
- Strength Parameters
- Composite Options
- Composite Orientation
- Offset
- Shell Alignment
- Composite Post Processing
- Stresses
- Inter Laminar Shear
- Failure Criterion
- Shear Stresses
- Summary
- Reference

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## SOLIDWORKS Flow Simulation – 2 days (14h)

### 1. Creating a SOLIDWORKS Flow Simulation Project

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- Model Preparation
- Post-Processing

### 2. Meshing

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- Computational Mesh
- Basic Mesh
- Initial Mesh
- Geometry Resolution
- Result Resolution/Level of initial Mesh
- Control Planes

### 3. Thermal Analysis

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- Fans
- Perforated Plates

### 4. External Transient Analysis

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- Reynolds Number
- External Flow
- Transient Analysis
- Turbulence Intensity
- Solution adaptive Mesh refinement
- Two-dimensional Flow
- Computational Domain
- Calculation control options
- Time animation

### 5. Conjugate Heat Transfer

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- Conjugate Heat transfer
- Real Gases

### 6. EFD Zooming

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- EFD Zooming

### 7. Porous Media

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- Porous media
- Design modification

### 8. Rotating Reference Frames

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- Rotating reference frame
- Averaging
- Noise Prediction
- Sliding Mesh
- Tangential faces of rotors
- Time step

### 9. Parametric Study

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- Parametric analysis
- Steady state analysis

### 10. Free Surface

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- Free Surface

### 11. Cavitation

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- Cavitation

### 12. Relative Humidity

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- Relative Humidity

### 13. Particle Trajectory

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- Particle Trajectory

### 14. Supersonic Flow

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- Supersonic Flow

### 15. FEA Load Transfer

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- FEA Load Transfer

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## SOLIDWORKS Flow Simulation: HVAC Module – 1 day (7h)

*\*The "SOLIDWORKS Flow Simulation" Training is required for this class.*

### 1. Introduction to HVAC

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- Objectives
- HVAC Module
- Case Study: Office
- Project Description
- Radiation
- Radiation Transparency
- Radiation Source
- Radiative Surface
- Discussion
- Comfort Parameters
- Conclusions

**Course Objectives :** At the end of each course, students will know the capabilities of the software and will be able to use the learned features.

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## SOLIDWORKS Flow Simulation: Electronic Cooling Module – 1 day (7h)

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### 1. Introduction to Electronics Module

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- Objectives
- Electronic Module
- Case Study: Computer Box
- Project Description
- Conclusions

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SOLIDWORKS Plastics – 1.5 day (10h), 2 day (14h) or 3 day (21h)

## 1. Basic Flow Analysis

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- Basic Flow Analysis
- Injection Process
- Element Types
- Units
- User Interface
- Injection Units
- Material
- Boundary Conditions
- Injection Location
- Create Mesh
- Running a Flow Analysis
- Flow Results

## 2. Detecting a Short Shot

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- Detecting Short Shots
- Fill Properties
- Flow Front Central Temperature
- Configurations

## 3. Automation Tools

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- Automation Tools
- Duplicate Study
- Plastics File Management
- Batch Manager

## 4. Injection Locations and Sink Marks

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- Injection Locations and Sink Marks
- Injection Location Rules
- Visibility Commands
- Sink Marks

## 5. Materials

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- Materials Properties
- User-Defined Database
- Resin Properties
- Temperature Properties
- Thermal Properties
- Rheological Properties
- PVT Data
- Thermo-Mechanical Properties

*see Part 2 on next page »*

## 6. Mesh Manipulation

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- Mesh Manipulation
- Local Mesh Refinement
- Edit/Review
- Element Issues
- Leader Lines
- Edit Study
- Solid Mesh
- Solid Mesh Size

## 7. Detecting Air Traps

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- Detecting Air Traps
- Air Traps
- Venting

## 8. Gate Blush

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- Gate Blush
- Runner Elements

## 9. Packing and Cooling Times

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- Pack and Cooling
- Flow/Pack Switch
- Pack Stage
- Pack Analysis
- Pack Results
- X-Y Plot
- Clipping Plane Mode
- Isosurface Mode
- Cooling Times

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## SOLIDWORKS Plastics (Part 2)

### 10. Multiple Cavity Molds

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- Multiple Cavity Molds
- Mold Layouts
- Runner System
- Runner Channel Design
- Clamping Force
- Runner Wizard Channel Design
- Family Mold Layout
- Using Runner-Balancing

### 11. Symmetry Analysis

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- Symmetry Analysis
- Symmetrical Runner
- Symmetry Face

### 12. Valve Gates and Hot Runners

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- Hot Runners
- Valve Gates

### 13. Reaction Injection Molding

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- Reaction Injection Molding

### 14. Using Inserts

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- Using Inserts
- Inserts
- Metal Material Database

### 15. Multi Material Overmolding

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- Multi Material Overmolding
- Assigning injection units

### 16. Co-Injection Molding

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- Co-Injection Molding
- Thick Parts

### 17. Bi-Injection Molding

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- Bi-Injection Molding
- Copy and Paste
- Bi-Injection
- Injection Start Value

### 18. Cooling Analysis

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- Cooling Analysis
- Cooling
- Cooling Channels and Mold Bodies
- Baffle
- Bubbler
- Cooling Simulations
- Coolant
- Mold
- Cool Parameters
- Cool Analysis
- Cool Results

### 19. Warpage Analysis

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- Warpage Analysis
- Shrinkage
- Warpage
- Warp Parameters
- Warp Results
- Reducing and Fixing Warped Parts

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