



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

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

2. Mesh Controls, Stress Concentrations, and Boundary Conditions

- Objectives
- Mesh control
- Project description
- Understanding the effect of boundary conditions

3. Assembly Analysis with Interactions

- Interaction analysis
- Contact or bonded interaction
- Pliers with local interaction

4. Symmetrical and Free Self- Equilibrated Assemblies

- Shrink fit parts
- Analysis with soft springs

5. Assembly Analysis with Connectors and Mesh Refinement

- Problem statement
- Remote load/mass
- Connectors
- Mesh control in an assembly
- Mesh plots

see Part 2 on next page »

6. Bonded Mesh Options

- Bonded mesh options
- Centrifugal force
- Cyclical symmetry
- Bonding options
- Bonding formulation

7. Analysis of Thin Components

- Thin components
- Mesh with solid elements
- Refined solid mesh
- Solid vs. Shell
- Creating shell elements
- Shell elements - Mid-plane surface
- Results comparison

8. Mixed Meshing - Shells & Solids

- Mixed meshing - Solids and shells

9. Beam Elements- Analysis of a Conveyor Frame

- Beam and truss elements

10. Mixed Meshing Solids, Beams & Shells

- Mixed Meshing
- Beam Imprint

11. Design Study

- Multiple load cases
- Geometry modification

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SOLIDWORKS Simulation Static (*Part 2*)

12. Thermal Stress Analysis

- Thermal stress analysis
- Saving model in a deformed shape

13. Adaptive Meshing

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

14. Large Displacement Analysis

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

Annex

- 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

- Basic motion analysis
- Forces
- Results

2. Building a Motion Model and Post Processing

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

3. Introduction to Contacts, Springs and Dampers

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

4. Advanced Contact

- 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

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

6. CAM synthesis

- Cams
- Trace path
- Exporting trace path curves

7. Motion Optimisation

- Motion Optimisation
- Sensors
- Optimisation analysis

8. Flexible Joints

- Flexible joints
- System with Flexible Joints

9. Redundancies

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

10. Export to FEA

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

11. Event Based Simulation

- Event based simulation
- Servo motors
- Sensors
- Task

12. Design Projects (Optional)

- 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

- Modal analysis basics
- Frequency analysis with supports
- Frequency analysis without supports
- Frequency analysis with load

2. Frequency Analysis of Assemblies

- All bonded contact conditions
- Bonded and free interactions

3. Buckling Analysis

- Buckling analysis

4. Load Cases

- Load Cases

5. Submodeling

- Submodeling

6. Topology Analysis

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

7. Thermal Analysis

- 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

- Steady state analysis

9. Advanced Thermal Stress 2D Simplification

- Thermal stress analysis
- Thermal analysis
- 3D model

10. Fatigue Analysis

- 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

- Fatigue study

see Part 2 on next page »

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SOLIDWORKS Simulation Professional (Part 2)

12. Drop Test Analysis

- Drop test analysis
- Rigid floor drop test
- Elastic floor/Elasto-Plastic Material
- Elasto-plastic material model
- Drop Test with Contact Interaction

13. Optimization Analysis

- Optimization analysis
- Static and frequency analyses

14. Pressure Vessel Analysis

- Pressure vessel analysis
- Manhole nozzle flange and cover

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SOLIDWORKS Simulation Premium – 3 days (21h)

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**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. Analyse de topologie

- 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 Contact Analysis

- Problem statement

8. Metal Forming

- Bending

DYNAMIC

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

- Model with remote mass

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)

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

***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

- Model preparation
- Postprocessing

2. Meshing

- Computational mesh
- Basic mesh
- Initial mesh
- Geometry resolution
- Result resolution/Level of initial mesh
- Control planes

3. Thermal Analysis

- Fans
- Perforated plates

4. External Transient Analysis

- 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

- Conjugate heat transfer
- Real gases

6. EFD Zooming

- EFD Zooming

7. Porous Media

- Porous media
- Design modification

8. Rotating Reference Frames

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

9. Parametric Study

- Parametric analysis
- Steady state analysis

10. Free Surface

- Free Surface

11. Cavitation

- Cavitation

12. Relative Humidity

- Relative Humidity

13. Particle Trajectory

- Particle Trajectory

14. Supersonic Flow

- Supersonic Flow

15. FEA Load Transfer

- 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

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

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

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1. Introduction to Electronics Module

- 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

- 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 Short Shots

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

3. Automation Tools

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

4. Injection Locations and Sink Marks

- Injection Locations and Sink Marks
- Injection Location Rules
- Visibility Commands
- Sink Marks
- Predict fill pattern
- Injection location advisor

5. Materials

- Materials Properties
- User-Defined Database
- Resin Properties
- Temperature Properties
- Heat Transfer Properties
- Viscosity
- PCT Data
- Mechanical Properties

see Part 2 on next page »

6. Mesh Manipulation

- Mesh Manipulation
- Local Refinement of Mesh
- Edit/Review
- Element Issues
- Leader Lines
- Solid Mesh
- Solid mesh size

7. Detecting Air Traps

- Detecting Air Traps
- Air Traps
- Venting
- Solver settings

8. Gate Blush

- Gate Blush
- Runner Elements

9. Packing and Cooling Times

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

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SOLIDWORKS Plastics (Part 2)

10. Multiple Cavity Molds

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

11. Symmetry Analysis

- Symmetry analysis
- Symmetry
- Cyclic symmetry
- Cyclic

12. Valve Gates and Hot Runners

- Hot Runners
- Valve Gates

13. Reaction Injection Molding

- Reaction Injection Molding

14. Using Inserts

- Using Inserts
- Inserts
- Metal Material Database

15. Multi Material Overmolding

- Multi-material overmolding
- Assigning injection units

16. Co-Injection Molding

- Co-Injection Molding
- Thick Parts

17. Bi-Injection Molding

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

18. Cooling Analysis

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

19. Warpage Analysis

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

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