Course objectives
Upon completion of this course you will be able to:

- Import, edit, and repair CAD geometry.
- Import and edit orphan meshes.
- Use virtual topology to ease the meshing of complicated geometry.
- Partition geometry to enable different meshing techniques.

Targeted audience
Simulation Analysts

Prerequisites
None
Day 1

Lecture 1  Geometry Import and Repair

- Demonstration 1  Geometry Import and Repair: Lens Model
- Demonstration 2  Geometry Import, Diagnostics, and Defeaturing
- Workshop 1  Geometry Import and Repair: Machine Part
- Workshop 2  Geometry Repair: Piston Model
- Workshop 3  Creating a Shell From a Thin Solid

Lecture 2  Orphan and Native Meshes

- Demonstration 3  Importing and Editing an Orphan Mesh
- Demonstration 4  Virtual Topology: Piston Model
- Demonstration 5  Virtual Topology: U-Joint Model
- Workshop 4  Importing, Editing, and Extracting Geometry from a Mesh
- Workshop 5  Virtual Topology: Bracket Model
Day 2

Lecture 3  Meshing and Partitioning

- Demonstration 6  Partitioning and Mixed Meshing
- Demonstration 7  Sweep Meshing Techniques
- Workshop 6  Hex Meshing Intersecting Pipes
- Workshop 7  Hex Meshing a Cardan Joint
- Workshop 8  Additional Geometry Repair and Meshing Exercises

Lecture 4  Bottom-Up Meshing

- Demonstration 8  Bottom-Up Meshing
- Workshop 9  Bottom-Up Meshing
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- Portfolio of established, best-in-class products
  - Abaqus, Isight, Tosca, fe-safe
  - All using a common extended licensing pool
## SIMULIA's Power of the Portfolio

<table>
<thead>
<tr>
<th>Tool</th>
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| Abaqus| - Routine and Advanced Simulation  
- Linear and Nonlinear, Static and Dynamic  
- Fluid, Thermal, Electrical, Acoustics  
- Extended Physics through Co-simulation  
- Model Preparation and Visualization | Realistic Human Simulation  
High Speed Crash & Impact  
Noise & Vibration |
| Isight| - Process Integration  
- Design Optimization  
- Parametric Optimization  
- Six Sigma and Design of Experiments | Material Calibration  
Workflow Automation  
Design Exploration |
| Tosca | - Non-Parametric Optimization  
- Structural and Fluid Flow Optimization  
- Topology, Sizing, Shape, Bead Optimization | Conceptual/Detailed Design  
Weight, Stiffness, Stress  
Pressure Loss Reduction |
| fe-safe| - Durability Simulation  
- Low Cycle and High Cycle Fatigue  
- Weld, High Temperature, Non-metallics | Safety Factors  
Creep-Fatigue Interaction  
Weld Fatigue |
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Lesson 1: Geometry Import and Repair

Lesson content:
- Introduction
- Geometry Import
- CAD Associative Import
- CAD Standalone Import
- Neutral Geometry Formats
- Geometry Repair
- Query and Diagnostics Tools
- Geometry Import Flowchart
- Example
- Shell Midsurface Creation
- Workshop Preliminaries
- Demonstration 1  Geometry Import and Repair: Lens Model
- Demonstration 2  Geometry Import, Diagnostics, and Defeaturing
- Workshop 1  Geometry Import and Repair: Machine Part
- Workshop 2  Geometry Repair: Piston Model
- Workshop 3  Creating a Shell From a Thin Solid

4 hours
Lesson 2: Orphan and Native Meshes

Lesson content:
- Introduction
- Dependent and Independent Part Instances
- Orphan Meshes
- Mesh Editing
- Creating Geometry from an Orphan Mesh
- Combined Orphan and Native Meshes
- Mesh Generation Techniques
  - Free meshing
  - Swept meshing
  - Structured meshing
- Virtual Topology
- Demonstration 3: Importing and Editing an Orphan Mesh
- Demonstration 4: Virtual Topology: Piston Model
- Demonstration 5: Virtual Topology: U-Joint Model
- Workshop 4: Importing, Editing, and Extracting Geometry from a Mesh
- Workshop 5: Virtual Topology: Bracket Model

3.5 hours
Lesson content:

- Enabling Various Meshing Techniques
- Controlling Mesh Density and Gradation
- Methods of Gaining More Control over the Mesh
- Creating and Merging Meshable Regions
- Hex Meshing Revolved Regions
- Mesh Stack Direction
- Parametric Modeling
- Assigning Element Types
- Verifying Mesh Quality
- Mass and Mesh Queries
- Midside Nodes
- Demonstration 6: Partitioning and Mixed Meshing
- Demonstration 7: Sweep Meshing Techniques
- Workshop 6: Hex Meshing Intersecting Pipes
- Workshop 7: Hex Meshing a Cardan Joint
- Workshop 8: Additional Geometry Repair and Meshing Exercises
Lesson 4: Bottom-Up Meshing

Lesson content:

- Introduction
- Basic Features
- Example
- Summary
- Demonstration 8: Bottom-Up Meshing
- Workshop 9: Bottom-Up Meshing

75 minutes