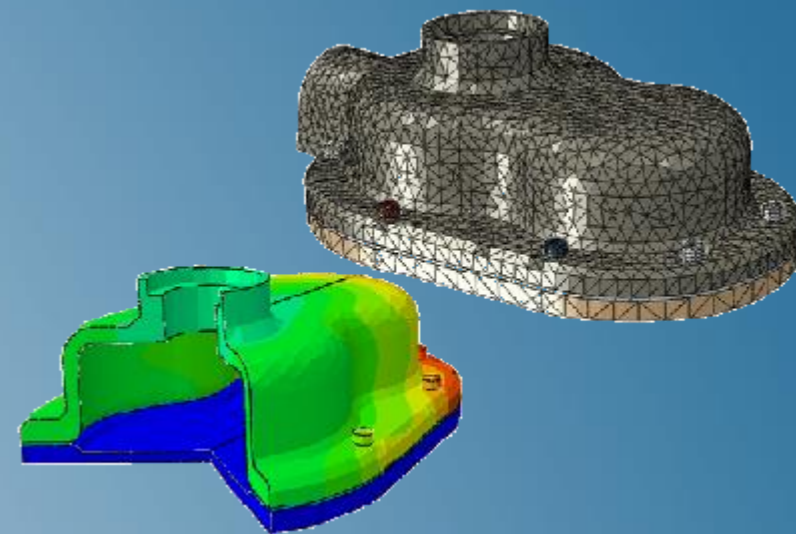


Introduction to Abaqus

Abaqus 2021



3DEXPERIENCE[®]

About this Course

Course objectives

Upon completion of this course you will be able to:

- ▶ Use Abaqus/CAE to create complete finite element models.
- ▶ Use Abaqus/CAE to submit and monitor analysis jobs.
- ▶ Use Abaqus/CAE to view and evaluate simulation results.
- ▶ Solve structural analysis problems using Abaqus/Standard and Abaqus/Explicit, including the effects of material nonlinearity, large deformation and contact.

Targeted audience

Simulation Analysts

Prerequisites

None



4 days

Day 1

Lesson 1

Overview of Abaqus

Demo 1

A First Look at Abaqus

Workshop 1

Linear Static Analysis of a Cantilever Beam

Lesson 2

Working with Geometry (Part 1)

Demo 2

Working with Native Geometry

Workshop 2

Creating Native Geometry: Pipe Creep Model

Lesson 3

Working with Geometry (Part 2)

Demo 3a

Generating a Shell From a Thin Solid

Workshop 3a

Import and Geometry Repair of Intersecting Pipes

Demo 3b

Importing and Editing an Orphan Mesh

Workshop 3b

Importing and Editing an Orphan Mesh: Pump Model

Day 2

Lesson 4

Material and Section Properties

Demo 4

Creating Materials and Assigning Sections

Workshop 4a

Material and Section Properties: Pipe Creep Model

Workshop 4b

Material and Section Properties: Pump Model

Lesson 5

Assemblies in Abaqus

Demo 5

Creating an Assembly

Workshop 5

Pump Model Assembly

Lesson 6

Steps, Output, Loads, & Boundary Conditions

Demo 6a

Creating Steps

Demo 6b

Using the Load Module

Workshop 6a

Step Definition and Loads: Pipe Creep Model

Workshop 6b

Step Definition and Loads: Pump Model

Lesson 7

Meshing Imported and Native Geometry

Demo 7

Using the Mesh Module

Workshop 7a

Structured Hex Meshing: Pipe Creep Model

Workshop 7b

Free and Swept Meshing: Pump Model

Workshop 7c

Meshing of Intersecting Pipes

Day 3

Lesson 8	Job Management and Results Visualization
Demo 8a	Using the Keywords Editor
Demo 8b	Visualizing Results
Workshop 8	Creep of a Pipe Intersection
Lesson 9	Linear and Nonlinear Problems
Lesson 10	Analysis Procedures (Part 1)
Demo 10	Nonlinear Static Analysis
Workshop 10a	Linear Analysis of a Skew Plate
Workshop 10b	Nonlinear Analysis of a Skew Plate
Lesson 11	Analysis Procedures (Part 2)
Demo 11	Multiple Load Cases
Workshop 11	Linear Static Analysis of a Cantilever Beam (<i>optional</i>)

Day 4

Lesson 12

Analysis Procedures (Part 3)

Workshop 12a

Dynamic Analysis of a Skew Plate

Workshop 12b

Pipe Whip Analysis

Lesson 13

Analysis Continuation Techniques

Workshop 13

Unloading Analysis of a Skew Plate

Lesson 14

Constraints and Connections

Demo 14

Defining a Rigid Body

Workshop 14

Tie Constraints: Pump Model

Lesson 15

Contact

Demo 15

Using Automatic Contact Detection and General Contact

Workshop 15

Nonlinear Static Analysis of a Pump Assembly

Additional Material

Appendix 1

Element Selection Criteria

Appendix 2

Analyzing Highly Nonlinear Quasi-Static Problems

Workshop A2

Single Pass Rolling of a Thick Plate

Appendix 3

Heat Transfer and Thermal-Stress Analysis

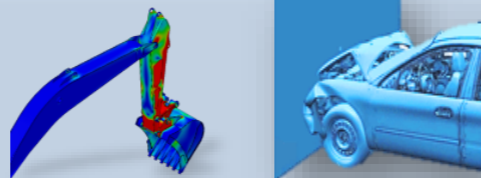
Workshop A3

Thermal-Stress Analysis of Intersecting Pipes

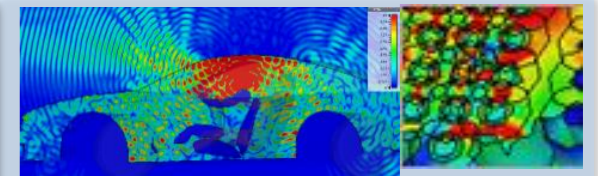
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- ▶ Advanced simulation portfolio covering simulation disciplines such as structural mechanics, computational fluid dynamics and electromagnetic field simulation, for a true multiphysics simulation approach.

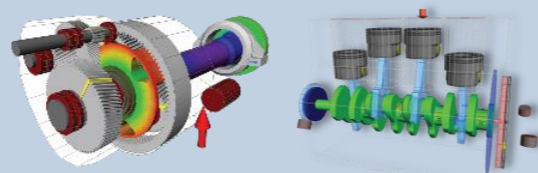
Structures



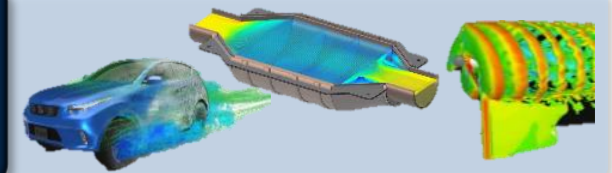
Electromagnetics



Multibody



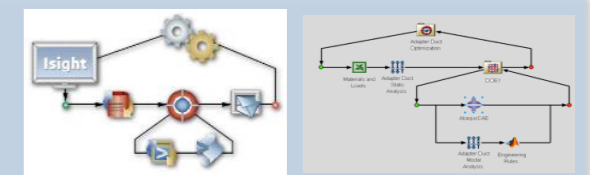
Fluids



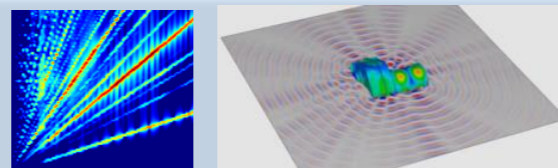
Durability



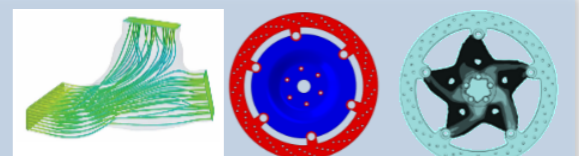
Automation



Vibro-acoustics



Optimization



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Revision Status (1/2)

Lesson 1	11/20	Updated for Abaqus 2021
Lesson 2	11/20	Updated for Abaqus 2021
Lesson 3	11/20	Updated for Abaqus 2021
Lesson 4	11/20	Updated for Abaqus 2021
Lesson 5	11/20	Updated for Abaqus 2021
Lesson 6	11/20	Updated for Abaqus 2021
Lesson 7	11/20	Updated for Abaqus 2021
Lesson 8	11/20	Updated for Abaqus 2021
Lesson 9	11/20	Updated for Abaqus 2021
Lesson 10	11/20	Updated for Abaqus 2021
Lesson 11	11/20	Updated for Abaqus 2021
Lesson 12	11/20	Updated for Abaqus 2021
Lesson 13	11/20	Updated for Abaqus 2021
Lesson 14	11/20	Updated for Abaqus 2021
Lesson 15	11/20	Updated for Abaqus 2021
Appendix 1	11/20	Updated for Abaqus 2021
Appendix 2	11/20	Updated for Abaqus 2021
Appendix 3	11/20	Updated for Abaqus 2021

Demonstration 1	11/20	Updated for Abaqus 2021
Demonstration 2	11/20	Updated for Abaqus 2021
Demonstration 3a	11/20	Updated for Abaqus 2021
Demonstration 3b	11/20	Updated for Abaqus 2021
Demonstration 4	11/20	Updated for Abaqus 2021
Demonstration 5	11/20	Updated for Abaqus 2021
Demonstration 6a	11/20	Updated for Abaqus 2021
Demonstration 6b	11/20	Updated for Abaqus 2021
Demonstration 7	11/20	Updated for Abaqus 2021
Demonstration 8a	11/20	Updated for Abaqus 2021
Demonstration 8b	11/20	Updated for Abaqus 2021
Demonstration 10	11/20	Updated for Abaqus 2021
Demonstration 11	11/20	Updated for Abaqus 2021
Demonstration 14	11/20	Updated for Abaqus 2021
Demonstration 15	11/20	Updated for Abaqus 2021

Revision Status (2/2)

Workshop 1	11/20	Updated for Abaqus 2021
Workshop 2	11/20	Updated for Abaqus 2021
Workshop 3a	11/20	Updated for Abaqus 2021
Workshop 3b	11/20	Updated for Abaqus 2021
Workshop 4a	11/20	Updated for Abaqus 2021
Workshop 4b	11/20	Updated for Abaqus 2021
Workshop 5	11/20	Updated for Abaqus 2021
Workshop 6a	11/20	Updated for Abaqus 2021
Workshop 6b	11/20	Updated for Abaqus 2021
Workshop 7a	11/20	Updated for Abaqus 2021
Workshop 7b	11/20	Updated for Abaqus 2021
Workshop 7c	11/20	Updated for Abaqus 2021
Workshop 8	11/20	Updated for Abaqus 2021

Workshop 10a	11/20	Updated for Abaqus 2021
Workshop 10b	11/20	Updated for Abaqus 2021
Workshop 11	11/20	Updated for Abaqus 2021
Workshop 12a	11/20	Updated for Abaqus 2021
Workshop 12b	11/20	Updated for Abaqus 2021
Workshop 13	11/20	Updated for Abaqus 2021
Workshop 14	11/20	Updated for Abaqus 2021
Workshop 15	11/20	Updated for Abaqus 2021
Workshop A2	11/20	Updated for Abaqus 2021
Workshop A3	11/20	Updated for Abaqus 2021

Lesson 1: Overview of Abaqus

Lesson content:

- ▶ What is Abaqus FEA?
- ▶ Abaqus/CAE
- ▶ Abaqus/Standard and Abaqus/Explicit
- ▶ Abaqus Conventions
- ▶ Working with the Model Tree
- ▶ Other Abaqus/CAE Topics
- ▶ Documentation
- ▶ Learning Community
- ▶ Abaqus Environment Settings
- ▶ Abaqus Fetch Utility
- ▶ Workshop Preliminaries
- ▶ Demonstration 1: A First Look at Abaqus/CAE
- ▶ Workshop 1: Linear Static Analysis of a Cantilever Beam



2.5 hours

Lesson 2: Working with Geometry (Part 1)

Lesson content:

- ▶ Abaqus/CAE: Part Module
- ▶ What are Parts?
- ▶ Creating Part Geometry
- ▶ Building a Part Using the Part Module Tools
- ▶ The Sketcher
- ▶ Adding Features
- ▶ Miscellaneous Topics
- ▶ Demonstration 2: Working with Native Geometry
- ▶ Workshop 2: Creating Native Geometry: Pipe Creep Model



2 hours

Lesson 3: Working with Geometry (Part 2)

Lesson content:

- ▶ Abaqus/CAE: Part Module
- ▶ Geometry Import and Repair
- ▶ Demonstration 3a: Generating a Shell From a Thin Solid
- ▶ Workshop 3a: Geometry Repair of Intersecting Pipes
- ▶ Part from an Orphan Mesh
- ▶ Creating Geometry from an Orphan Mesh
- ▶ Demonstration 3b: Importing and Editing an Orphan Mesh
- ▶ Workshop 3b: Importing and Editing an Orphan Mesh: Pump Model



1 hour

Lesson 4: Material and Section Properties

Lesson content:

- ▶ Abaqus/CAE: Property Module
- ▶ Abaqus Material Definitions
- ▶ Abaqus Conventions
- ▶ Linear Elasticity
- ▶ Large Strain Elasticity
- ▶ Metal Plasticity
- ▶ Material Calibration
- ▶ Material Databases
- ▶ Section Properties
- ▶ Special Features: Skins and Stringers
- ▶ Demonstration 4: Creating Materials and Assigning Sections
- ▶ Workshop 4a: Material and Section Properties: Pipe Model
- ▶ Workshop 4b: Material and Section Properties: Pump Model



2 hours

Lesson 5: Assemblies in Abaqus

Lesson content:

- ▶ Abaqus/CAE: Assembly Module
- ▶ What is an Assembly?
- ▶ Positioning Instances
- ▶ Subassemblies
- ▶ Other Operations
- ▶ Sets
- ▶ Surfaces
- ▶ Display Groups
- ▶ Instance Types
- ▶ Demonstration 5: Creating an Assembly; Boolean Operations
- ▶ Workshop 5: Pump Model Assembly



2 hours

Lesson 6: Steps, Output, Loads, & Boundary Conditions

Lesson content:

- ▶ Abaqus/CAE: Step Module
- ▶ Analysis Steps and Procedures
- ▶ Demonstration 6a: Creating Steps
- ▶ Output Requests
- ▶ Output Files
- ▶ Abaqus/CAE: Load Module
- ▶ Amplitudes and Distributions
- ▶ Loads and Boundary Conditions
- ▶ Initial Conditions
- ▶ Demonstration 6b: Using the Load Module
- ▶ Workshop 6a: Step Definition and Loads: Pipe Creep Model
- ▶ Workshop 6b: Step Definition and Loads: Pump Model



2 hours

Lesson 7: Meshing Imported and Native Geometry

Lesson content:

- ▶ Abaqus/CAE: Mesh Module
- ▶ What is a Mesh?
- ▶ Elements in Abaqus
- ▶ Mesh Generation Workflow
- ▶ The Mesh Module
- ▶ Common Tools:
 - Density
 - Controls
 - Element Selection
 - Meshing
 - Local Fine-tuning
 - Quality Checks
- ▶ Advanced Topics:
 - Virtual Topology
 - Bottom-up Meshing
 - Mesh Compatibility
 - Mesh Convergence
- ▶ Dependent and Independent Part Instances
- ▶ Demonstration 7: Using the Mesh Module
- ▶ Workshop 7a: Structured Hex Meshing: Pipe Creep Model
- ▶ Workshop 7b: Free and Swept Meshing: Pump Model
- ▶ Workshop 7c: Meshing of Intersecting Pipes



2 hours

