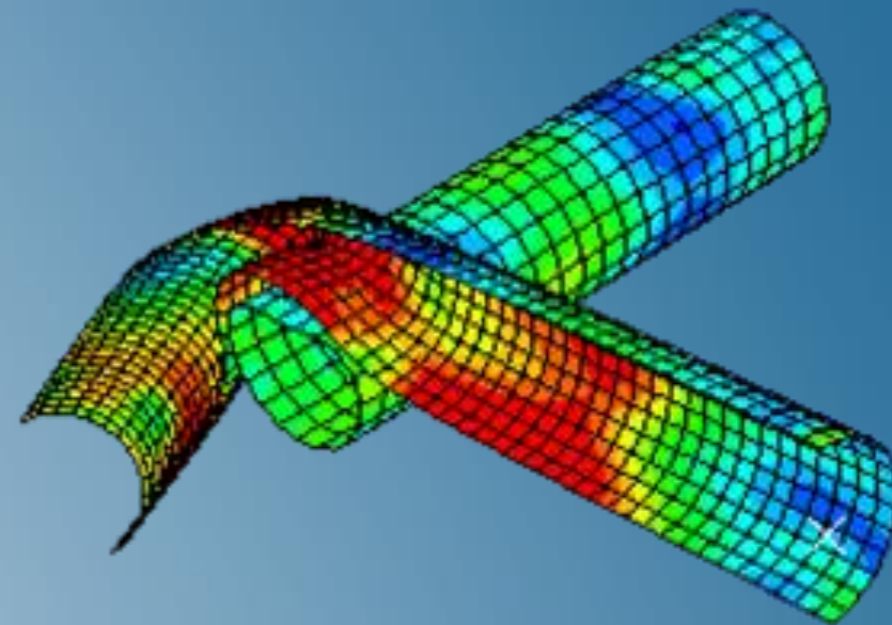


Introduction to Abaqus/Standard and Abaqus/Explicit

Abaqus 2022



3DEXPERIENCE[®]

About this Course

Course objectives

Upon completion of this course you will be able to:

- ▶ Complete finite element models using Abaqus keywords.
- ▶ Submit and monitor analysis jobs.
- ▶ 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



3 days

Day 1

Lesson 1	Defining an Abaqus Model
Workshop 1	Basic Input and Output
Lesson 2	Linear Static Analysis
Workshop 2	Linear Static Analysis of a Cantilever Beam: Multiple Load Cases
Lesson 3	Nonlinear Analysis in Abaqus/Standard
Workshop 3	Nonlinear Statics

Day 2

Lesson 4 Multistep Analysis in Abaqus

Workshop 4 Unloading Analysis

Lesson 5 Constraints and Contact

Workshop 5 Seal Contact

Lesson 6 Introduction to Dynamics

Workshop 6 Dynamics

Day 3

Lesson 7	Using Abaqus/Explicit
Workshop 7	Contact with Abaqus/Explicit
Lesson 8	Quasi-Static Analysis in Abaqus/Explicit
Workshop 8	Quasi-Static Analysis (<i>Optional</i>)
Lesson 9	Combining Abaqus/Standard & Abaqus/Explicit
Workshop 9	Import Analysis (<i>Optional</i>)

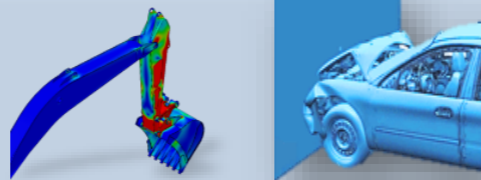
Additional Material

Appendix 1	Element Selection Criteria
Appendix 2	Material and Section Properties
Appendix 3	Contact Issues Specific to Abaqus/Standard
Appendix 4	Contact Issues Specific to Abaqus/Explicit

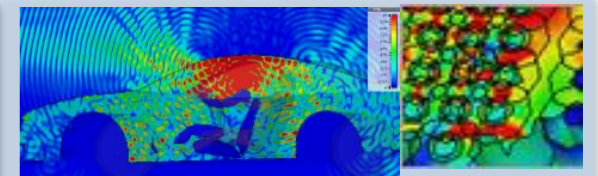
SIMULIA

- ▶ SIMULIA is the Dassault Systèmes brand for realistic simulation solutions.
- ▶ Advanced simulation portfolio covering simulation disciplines such as structural mechanics, computational fluid dynamics and electromagnetic field simulation, for a true multiphysics simulation approach.

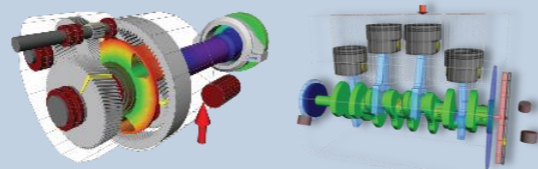
Structures



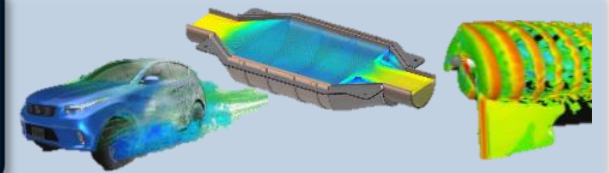
Electromagnetics



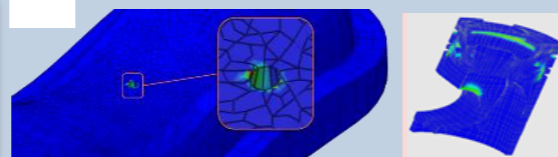
Multibody



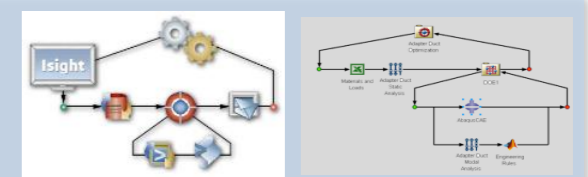
Fluids



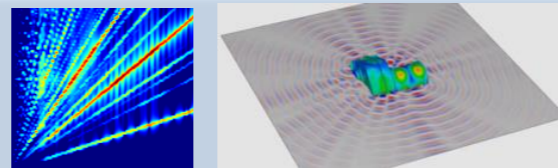
Durability



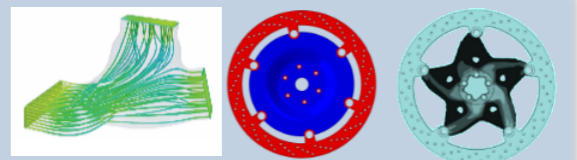
Automation



Vibro-acoustics



Optimization



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Revision Status

Lesson 1	11/21	Updated for Abaqus 2022
Lesson 2	11/21	Updated for Abaqus 2022
Lesson 3	11/21	Updated for Abaqus 2022
Lesson 4	11/21	Updated for Abaqus 2022
Lesson 5	11/21	Updated for Abaqus 2022
Lesson 6	11/21	Updated for Abaqus 2022
Lesson 7	11/21	Updated for Abaqus 2022
Lesson 8	11/21	Updated for Abaqus 2022
Lesson 9	11/21	Updated for Abaqus 2022
Appendix 1	11/21	Updated for Abaqus 2022
Appendix 2	11/21	New for Abaqus 2022
Appendix 3	11/21	Updated for Abaqus 2022
Appendix 3	11/21	Updated for Abaqus 2022

Workshop 1	11/21	Updated for Abaqus 2022
Workshop 2	11/21	Updated for Abaqus 2022
Workshop 3	11/21	Updated for Abaqus 2022
Workshop 4	11/21	Updated for Abaqus 2022
Workshop 5	11/21	Updated for Abaqus 2022
Workshop 6	11/21	Updated for Abaqus 2022
Workshop 7	11/21	Updated for Abaqus 2022
Workshop 8	11/21	Updated for Abaqus 2022
Workshop 9	11/21	Updated for Abaqus 2022

Lesson 1: Defining an Abaqus Model

Lesson content:

- ▶ Introduction
- ▶ Abaqus FEA
- ▶ Abaqus/CAE
- ▶ Abaqus/Standard and Abaqus/Explicit
- ▶ Documentation
- ▶ SIMULIA Community
- ▶ Components of an Abaqus Model
- ▶ Details of an Abaqus Input File
- ▶ Abaqus Conventions
- ▶ Output
- ▶ Example: Cantilever Beam Model
- ▶ Parts and Assemblies (optional)
- ▶ Abaqus Environment Settings
- ▶ Managing Memory and Disk Resources
- ▶ Abaqus Fetch Utility
- ▶ Workshop Preliminaries
- ▶ Workshop 1: Basic Input and Output (IA)
- ▶ Workshop 1: Basic Input and Output (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2 hours

Lesson 2: Linear Static Analysis

Lesson content:

- ▶ Linear and Nonlinear Procedures
- ▶ Linear Static Analysis and Multiple Load Cases
- ▶ Multiple Load Case Usage
- ▶ Examples
- ▶ Workshop 2: Linear Static Analysis of a Cantilever Beam (IA)
- ▶ Workshop 2: Linear Static Analysis of a Cantilever Beam (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2 hours

Lesson 3: Nonlinear Analysis in Abaqus

Lesson content:

- ▶ Nonlinearity in Structural Mechanics
- ▶ Equations of Motion
- ▶ Nonlinear Analysis Using Implicit Methods
- ▶ Nonlinear Analysis Using Explicit Methods
- ▶ Input File for Nonlinear Analysis
- ▶ Status File
- ▶ Message File
- ▶ Output from Nonlinear Cantilever Beam Analysis
- ▶ Workshop 3: Nonlinear Statics (IA)
- ▶ Workshop 3: Nonlinear Statics (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2 hours

Lesson 4: Multistep Analysis in Abaqus

Lesson content:

- ▶ Multistep Analyses
- ▶ Restart Analysis in Abaqus
- ▶ Postprocessing of Restart Data
- ▶ Workshop 4: Unloading Analysis (IA)
- ▶ Workshop 4: Unloading Analysis (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



1 hour

Lesson 5: Constraints and Contact

Lesson content:

- ▶ Constraints
- ▶ Tie Constraints
- ▶ Rigid Bodies
- ▶ Shell-to-solid Coupling
- ▶ Contact
- ▶ Defining General Contact
- ▶ Defining Contact Pairs
- ▶ Defining Surfaces
- ▶ Local Surface Behavior
- ▶ Relative Sliding of Points in Contact
- ▶ Adjusting Initial Nodal Locations for Contact
- ▶ Contact Output
- ▶ Workshop 5: Seal Contact (IA)
- ▶ Workshop 5: Seal Contact (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2.5 hours

Lesson 6: Introduction to Dynamics

Lesson content:

- ▶ What Makes a Problem Dynamic?
- ▶ Equations for Dynamic Problems
- ▶ Linear Dynamics
- ▶ Nonlinear Dynamics
- ▶ Comparing Abaqus/Standard and Abaqus/Explicit
- ▶ Nonlinear Dynamics Example
- ▶ Workshop 6: Dynamics (IA)
- ▶ Workshop 6: Dynamics (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2 hours

Lesson 7: Using Abaqus/Explicit

Lesson content:

- ▶ Overview of the Explicit Dynamics Procedure
- ▶ Abaqus/Explicit Syntax
- ▶ Rigid Bodies
- ▶ Workshop 7: Contact with Abaqus/Explicit (IA)
- ▶ Workshop 7: Contact with Abaqus/Explicit (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2 hours

Lesson 8: Quasi-Static Analysis in Abaqus/Explicit

Lesson content:

- ▶ Introduction
- ▶ Solution Strategies
- ▶ Quasi-Static Simulations Using Explicit Dynamics
- ▶ Energy Balance
- ▶ Example: Load Rates
- ▶ Example: Mass Scaling
- ▶ Adaptive Meshing
- ▶ Workshop 8: Quasi-Static Analysis (IA)
- ▶ Workshop 8: Quasi-Static Analysis (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



2 hours

Lesson 9: Combining Abaqus/Standard & Abaqus/Explicit

Lesson content:

- ▶ Introduction
- ▶ Abaqus Usage
- ▶ Springback Calculation using Abaqus/Standard
- ▶ Workshop 9: Import Analysis (IA)
- ▶ Workshop 9: Import Analysis (KW)



Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.



1 hour

Appendix 1: Element Selection Criteria

Appendix content:

- ▶ Elements
- ▶ Structural (Shells and Beams) vs. Continuum Elements
- ▶ Modeling Bending Using Continuum Elements
- ▶ Stress Concentrations
- ▶ Contact
- ▶ Incompressible Materials
- ▶ Mesh Generation
- ▶ Solid Element Selection Summary



1.5 hours

Appendix 2: Material and Section Properties

Appendix content:

- ▶ Abaqus Material Definitions
- ▶ Abaqus Conventions
- ▶ Linear Elasticity
- ▶ Large Strain Elasticity
- ▶ Metal Plasticity
- ▶ Section Properties



45 minutes

Appendix 3: Contact Issues Specific to Abaqus/Standard

Appendix content:

- ▶ Contact as Part of the Model Definition
- ▶ Mesh Density Considerations
- ▶ Contact Logic in Abaqus/Standard



30 minutes

Appendix 4: Contact Issues Specific to Abaqus/Explicit

Appendix content:

- ▶ Contact Pairs as Part of the History Data
- ▶ Enforcing the Contact Constraints
- ▶ Double-Sided Contact
- ▶ Initial Kinematic Compliance



30 minutes