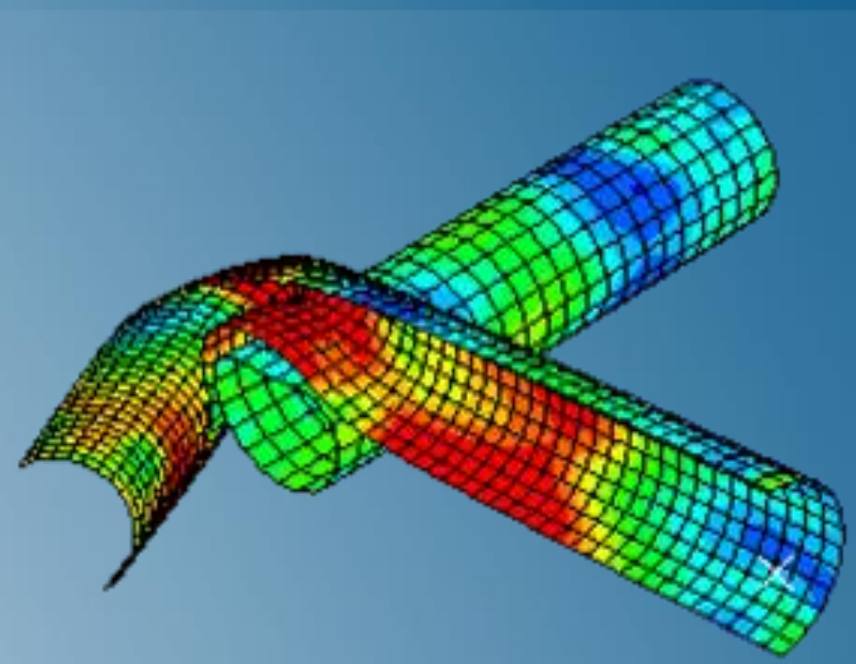
Introduction to Abaqus/Standard and Abaqus/Explicit

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 (*Optional*)
Lesson 9	Combining Abaqus/Standard & Abaqus/Explicit
Workshop 9	Import Analysis (*Optional*)

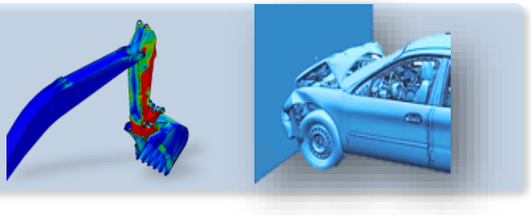
Additional Material

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

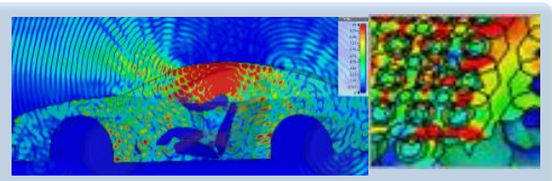
SIMULIA

- 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.

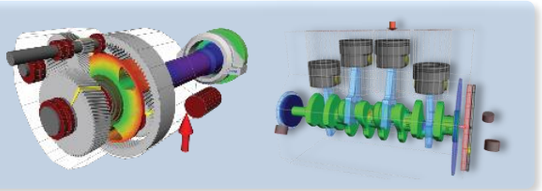
Structures



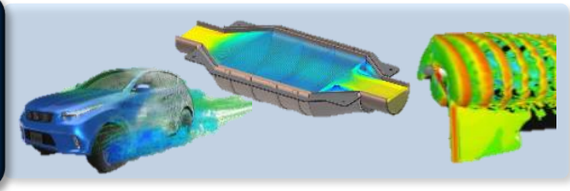
Electromagnetics



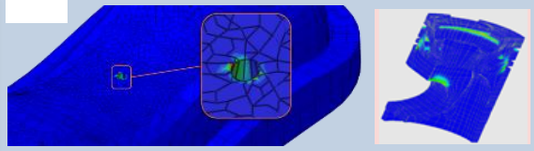
Multibody



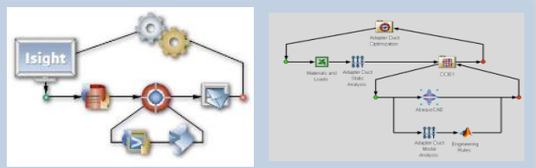
Fluids



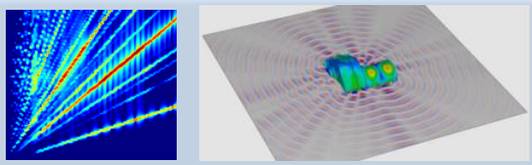
Durability



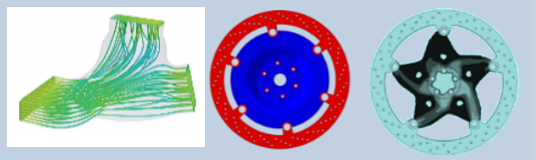
Automation



Vibro-acoustics



Optimization

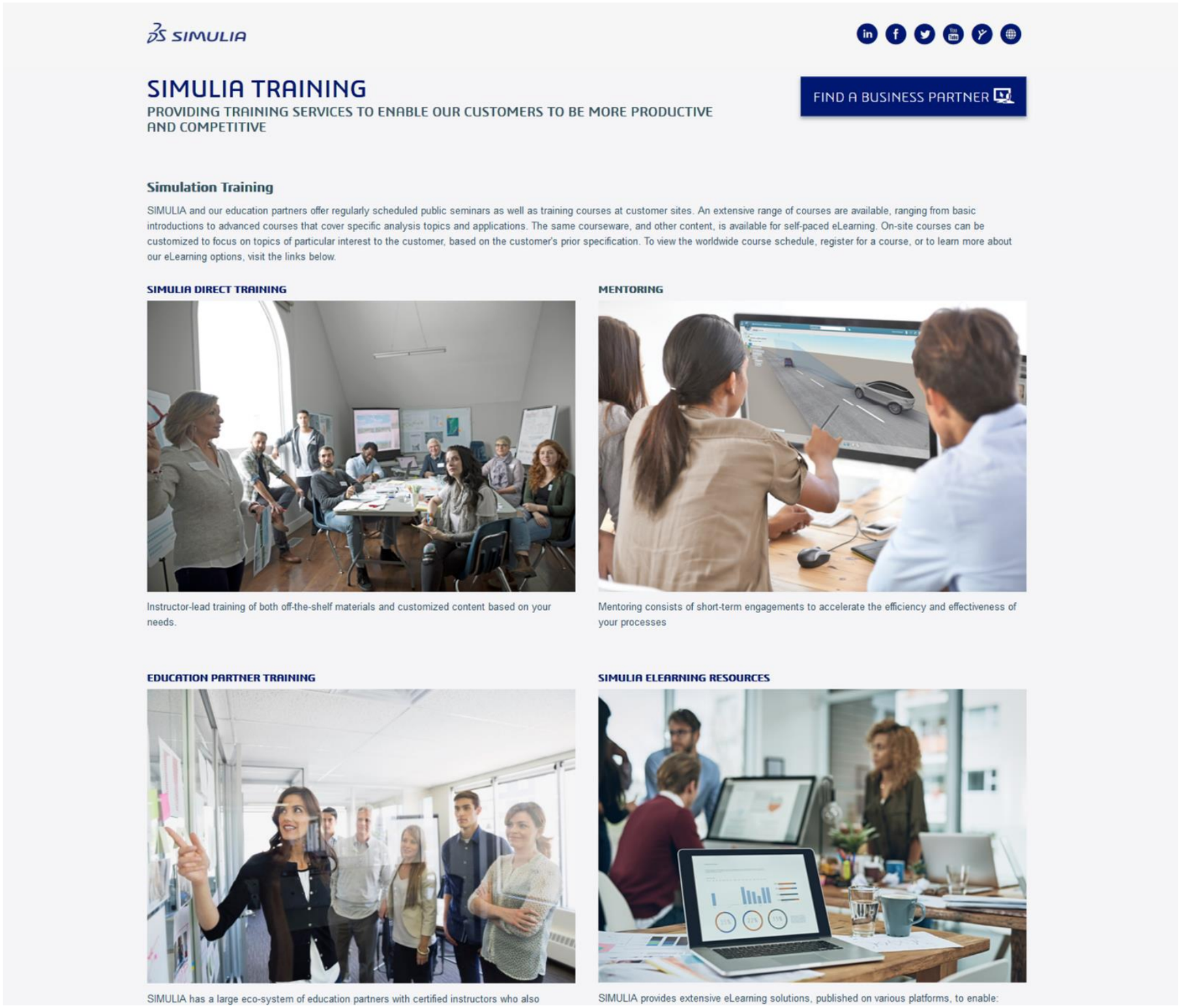


Join the Community!

Go to go.3ds.com/simc to log in or join!

SIMULIA Training

https://www.3ds.com/products-services/simulia/training/



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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