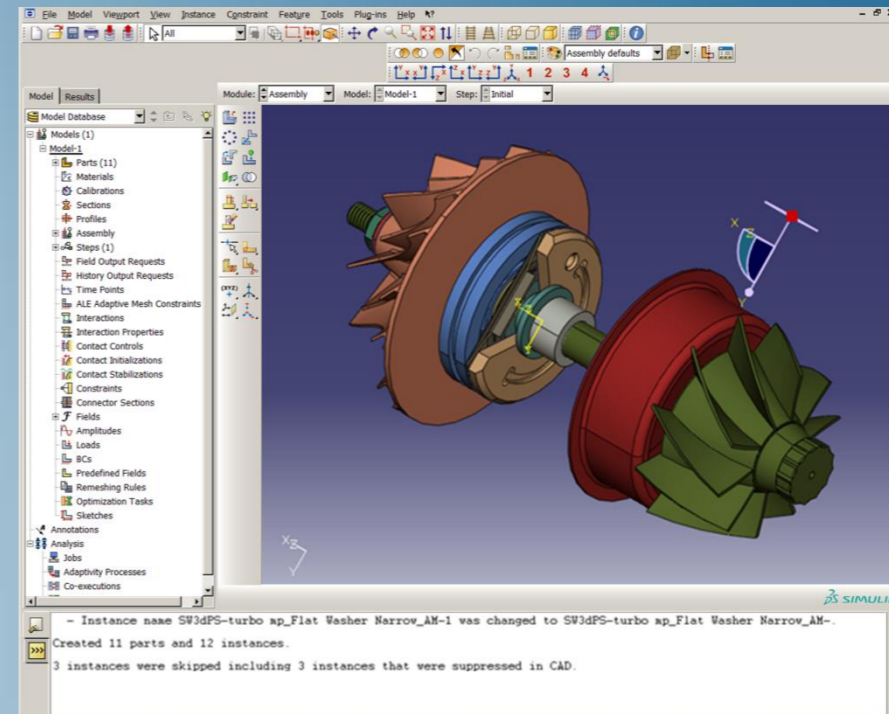


Introduction to Abaqus/CAE

Abaqus 2019



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.

Targeted audience

Simulation Analysts

Prerequisites

None



2 days

Day 1

Lesson 1

Introducing Abaqus/CAE

Demo 1

A First Look at Abaqus

Workshop 1

Overview of Abaqus/CAE

Lesson 2

Working with Geometry in Abaqus/CAE

Demo 2a

Working with Native Geometry

Demo 2b

Generating a Shell Feature from a Solid Feature

Demo 2c

Generating a Shell From a Thin Solid

Workshop 2a

Solid and Rigid Parts—Hinge Model

Workshop 2b

Creating Parts Using Constraints and Dimensions

Workshop 2c

Creating Parts—Clip and Plate Model

Lesson 3

Working with Models Created Outside Abaqus

Demo 3

Importing and Editing an Orphan Mesh

Workshop 3

Orphan Mesh Editing—Pump Model

Day 2

Lesson 4

Material Properties and Assemblies

Demo 4a

Materials and Sections; Visualizing Beam Cross-Sections

Demo 4b

Creating an Assembly; Boolean Operations

Workshop 4a

Assigning Material Properties and Defining the Assembly—Hinge Model

Workshop 4b

Assigning Material Properties and Defining the Assembly—Clip and Plate Model

Lesson 5

Steps, Interactions, and Loads

Demo 5a

Creating Steps

Demo 5b

Using the Load Module

Demo 5c

Defining a Rigid Body

Demo 5d

Using Automatic Contact Detection and General Contact

Workshop 5a

Defining Steps, Interactions, Boundary Conditions, and Loads—Hinge Model

Workshop 5b

Defining Steps, Interactions, Boundary Conditions, and Loads—Clip and Plate Model

Day 2 (cont'd)

Lesson 6

Meshing

Demo 6a

Using the Mesh Module

Demo 6b

Partitioning and Meshing

Workshop 6a

Three-Dimensional Meshing—Hinge Model

Workshop 6b

Two-Dimensional Meshing—Fuse Model

Workshop 6c

Meshing—Clip and Plate Model

Lesson 7

Job Management and Results Visualization

Demo 7a

Using the Keywords Editor

Demo 7b

Visualizing Results

Workshop 7a

Job Management and Visualization—Hinge Model

Workshop 7b

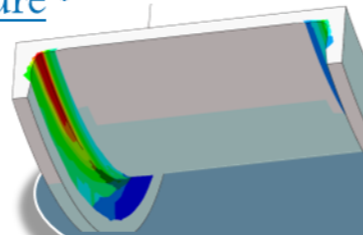
Visualizing Results and Modifying the Model Definition—Clip and Plate Model

SIMULIA

- ▶ SIMULIA is the Dassault Systèmes brand for Realistic Simulation solutions
- ▶ Portfolio of established, best-in-class products
 - Abaqus, Isight, Tosca, fe-safe, Simpack

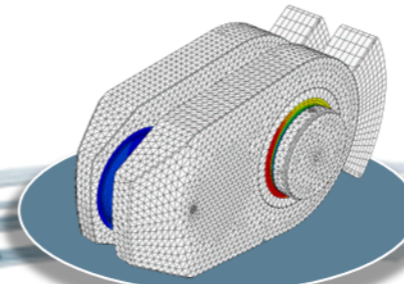
Design Optimization: Tosca Structure *

Simulation-driven design refinement to improve performance



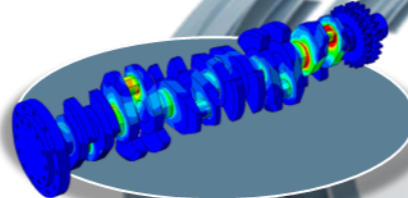
Durability Assessment: fe-safe *

Accurate life estimation to achieve certification



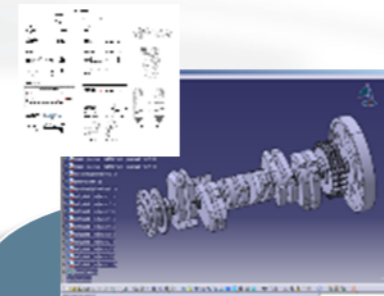
FEA Stress Analysis: Abaqus *

Detailed stress analysis using extracted load history from MBS



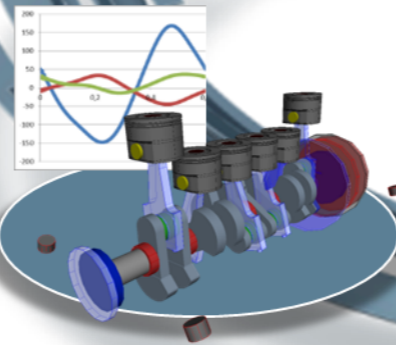
CAD Geometry: CATIA

Fully parameterized 3D geometry; FEA model generation via associative interface



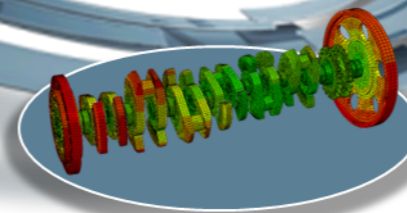
Multibody Simulation: Simpack

System analysis to extract virtual load history of complete working cycle



Mesh Calibration: Isight *

Automated mesh calibration; sufficient mesh quality for accurate results

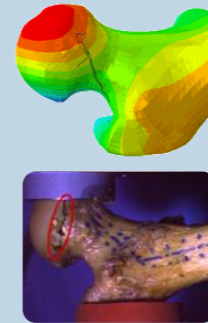


* Included in extended licensing pool

SIMULIA's Power of the Portfolio

Abaqus

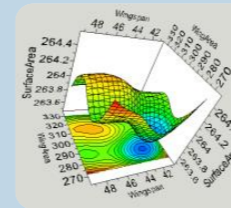
- Routine and Advanced Simulation
- Linear and Nonlinear, Static and Dynamic
- Thermal, Electrical, Acoustics
- Extended Physics through Co-simulation
- Model Preparation and Visualization



**Realistic Human Simulation
High Speed Crash & Impact
Noise & Vibration**

Isight

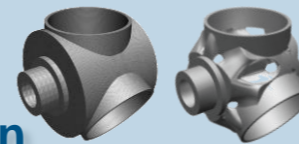
- Process Integration
- Design Optimization
- Parametric Optimization
- Six Sigma and Design of Experiments



**Material Calibration
Workflow Automation
Design Exploration**

Tosca

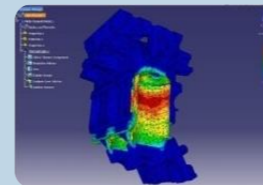
- Non-Parametric Optimization
- Structural and Fluid Flow Optimization
- Topology, Sizing, Shape, Bead Optimization



**Conceptual/Detailed Design
Weight, Stiffness, Stress
Pressure Loss Reduction**

fe-safe

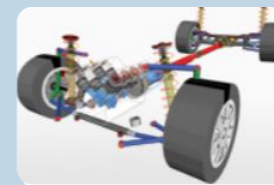
- Durability Simulation
- Low Cycle and High Cycle Fatigue
- Weld, High Temperature, Non-metallics



**Safety Factors
Creep-Fatigue Interaction
Weld Fatigue**

Simpack

- 3D Multibody Dynamics Simulation
- Mechanical or Mechatronic Systems
- Detailed Transient Simulation (Offline and Realtime)



**Complete System Analyses
(Quasi-)Static, Dynamics, NVH
Flex Bodies, Advanced
Contact**

Join the Community!

How can you maximize the robust technology of the SIMULIA Portfolio ?
Connect with peers to share knowledge and get technical insights

Go to www.3ds.com/slc
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Discover new ways to explore how to leverage realistic simulation to drive product innovation. Join the thousands of Abaqus and Isight users who are already gaining valuable knowledge from the SIMULIA Learning Community.

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Connect. Share. Spark Innovation.

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Revision Status

Lesson 1	11/18	Updated for Abaqus 2019
Lesson 2	11/18	Updated for Abaqus 2019
Lesson 3	11/18	Updated for Abaqus 2019
Lesson 4	11/18	Updated for Abaqus 2019
Lesson 5	11/18	Updated for Abaqus 2019
Lesson 6	11/18	Updated for Abaqus 2019
Lesson 7	11/18	Updated for Abaqus 2019
Demonstration 1	11/18	Updated for Abaqus 2019
Demonstration 2a	11/18	Updated for Abaqus 2019
Demonstration 2b	11/18	Updated for Abaqus 2019
Demonstration 2c	11/18	Updated for Abaqus 2019
Demonstration 3	11/18	Updated for Abaqus 2019
Demonstration 4a	11/18	Updated for Abaqus 2019
Demonstration 4b	11/18	Updated for Abaqus 2019
Demonstration 5a	11/18	Updated for Abaqus 2019
Demonstration 5b	11/18	Updated for Abaqus 2019
Demonstration 5c	11/18	Updated for Abaqus 2019
Demonstration 5d	11/18	Updated for Abaqus 2019

Demonstration 6a	11/18	Updated for Abaqus 2019
Demonstration 6b	11/18	Updated for Abaqus 2019
Demonstration 7a	11/18	Updated for Abaqus 2019
Demonstration 7b	11/18	Updated for Abaqus 2019
Workshop 1	11/18	Updated for Abaqus 2019
Workshop 2a	11/18	Updated for Abaqus 2019
Workshop 2b	11/18	Updated for Abaqus 2019
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Workshop 6a	11/18	Updated for Abaqus 2019
Workshop 6b	11/18	Updated for Abaqus 2019
Workshop 6c	11/18	Updated for Abaqus 2019
Workshop 7a	11/18	Updated for Abaqus 2019
Workshop 7b	11/18	Updated for Abaqus 2019

Lesson 1: Introducing Abaqus/CAE

Lesson content:

- ▶ What is Abaqus FEA?
- ▶ Why Abaqus/CAE Over Other Tools?
- ▶ Primary Features of Abaqus/CAE
- ▶ Miscellaneous Features of Abaqus/CAE
- ▶ Starting Abaqus/CAE
- ▶ Important Abaqus/CAE Terminology
- ▶ Documentation
- ▶ SIMULIA Learning Community
- ▶ Abaqus Environment Settings
- ▶ Abaqus/CAE Checklist
- ▶ Working with the Model Tree
- ▶ Workshop Preliminaries
- ▶ Demonstration 1: A First Look at Abaqus/CAE
- ▶ Workshop 1: Overview of Abaqus/CAE



2 hours

Lesson 2: Working with Geometry in Abaqus/CAE

Lesson content:

- ▶ What are Parts?
- ▶ Defining a Part
- ▶ Geometry Import and Repair
- ▶ Building a Part Using the Part Module Tools
- ▶ Demonstration 2a: Working with Native Geometry
- ▶ Demonstration 2b: Generating a Shell Feature from a Solid Feature
- ▶ Demonstration 2c: Generating a Shell From a Thin Solid
- ▶ Workshop 2a: Solid and Rigid Parts—Hinge Model
- ▶ Workshop 2b: Creating Parts Using Constraints and Dimensions
- ▶ Workshop 2c: Creating Parts—Clip and Plate Model



3 hours

Lesson 3: Working with Models Created Outside Abaqus

Lesson content:

- ▶ Details of an Abaqus Input File
- ▶ Orphan Mesh Import
- ▶ Example
- ▶ Creating Geometry from an Orphan Mesh
- ▶ Combining Orphan and Native Mesh Features
- ▶ Demonstration 3: Importing and Editing an Orphan Mesh
- ▶ Workshop 3: Orphan Mesh Editing—Pump Model



2 hours

Lesson 4: Material Properties and Assemblies

Lesson content:

- ▶ Defining and Assigning Properties
- ▶ Material Evaluation
- ▶ Material Databases
- ▶ Material Calibration
- ▶ What is an Assembly?
- ▶ Positioning Instances
- ▶ Patterning
- ▶ Boolean Operations
- ▶ Sets and Surfaces
- ▶ Display Groups
- ▶ Hiding/Showing Instances
- ▶ Switching Context for Model and Part Instances
- ▶ Demonstration 4a: Materials and Sections; Visualizing Beam Cross-Sections
- ▶ Demonstration 4b: Creating an Assembly; Boolean Operations
- ▶ Workshop 4a: Assigning Material Properties and Defining the Assembly—Hinge Model
- ▶ Workshop 4b: Assigning Material Properties and Defining the Assembly—Clip and Plate Model



2 hours

Lesson 5: Steps, Interactions, and Loads

Lesson content:

- ▶ Steps
- ▶ Output
- ▶ Interactions
- ▶ Loads, Boundary Conditions, and Initial Conditions
- ▶ Model Verification
- ▶ Demonstration 5a: Creating Steps
- ▶ Demonstration 5b: Using the Load Module
- ▶ Demonstration 5c: Defining a Rigid Body
- ▶ Demonstration 5d: Using Automatic Contact Detection and General Contact
- ▶ Workshop 5a: Defining Steps, Interactions, Boundary Conditions, and Loads—Hinge Model
- ▶ Workshop 5b: Defining Steps, Interactions, Boundary Conditions, and Loads—Clip and Plate Model



2 hours

Lesson 6: Meshing

Lesson content:

- ▶ Overview
- ▶ Introduction
- ▶ Dependent and Independent Part Instances
- ▶ Mesh Generation Techniques
- ▶ Enabling Various Meshing Techniques
- ▶ Bottom-Up Hex Meshing
- ▶ Mesh Compatibility
- ▶ Controlling Mesh Density and Gradation
- ▶ Parametric Modeling
- ▶ Assigning Element Types
- ▶ Verifying Mesh Quality
- ▶ Mass and Mesh Queries
- ▶ Demonstration 6a: Using the Mesh Module
- ▶ Demonstration 6b: Partitioning and Meshing
- ▶ Workshop 6a: Three-Dimensional Meshing—Hinge Model
- ▶ Workshop 6b: Two-Dimensional Meshing—Fuse Model
- ▶ Workshop 6c: Meshing—Clip and Plate Model



2 hours

Lesson 7: Job Management and Results Visualization

Lesson content:

- ▶ Job Management
- ▶ Keywords Editor
- ▶ Review of ODB Output
- ▶ Results Visualization: Basic features
- ▶ Results Visualization: Advanced/miscellaneous features
- ▶ Demonstration 7a: Using the Keywords Editor
- ▶ Demonstration 7b: Visualizing Results
- ▶ Workshop 7a: Job Management and Visualization—Hinge Model
- ▶ Workshop 7b: Visualizing Results and Modifying the Model Definition—Clip and Plate Model



2 hours