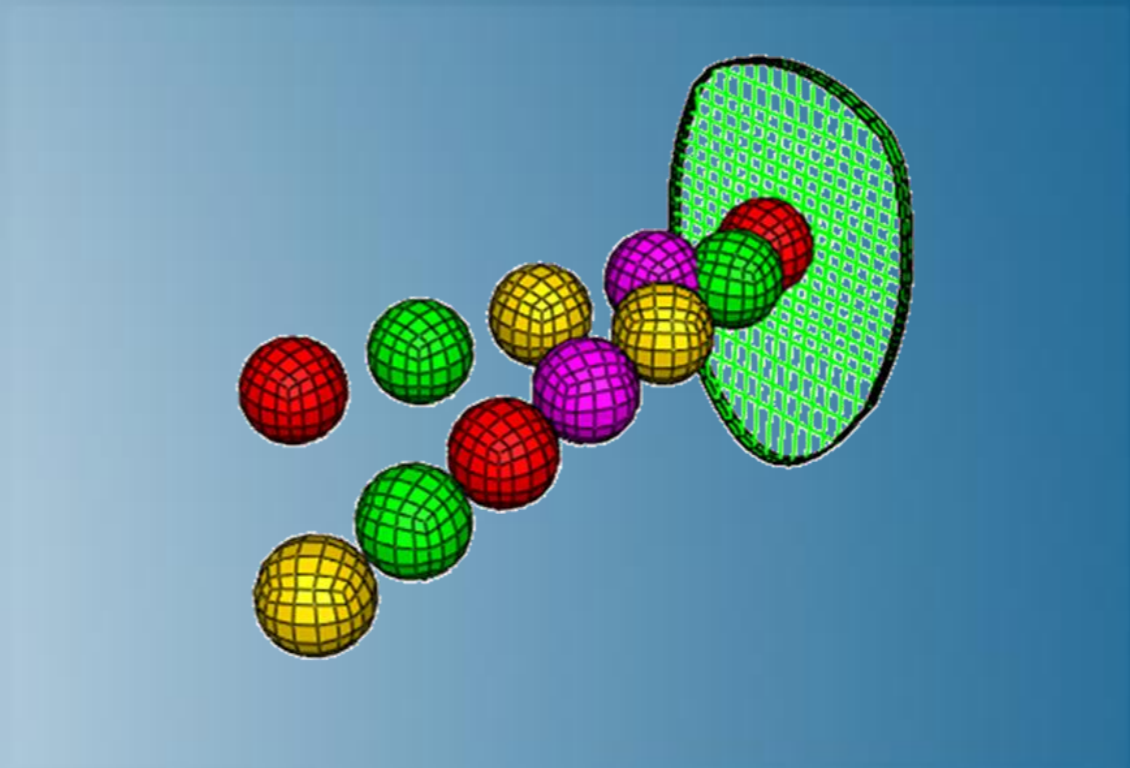


Introduction to Abaqus Scripting

Abaqus 2019



3DEXPERIENCE[®]



About this Course

Course objectives

- ▶ Help students to develop a high level understanding of the Abaqus scripting capabilities.
- ▶ Organize and present the technical details of Python and the Abaqus Scripting Interface.
- ▶ Expose the strengths and weaknesses of Abaqus scripting.
- ▶ Encourage the student to use scripting in new ways.

Targeted audience

Simulation Analysts

Prerequisites

None



2 days

Day 1

- ▶ Lecture 1 Overview of Scripting in Abaqus
 - Workshop 1 Creating a Basic Abaqus Script

- ▶ Lecture 2 Why Python?
 - Workshop 2 Running Python

- ▶ Lecture 3 Python Core Language Part 1
 - Workshop 3 Python Types, Operators, and Expressions
 - Workshop 4 Investigating Python Objects

- ▶ Lecture 4 Python Core Language Part 2
 - Workshop 5a Defining functions
 - Workshop 5b Defining a Function for a Series Calculation (optional)
 - Workshop 6 Modules

Day 2

- ▶ Lecture 5 Abaqus Scripting Interface Basics
 - Workshop 7 Creating a Macro and Getting Input interactively

- ▶ Lecture 6 Abaqus Object Model
 - Workshop 8 Working with the Session Object

- ▶ Lecture 7 Postprocessing with Abaqus Scripting
 - Workshop 9 Working with the ODB Object
 - Workshop 10 Linear Superposition of Results

- ▶ Lecture 8 Miscellaneous Topics
 - Workshop 11 Creating Kernel and GUI Scripts
 - Workshop 12 Setting Abaqus Defaults

Additional Material

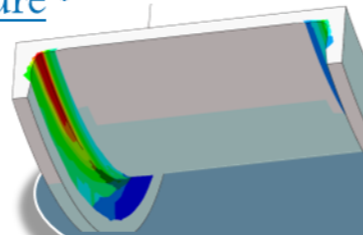
- ▶ Appendix 1 Optional Topics

SIMULIA

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

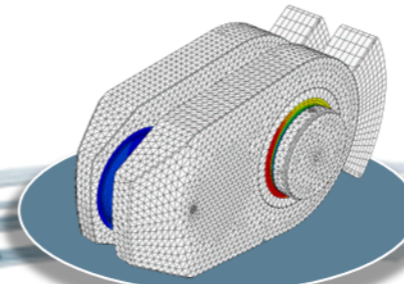
Design Optimization: Tosca Structure *

Simulation-driven design refinement to improve performance



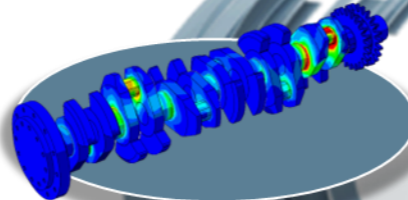
Durability Assessment: fe-safe *

Accurate life estimation to achieve certification



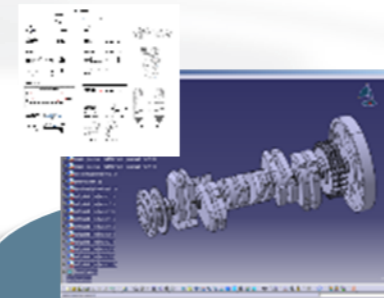
FEA Stress Analysis: Abaqus *

Detailed stress analysis using extracted load history from MBS



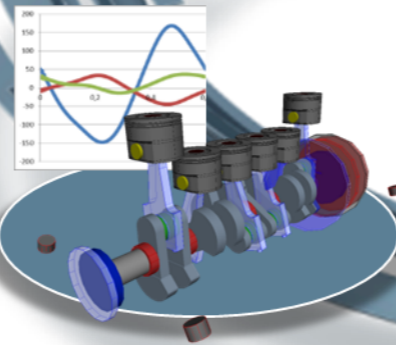
CAD Geometry: CATIA

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



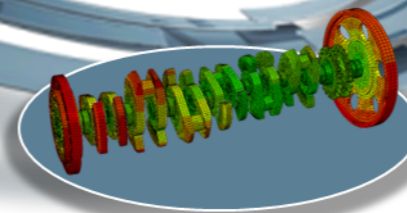
Multibody Simulation: Simpack

System analysis to extract virtual load history of complete working cycle



Mesh Calibration: Isight *

Automated mesh calibration; sufficient mesh quality for accurate results

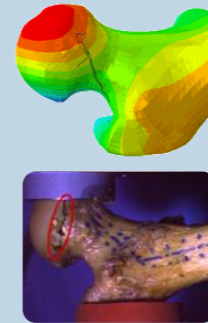


* Included in extended licensing pool

SIMULIA's Power of the Portfolio

Abaqus

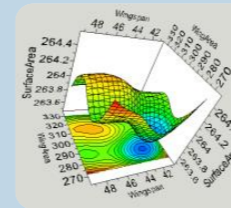
- Routine and Advanced Simulation
- Linear and Nonlinear, Static and Dynamic
- Thermal, Electrical, Acoustics
- Extended Physics through Co-simulation
- Model Preparation and Visualization



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

Isight

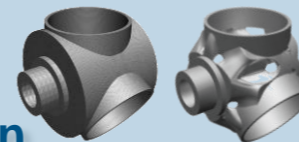
- Process Integration
- Design Optimization
- Parametric Optimization
- Six Sigma and Design of Experiments



**Material Calibration
Workflow Automation
Design Exploration**

Tosca

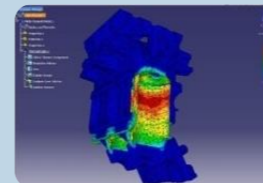
- Non-Parametric Optimization
- Structural and Fluid Flow Optimization
- Topology, Sizing, Shape, Bead Optimization



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

fe-safe

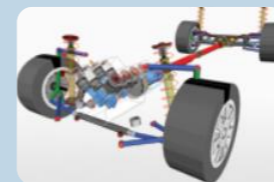
- Durability Simulation
- Low Cycle and High Cycle Fatigue
- Weld, High Temperature, Non-metallics



**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
to log in or join!



 SIMULIA

Let the SIMULIA Learning Community be *Your* Portal to 21st Century Innovation

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.

For more information and registration, visit 3ds.com/simulia-learning.
Connect. Share. Spark Innovation.

 | The 3DEXPERIENCE Company

SIMULIA Training

<http://www.3ds.com/products-services/simulia/services/training-courses/>

Home ... SIMULIA SERVICES TRAINING COURSES SCHEDULE & REGISTRATION

SIMULIA




in f t YouTube

SIMULIA SERVICES
PROVIDING HIGH QUALITY SIMULATION AND TRAINING SERVICES TO
ENABLE OUR CUSTOMERS TO BE MORE PRODUCTIVE AND COMPETITIVE.

CONTACT SALES

Training Schedule & Registration

We offer regularly scheduled public seminars as well as training courses at customer sites. An extensive range of courses are available, ranging from basic introductions to advanced courses that cover specific analysis topics and applications. On-site courses can be customized to focus on topics of particular interest to the customer, based on the customer's prior specification. To view the worldwide course schedule and to register for a course, visit the links below.

North American  > By Location > By Course	International  > By Location > By Course	Live Online Training  > Full Schedule
--	---	--

Legal Notices

The software described in this documentation is available only under license from Dassault Systèmes or its subsidiaries and may be used or reproduced only in accordance with the terms of such license.

This documentation and the software described in this documentation are subject to change without prior notice.

Dassault Systèmes and its subsidiaries shall not be responsible for the consequences of any errors or omissions that may appear in this documentation.

No part of this documentation may be reproduced or distributed in any form without prior written permission of Dassault Systèmes or its subsidiaries.

© Dassault Systèmes, 2018

Printed in the United States of America.

Abaqus, the 3DS logo, and SIMULIA are trademarks or registered trademarks of Dassault Systèmes or its subsidiaries in the US and/or other countries.

Other company, product, and service names may be trademarks or service marks of their respective owners. For additional information concerning trademarks, copyrights, and licenses, see the Legal Notices in the SIMULIA User Assistance.

Revision Status

Lecture 1	11/18	Updated for Abaqus 2019
Lecture 2	11/18	Updated for Abaqus 2019
Lecture 3	11/18	Updated for Abaqus 2019
Lecture 4	11/18	Updated for Abaqus 2019
Lecture 5	11/18	Updated for Abaqus 2019
Lecture 6	11/18	Updated for Abaqus 2019
Lecture 7	11/18	Updated for Abaqus 2019
Lecture 8	11/18	Updated for Abaqus 2019
Appendix 1	11/18	Updated for Abaqus 2019
Workshop 1	11/18	Updated for Abaqus 2019
Workshop 2	11/18	Updated for Abaqus 2019
Workshop 3	11/18	Updated for Abaqus 2019
Workshop 4	11/18	Updated for Abaqus 2019
Workshop 5a	11/18	Updated for Abaqus 2019
Workshop 5b	11/18	Updated for Abaqus 2019
Workshop 6	11/18	Updated for Abaqus 2019
Workshop 7	11/18	Updated for Abaqus 2019
Workshop 8	11/18	Updated for Abaqus 2019
Workshop 9	11/18	Updated for Abaqus 2019
Workshop 10	11/18	Updated for Abaqus 2019
Workshop 11	11/18	Updated for Abaqus 2019
Workshop 12	11/18	Updated for Abaqus 2019

Lesson 1: Overview of Scripting in Abaqus

Lesson content:

- ▶ Overview
- ▶ Terminology
- ▶ Types and Languages for Customizing Abaqus
- ▶ Abaqus Python Resources
- ▶ Examples
- ▶ Abaqus Scripting Interface Basics
- ▶ Workshop Preliminaries
- ▶ Workshop 1: Creating a Basic Abaqus Script



1.5 hours

Lesson 2: Why Python?

Lesson content:

- ▶ High Level Description of the Language
- ▶ Why Python?
- ▶ Growing Python Universe
- ▶ Running Python
- ▶ Lexical Convention and Syntax
- ▶ Workshop 2: Running Python



1.5 hours

Lesson 3: Python Core Language Part 1

Lesson content:

- ▶ Types Overview
- ▶ Principal built-in types
- ▶ Operators and Expressions
- ▶ Workshop 3: Python Types, Operators, and Expressions
- ▶ Objects
- ▶ Workshop 4: Investigating Python Objects



2.5 hours

Lesson 4: Python Core Language Part 2

Lesson content:

- ▶ Control Flow
- ▶ Functions
- ▶ Workshop 5a: Defining functions
- ▶ Workshop 5b: Defining a Function for a Series Calculation (optional)
- ▶ Modules
- ▶ Namespaces
- ▶ Exceptions
- ▶ Common Issues for New Users
- ▶ Workshop 6: Modules



2.5 hours

Lesson 5: Abaqus Scripting Interface Basics

Lesson content:

- ▶ Abaqus PDE
- ▶ Abaqus Namespaces
- ▶ Abaqus Macro Scripts
- ▶ Abaqus Python Style Guide
- ▶ Getting Input
- ▶ Workshop 7: Creating a Macro and Getting Input interactively



1.5 hours

Lesson 6: Abaqus Object Model

Lesson content:

- ▶ Introduction to Object Oriented Programming
- ▶ Abaqus Object Model Basics
- ▶ The Session Object
- ▶ The Mdb Object
- ▶ Exploring Your Data
- ▶ Abaqus Data Types
- ▶ Abaqus Modules
- ▶ Workshop 8: Working with the Session Object



1.5 hours

Lesson 7: Postprocessing with Abaqus Scripting

Lesson content:

- ▶ The Odb Object
- ▶ Writing to the Odb
- ▶ Examples
- ▶ Workshop 9: Working with the ODB Object
- ▶ Workshop 10: Linear Superposition of Results



2.5 hours

Lesson 8: Miscellaneous Topics

Lesson content:

- ▶ Plug-ins
- ▶ Really Simple GUI (RSG)
- ▶ Job Monitoring
- ▶ Custom Data
- ▶ Setting Abaqus Defaults
- ▶ Workshop 11: Creating Kernel and GUI Scripts
- ▶ Workshop 12: Setting Abaqus Defaults



2.5 hours

Appendix 1: Optional Topics

Appendix content:

- ▶ Data Types
- ▶ Objects
- ▶ Common Issues for New Users
- ▶ Setting Abaqus Defaults
- ▶ Copy of Objects
- ▶ Custom Data
- ▶ Abaqus PDE Extras
- ▶ Object Oriented Programming: Inheritance



30 minutes