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
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
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- Portfolio of established, best-in-class products
  - Abaqus, Isight, Tosca, fe-safe, Simpack

* Included in extended licensing pool
## SIMULIA’s Power of the Portfolio

<table>
<thead>
<tr>
<th>Software</th>
<th>Features</th>
<th>Applications</th>
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| **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  
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## Revision Status

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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

75 minutes
Lesson content:

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

3 hours
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
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

2.5 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

3 hours
Appendix 1

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