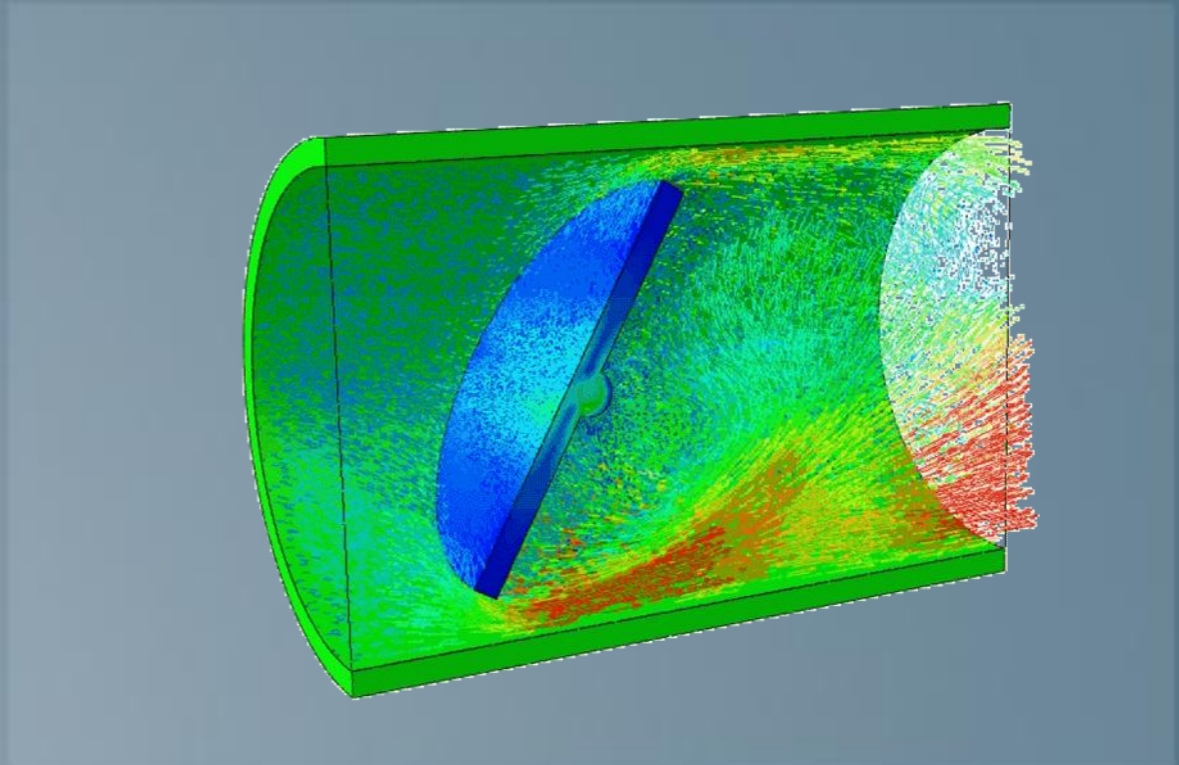


Introduction to Abaqus/CFD for Multiphysics Applications

6.14



3DEXPERIENCE



About this Course

Course objectives

Upon completion of this course you will be able to:

- ▶ Set up and create CFD and FSI models with Abaqus
- ▶ Perform CFD analyses with Abaqus
- ▶ Perform FSI analyses with Abaqus
- ▶ Postprocess CFD and FSI results

Targeted audience

Simulation Analysts

Prerequisites

None



2 days

Day 1

- ▶ Lecture 1 Review of CFD Fundamentals
- ▶ Lecture 2 Introduction
- ▶ Lecture 3 Getting Started with Abaqus/CFD
- ▶ Workshop 1 Unsteady flow across a circular cylinder
- ▶ Lecture 4 CFD Modeling Techniques – Part 1
- ▶ Workshop 2 Fluid flow through a pipe with a constriction

Day 2

- ▶ Lecture 5 CFD Modeling Techniques – Part 2
- ▶ Lecture 6 Getting Started with FSI Using Abaqus/CFD
- ▶ Workshop 1 Unsteady flow across a circular cylinder (continued)
- ▶ Lecture 7 FSI Modeling Techniques
- ▶ Workshop 3 Antilock braking system
- ▶ Lecture 8 Postprocessing CFD/FSI Analyses
- ▶ Workshop 4 Heat transfer analysis of a component-mounted electronic circuit board

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Revision Status

Lecture 1	5/14	Updated for 6.14
Lecture 2	5/14	Updated for 6.14
Lecture 3	5/14	Updated for 6.14
Lecture 4	5/14	Updated for 6.14
Lecture 5	5/14	Updated for 6.14
Lecture 6	5/14	Updated for 6.14
Lecture 7	5/14	Updated for 6.14
Lecture 8	5/14	Updated for 6.14
Workshop 1	5/14	Updated for 6.14
Workshop 2	5/14	Updated for 6.14
Workshop 3	5/14	Updated for 6.14
Workshop 4	5/14	Updated for 6.14

Lesson 1: Review of CFD Fundamentals

Lesson content:

- ▶ Overview
- ▶ What is CFD?
- ▶ Numerical Simulation of Physical Phenomena
- ▶ Computational Solid Mechanics (CSM) vs. Computational Fluid Dynamics (CFD)
- ▶ CFD Basics
- ▶ Governing Equations
- ▶ Diffusion and Advection
- ▶ Flow Features
- ▶ Heat Transfer in Fluid Dynamics
- ▶ Non-dimensional Quantities in CFD
- ▶ Initial and Boundary Conditions
- ▶ Solution Methodology
- ▶ Turbulence Modeling
- ▶ References



1.5 hours

Lesson 2: Introduction

Lesson content:

- ▶ Multiphysics
- ▶ Abaqus Multiphysics
- ▶ Extended Multiphysics
- ▶ Multiphysics Coupling
- ▶ Abaqus/CFD
- ▶ Fluid-Structure Interaction (FSI)
- ▶ Native FSI using Abaqus
- ▶ Target Applications
- ▶ System and Licensing Requirements
- ▶ Execution Procedure



2 hours

Lesson 3: Getting Started with Abaqus/CFD

Lesson content:

- ▶ CFD Simulation Workflow
- ▶ Setting up CFD Analyses
- ▶ Case Study 1: Flow around a Rigid Circular Cylinder
- ▶ Case Study 2: Flow around an Oscillating Rigid Circular Cylinder
- ▶ Modeling Heat Transfer
- ▶ Modeling Turbulence
- ▶ Workshop Preliminaries
- ▶ Workshop 1: Unsteady flow across a circular cylinder



2 hours

Lesson 4: CFD Modeling Techniques – Part 1

Lesson content:

- ▶ Material Properties
- ▶ Meshing
- ▶ Incompressible Flow Analysis Procedure
- ▶ Solution Algorithm
- ▶ Linear Equation Solvers
- ▶ Pressure Equation Solvers
- ▶ Momentum Equation Solvers
- ▶ Equation Solver Output
- ▶ Workshop 2: Fluid flow through a pipe with a constriction



2 hours

Lesson 5: CFD Modeling Techniques – Part 2

Lesson content:

- ▶ Initial Conditions
- ▶ Boundary Conditions
- ▶ Primary Turbulence Variables and Turbulence Flow Features
- ▶ Turbulence Modeling
- ▶ Body Forces
- ▶ Heat Sources
- ▶ Porous Media Modeling
- ▶ User Subroutines
- ▶ Output
- ▶ Deforming Meshes
- ▶ Monitoring a CFD Calculation



2 hours

Lesson 6: Getting Started with FSI using Abaqus/CFD

Lesson content:

- ▶ Setting up FSI Analyses
- ▶ Case Study 3: Flow around a Spring-loaded Rigid Circular Cylinder
- ▶ FSI Analyses with Shells/Membranes
- ▶ Conjugate Heat Transfer Analyses
- ▶ Workshop 1 (continued): Unsteady flow across a circular cylinder



2 hours

Lesson 7: FSI Modeling Techniques

Lesson content:

- ▶ FSI Analysis Workflow
- ▶ FSI Analysis Attributes
- ▶ Conjugate Heat Transfer
- ▶ Workshop 3: Antilock braking system



2 hours

Lesson 8: Postprocessing CFD/FSI Analyses

Lesson content:

- ▶ Abaqus/CAE Tips
- ▶ Isosurfaces
- ▶ View Cuts
- ▶ Vector Plots
- ▶ Stream Toolset (Instantaneous Particle Traces)
- ▶ Workshop 4: Heat transfer analysis of a component-mounted electronic circuit board



2 hours