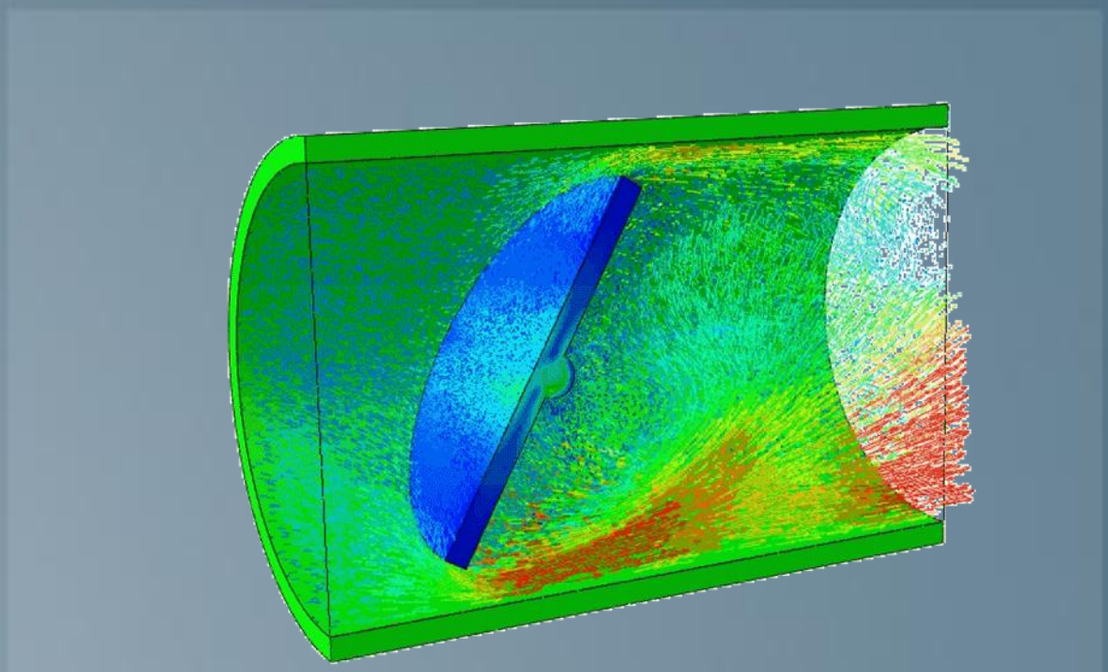
Introduction to Abaqus/CFD for Multiphysics Applications

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