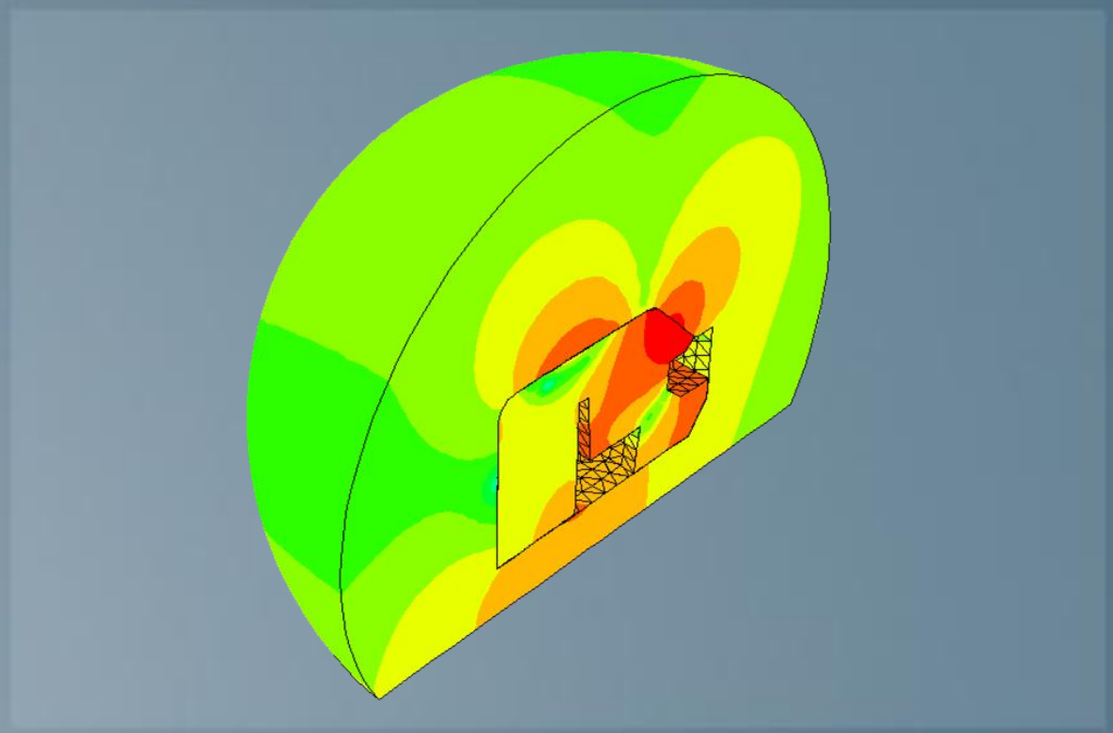
Structural-Acoustic Analysis with Abaqus

6.14



About this Course

Course objectives

Upon completion of this course you will be able to:

- Pure acoustics analysis
- Coupled structural-acoustic analysis
- Scattering and shock analysis
- Mesh size and mesh density effects for different analysis procedures
- Acoustic analysis output and postprocessing

Targeted audience

Simulation Analysts

Prerequisites

This course is recommended for engineers with experience using Abaqus. Some understanding of acoustics is helpful but is not required.

2 days

Day 1

- Lecture 1: Introduction
- Lecture 2: Acoustic Phenomena
- Lecture 3: Modeling Acoustic Problems Using Abaqus
  - Workshop 1: Acoustic Evaluation of a Simple Air Duct Section
  - Workshop 2: Acoustic Evaluation of a Small Vented Room

Day 2

- Lecture 4: Coupled Structural-Acoustic Analysis
  - Workshop 3: Truck Cab Acoustic Analysis
- Lecture 5: Acoustic Scattering and Shock
  - Workshop 4: Underwater Shock Analysis
- Lecture 6: Additional Examples

Additional Material

- Appendix 1 Acoustic Theory

Join the Community!

How can you maximize the robust technology of Abaqus FEA and Isight?

Connect with peers to share knowledge and get technical insights

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.

DASSAULT SYSTEMES | The **3D**EXPERIENCE Company

©2013 Dassault Systèmes. All rights reserved.

Legal Notices

The Abaqus Software described in this documentation is available only under license from Dassault Systèmes or its subsidiary 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 subsidiary.

© Dassault Systèmes, 2014

Printed in the United States of America.

Abaqus, the 3DS logo, SIMULIA, and CATIA 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 Abaqus 6.14 Installation and Licensing Guide.

Revision Status

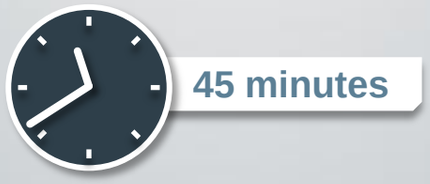
Lecture 1	5/14	Updated for 6.14
Lecture 2	5/14	Updated for 6.14
Lecture 3	5/14	Updated for 6.14
Lecture 4	5/14	Updated for 6.14
Lecture 5	5/14	Updated for 6.14
Lecture 6	5/14	Updated for 6.14
Appendix 1	5/14	Updated for 6.14
Workshop 1	5/14	Updated for 6.14
Workshop 2	5/14	Updated for 6.14
Workshop 3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

Lesson 1: Introduction

Lesson content:

- Acoustic Problem Types Possible with Abaqus
- General Capabilities
- Examples
  - Weighted dB in Abaqus/Viewer
  - Sound transmission through a rubber door seal
  - Acoustic radiation of a muffler
  - Ship shock simulation
  - Tire design for noise reduction

www.3ds.com | © Dassault Systèmes



Lesson 2: Acoustic Phenomena

Lesson content:

- Phenomena
- Governing Equations and Assumptions
- Acoustics Modeling
- Acoustics Terminology
- Useful Data and Definitions
- References

www.3ds.com | © Dassault Systèmes

45 minutes

Lesson 3: Modeling Acoustic Problems Using Abaqus

Lesson content:

- Acoustic Properties
- Acoustic Element Types
- Loads
- Boundary Conditions
- Exterior Problems
- Exterior Problems using Impedance
- Exterior Problems using Infinite Elements
- Creating Acoustic Infinite Elements Using Abaqus/CAE
- Acoustics with Mean Flow
- Analysis Procedures
- Output
- Maximum Element Size
- External Meshed Domains
- Parallel Execution
- Workshop Preliminaries
- Workshop 1: Acoustic Evaluation of a Simple Air Duct Section (IA)
- Workshop 1: Acoustic Evaluation of a Simple Air Duct Section (KW)
- Workshop 2: Acoustic Evaluation of a Small Vented Room (IA)
- Workshop 2: Acoustic Evaluation of a Small Vented Room (KW)

Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.

4.5 hours

www.3ds.com | © Dassault Systèmes

Lesson 4: Coupled Structural-Acoustic Analysis

Lesson content:

- Introduction
- Near-Field and Far-Field Effects
- Fully Coupled Analysis
- Sequentially Coupled Analysis
- Acoustic-to-Structural Submodeling
- Coupled Acoustic-Structural Substructures
- Boundary Impedances
- Creating ASI elements on geometry
- Creating ASI elements on orphan meshes
- Workshop 3: Workshop 3: Truck Cab Acoustic Analysis (IA)
- Workshop 3: Workshop 3: Truck Cab Acoustic Analysis (KW)

Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.

2.5 hours

www.3ds.com | © Dassault Systèmes

Lesson 5: Acoustic Scattering and Shock

Lesson content:

- Acoustic Scattering and Shock with Abaqus
- Incident Wave Loading
- UNDEX Loading
- UNDEX Example Problem
- Air Blast Loading
- Workshop 4: Underwater Shock Analysis (IA)
- Workshop 4: Underwater Shock Analysis (KW)

Both interactive (IA) and keywords (KW) versions of the workshop are provided. Complete only one.

3 hours

www.3ds.com | © Dassault Systèmes

Lesson 6: Additional Examples

Lesson content:

- Sloshing
- Acoustics in Fibrous Materials
- Simple Expansion Muffler with Mean Flow
- Harmonic Distortion
- Effect of Surface Treatments on Room Acoustics
- Nonlinear Structural Behavior
- Coupled Piezoelectric and Acoustic Analysis
- Acoustics of a Truck Cab: Fully Coupled Analysis
- Acoustics of a Truck Cab: Sequential Analysis
- Summary

www.3ds.com | © Dassault Systèmes

75 minutes

Appendix 1: Acoustic Theory

Appendix content:

- Governing Equations
- Properties of an Acoustic Medium
- Loads

www.3ds.com | © Dassault Systèmes

45 minutes