Course objectives
Upon completion of this course you will be able to:

- Set up and create electromagnetic models with Abaqus
- Perform low frequency eddy current analyses with Abaqus
- Perform transient eddy current analyses with Abaqus
- Perform magnetostatic analyses with Abaqus

Targeted audience
Simulation Analysts

Prerequisites
This course is recommended for engineers with experience using Abaqus
Day 1

- Lecture 1  Introduction to Computational Electromagnetics
- Lecture 2  Geometry, Material Properties, Elements and Meshing
  - Workshop 1  Heating of a Rod: Problem setup
  - Workshop 2  Sphere in a Magnetic Field: Problem setup
- Lecture 3  Loads and Boundary Conditions
- Lecture 4  Output and Transfer of Results
  - Workshop 1 (cont’d)  Heating of a Rod: Thermal Response
  - Workshop 2 (cont’d)  Sphere in a Magnetic Field: Electromagnetic Response
  - Workshop 3  Magnetostatic Analysis of a Solenoid Valve
  - Workshop 4  Magnetic Pulse Forming of a Metallic Tube
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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

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

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

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

**Simpack**
- 3D Multibody Dynamics Simulation
- Mechanical or Mechatronic Systems
- Detailed Transient Simulation (Offline and Realtime)

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

**Material Calibration**
- Workflow Automation
- Design Exploration

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

**Safety Factors**
- Creep-Fatigue Interaction
- Weld Fatigue

**Complete System Analyses**
- (Quasi-)Static, Dynamics, NVH Flex Bodies, Advanced Contact

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**Safety Factors**
- Creep-Fatigue Interaction
- Weld Fatigue

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**Simpack**
- 3D Multibody Dynamics Simulation
- Mechanical or Mechatronic Systems
- Detailed Transient Simulation (Offline and Realtime)
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## Revision Status

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Lesson 1: Introduction to Computational Electromagnetics

Lesson content:

- Motivation
- Basics of Electromagnetism
- Computational Electromagnetics in Abaqus
- Workflow of an Electromagnetic Analysis
- Examples
Lesson 2: Geometry, Material Properties, Elements and Meshing

Lesson content:

- Geometry Creation
- Material Properties
- Element Technology
- Meshing
- Workshop Preliminaries
- Workshop 1: Heating of a Rod: Problem setup
- Workshop 2: Sphere in a Magnetic Field: Problem setup
Lesson content:

- Introduction
- Loads
- Boundary Conditions
- Symmetry
- Motion
Lesson 4: Output and Transfer of Results

Lesson content:

- Analysis Procedures
- Co-simulation
- Sequential Mapping
- Output
- Workshop 1 (cont’d): Heating of a Rod: Thermal Response
- Workshop 2 (cont’d): Sphere in a Magnetic Field: Electromagnetic Response
- Workshop 3: Magnetostatic Analysis of a Solenoid Valve
- Workshop 4: Magnetic Pulse Forming of a Metallic Tube

3 hours