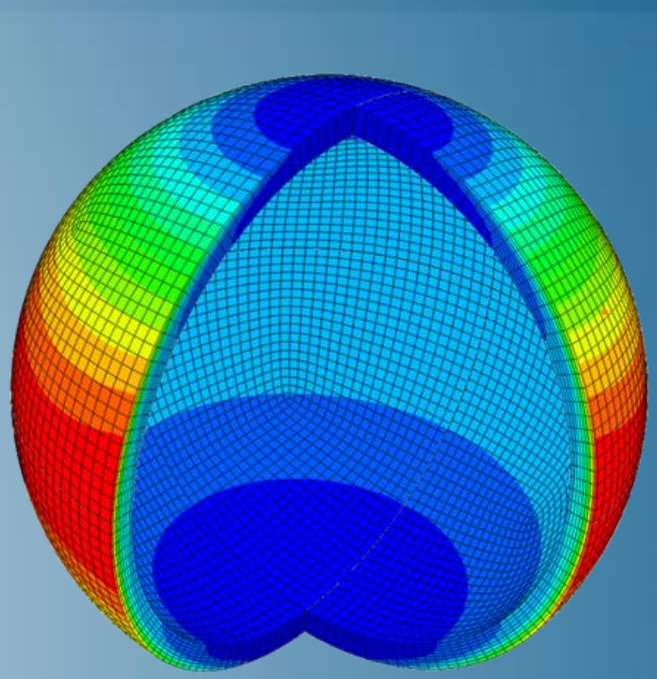
Electromagnetic Analysis with Abaqus

Abaqus 2019



3DEXPERIENCE®

About this Course

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

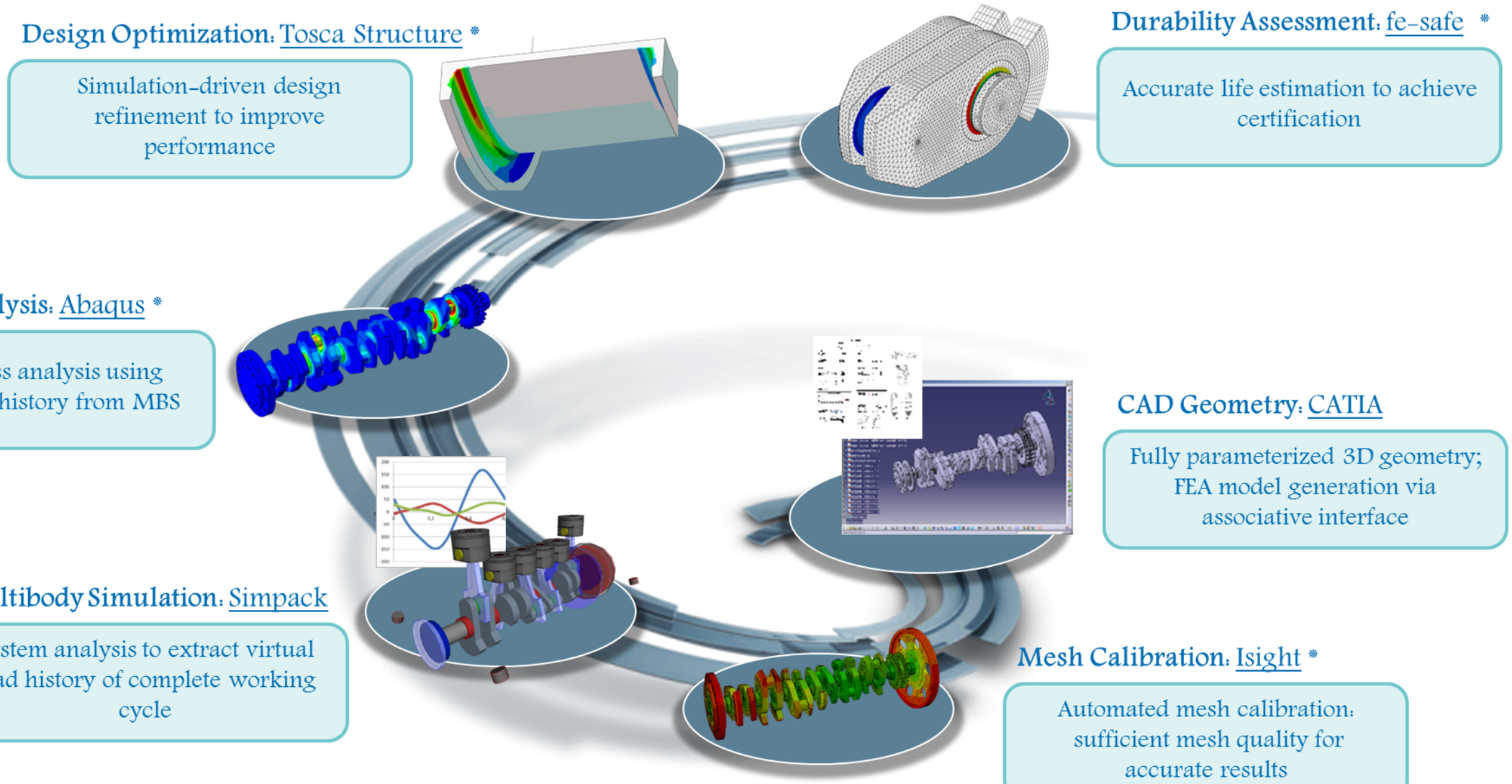
1 day

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

SIMULIA

- SIMULIA is the Dassault Systèmes brand for Realistic Simulation solutions
- Portfolio of established, best-in-class products
  - Abaqus, Isight, Tosca, fe-safe, Simpack



Design Optimization: Tosca Structure *

Simulation-driven design refinement to improve performance

Durability Assessment: fe-safe *

Accurate life estimation to achieve certification

FEA Stress Analysis: Abaqus *

Detailed stress analysis using extracted load history from MBS

CAD Geometry: CATIA

Fully parameterized 3D geometry; FEA model generation via associative interface

Multibody Simulation: Simpack

System analysis to extract virtual load history of complete working cycle

Mesh Calibration: Isight *

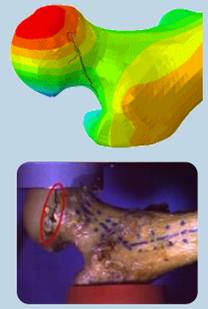
Automated mesh calibration: sufficient mesh quality for accurate results

* Included in extended licensing pool

SIMULIA's Power of the Portfolio

Abaqus

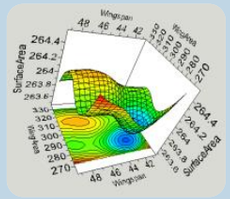
- Routine and Advanced Simulation
- Linear and Nonlinear, Static and Dynamic
- Thermal, Electrical, Acoustics
- Extended Physics through Co-simulation
- Model Preparation and Visualization



Realistic Human Simulation
High Speed Crash & Impact
Noise & Vibration

Isight

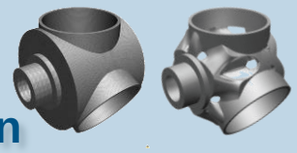
- Process Integration
- Design Optimization
- Parametric Optimization
- Six Sigma and Design of Experiments



Material Calibration
Workflow Automation
Design Exploration

Tosca

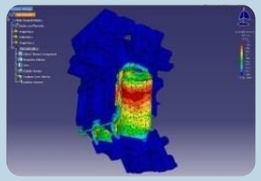
- Non-Parametric Optimization
- Structural and Fluid Flow Optimization
- Topology, Sizing, Shape, Bead Optimization



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

fe-safe

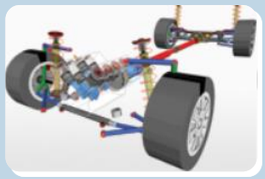
- Durability Simulation
- Low Cycle and High Cycle Fatigue
- Weld, High Temperature, Non-metallics



Safety Factors
Creep-Fatigue Interaction
Weld Fatigue

Simpack

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



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

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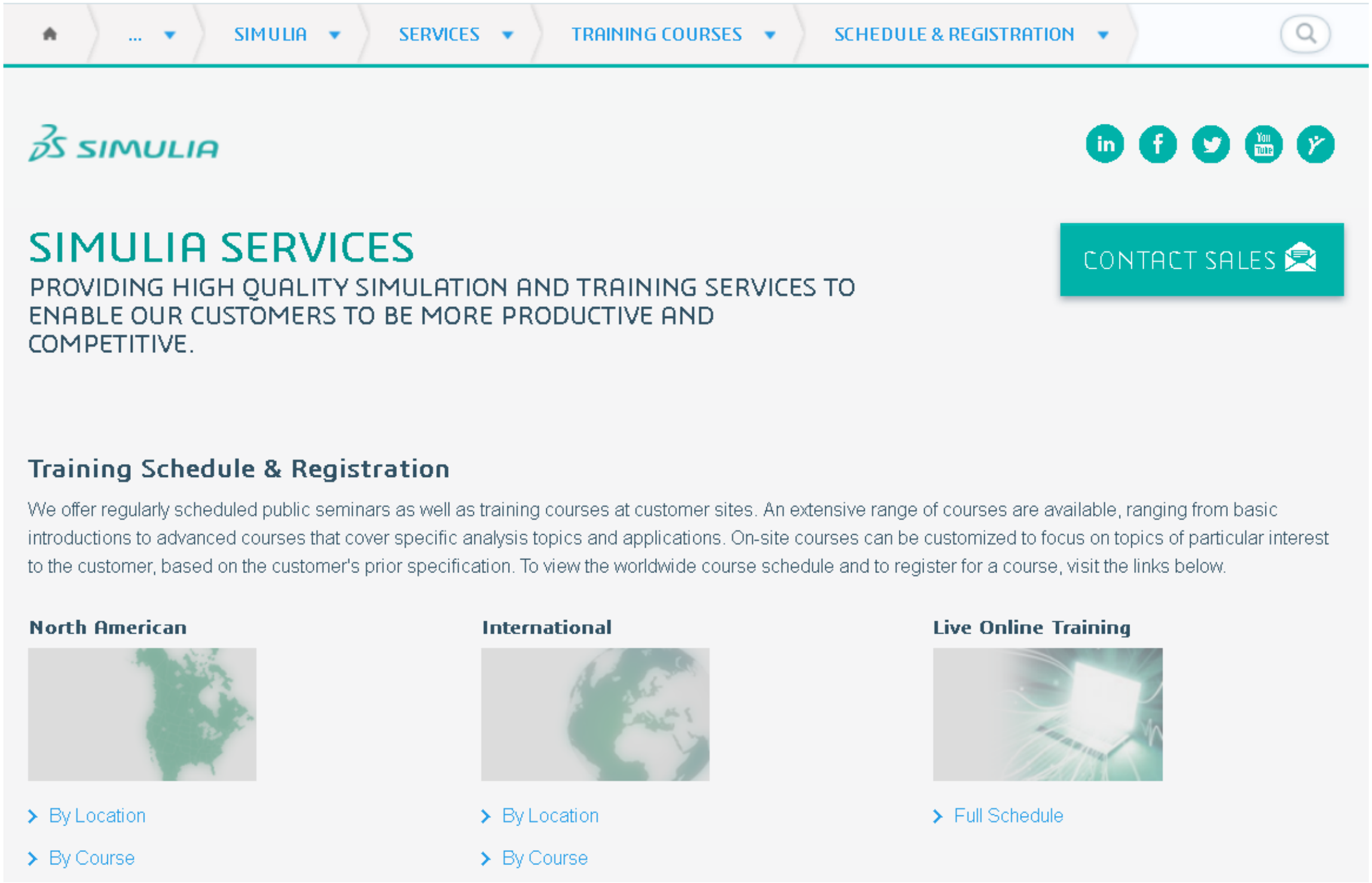

Legal Notices

Revision Status

Lecture 1	11/18	Updated for Abaqus 2019
Lecture 2	11/18	Updated for Abaqus 2019
Lecture 3	11/18	Updated for Abaqus 2019
Lecture 4	11/18	Updated for Abaqus 2019
Workshop 1	11/18	Updated for Abaqus 2019
Workshop 2	11/18	Updated for Abaqus 2019
Workshop 3	11/18	Updated for Abaqus 2019
Workshop 4	11/18	Updated for Abaqus 2019

Lesson 1: Introduction to Computational Electromagnetics

Lesson content:

- Motivation
- Basics of Electromagnetism
- Computational Electromagnetics in Abaqus
- Workflow of an Electromagnetic Analysis
- Examples

45 minutes

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

2 hours

Lesson 3: Loads and Boundary Conditions

Lesson content:

- Introduction
- Loads
- Boundary Conditions
- Symmetry
- Motion

1 hour

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