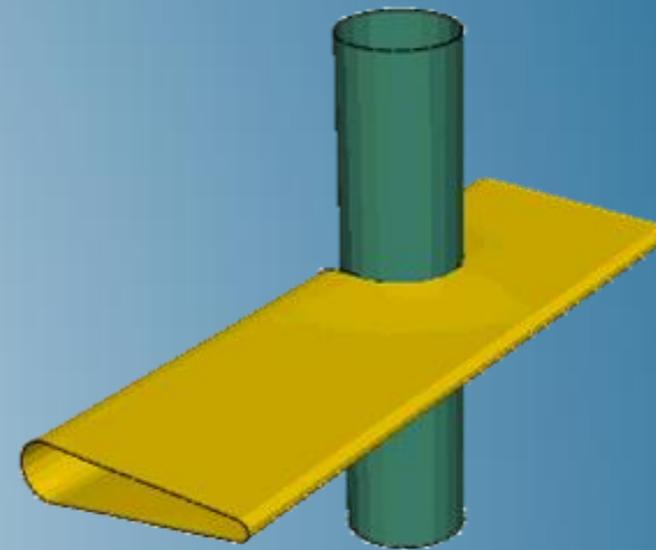


# CZone for Abaqus

Abaqus 2018



**3DEXPERIENCE**<sup>®</sup>



# About this Course

## Course objectives

Upon completion of this course you will be able to:

- ▶ Include crushable composite structures in your impact simulations
- ▶ Understand guidelines for defining crushable composite materials based on composite coupon and component testing
- ▶ Incorporate crushable composite structures into your models and how to postprocess CZA analysis results

## Targeted audience

Engineers with experience using Abaqus/Explicit

## Prerequisites

The *Abaqus/Explicit: Advanced Topics and Analysis of Composite Materials with Abaqus* seminars are recommended as prerequisites



4 hours

# Day 1

---

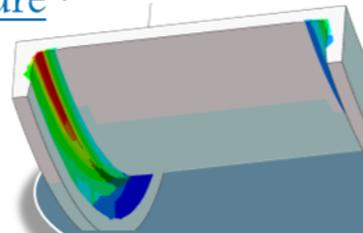
- ▶ Lecture 1            Modeling Crushable Composite Materials
  
- ▶ Lecture 2            Creating a CZA Model
  - Workshop 1        Race car wing impact: Model Setup
  
- ▶ Lecture 3            Postprocessing
  - Workshop 2        Race car wing impact: Postprocessing

# SIMULIA

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

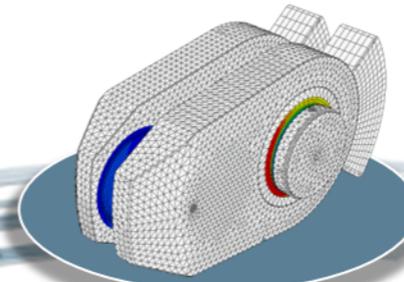
## Design Optimization: Tosca Structure \*

Simulation-driven design refinement to improve performance



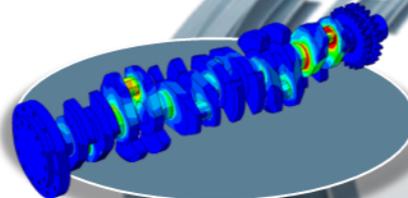
## Durability Assessment: fe-safe \*

Accurate life estimation to achieve certification



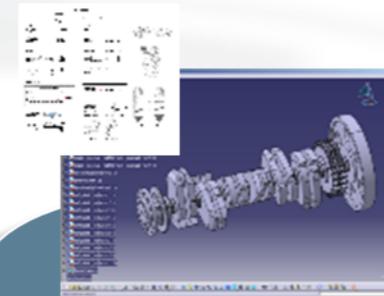
## FEA Stress Analysis: Abaqus \*

Detailed stress analysis using extracted load history from MBS



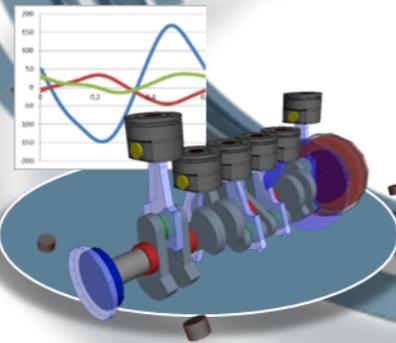
## CAD Geometry: CATIA

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



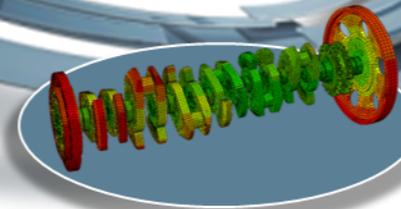
## Multibody Simulation: Simpack

System analysis to extract virtual load history of complete working cycle



## Mesh Calibration: Isight \*

Automated mesh calibration; sufficient mesh quality for accurate results

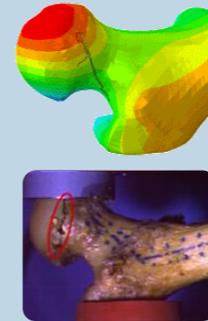


\* Included in extended licensing pool

# SIMULIA's Power of the Portfolio

## Abaqus

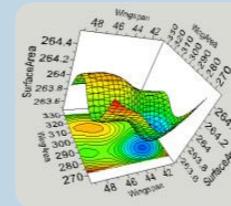
- Routine and Advanced Simulation
- Linear and Nonlinear, Static and Dynamic
- Thermal, Electrical, Acoustics
- Extended Physics through Co-simulation
- Model Preparation and Visualization



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

## Isight

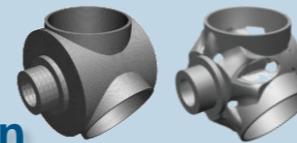
- Process Integration
- Design Optimization
- Parametric Optimization
- Six Sigma and Design of Experiments



**Material Calibration  
Workflow Automation  
Design Exploration**

## Tosca

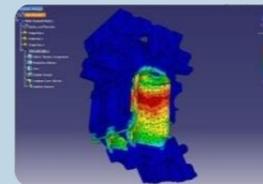
- Non-Parametric Optimization
- Structural and Fluid Flow Optimization
- Topology, Sizing, Shape, Bead Optimization



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

## fe-safe

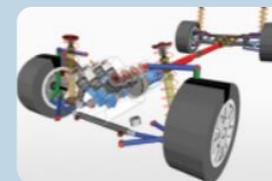
- Durability Simulation
- Low Cycle and High Cycle Fatigue
- Weld, High Temperature, Non-metallics



**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**

# Join the Community!

How can you maximize the robust technology of the SIMULIA Portfolio ?  
Connect with peers to share knowledge and get technical insights

Go to [www.3ds.com/slc](http://www.3ds.com/slc)  
to log in or join!



 SIMULIA

## Let the SIMULIA Learning Community be *Your* Portal to 21<sup>st</sup> 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](http://3ds.com/simulia-learning).  
**Connect. Share. Spark Innovation.**

 | The 3DEXPERIENCE Company

# SIMULIA Training

<http://www.3ds.com/products-services/simulia/services/training-courses/>

Home ... SIMULIA SERVICES TRAINING COURSES SCHEDULE & REGISTRATION

**SIMULIA**

in f t YouTube

**SIMULIA SERVICES**  
PROVIDING HIGH QUALITY SIMULATION AND TRAINING SERVICES TO ENABLE OUR CUSTOMERS TO BE MORE PRODUCTIVE AND COMPETITIVE.

**CONTACT SALES**

### Training Schedule & Registration

We offer regularly scheduled public seminars as well as training courses at customer sites. An extensive range of courses are available, ranging from basic introductions to advanced courses that cover specific analysis topics and applications. On-site courses can be customized to focus on topics of particular interest to the customer, based on the customer's prior specification. To view the worldwide course schedule and to register for a course, visit the links below.

#### North American

- > By Location
- > By Course

#### International

- > By Location
- > By Course

#### Live Online Training

- > Full Schedule

## Legal Notices

---

The software described in this documentation is available only under license from Dassault Systèmes or its subsidiaries 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 subsidiaries.

© Dassault Systèmes, 2017

Printed in the United States of America.

Abaqus, the 3DS logo, and SIMULIA 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 SIMULIA User Assistance.

## Revision Status

---

<b>Lecture 1</b>	<b>11/17</b>	<b>Updated for Abaqus 2018</b>
<b>Lecture 2</b>	<b>11/17</b>	<b>Updated for Abaqus 2018</b>
<b>Lecture 3</b>	<b>11/17</b>	<b>Updated for Abaqus 2018</b>
<b>Workshop 1</b>	<b>11/17</b>	<b>Updated for Abaqus 2018</b>
<b>Workshop 2</b>	<b>11/17</b>	<b>Updated for Abaqus 2018</b>

# Lesson 1: Modeling Crushable Composite Materials

## *Lesson content:*

- ▶ What is CZone?
- ▶ Why do we need CZone?
- ▶ CZone applications and examples
- ▶ CZone crush stress
- ▶ Other CZA material properties
- ▶ More on Damping and Viscoelasticity
- ▶ Summary



1.5 hours

# Lesson 2: Creating a CZA Model

## *Lesson content:*

- ▶ Modeling crushable structures
- ▶ Composite layups
- ▶ CZone contact
- ▶ Output
- ▶ CZA plug-in for Abaqus/CAE
- ▶ CZA modeling checklist
- ▶ Workshop Preliminaries
- ▶ Workshop 1: Race car wing impact: Model Setup



2 hours

# Lesson 3: CZA Postprocessing

## *Lesson content:*

- ▶ Introduction
- ▶ Identifying failure
- ▶ Viewing a composite layup
- ▶ X-Y plots
- ▶ Workshop 2: Race car wing impact: Postprocessing



1 hour