

# Tire Analysis with Abaqus: Fundamentals

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## Day 1

- Tire Modeling Tools in Abaqus
- Axisymmetric Model Building
  - Workshop 1: Modeling a tire cross-section

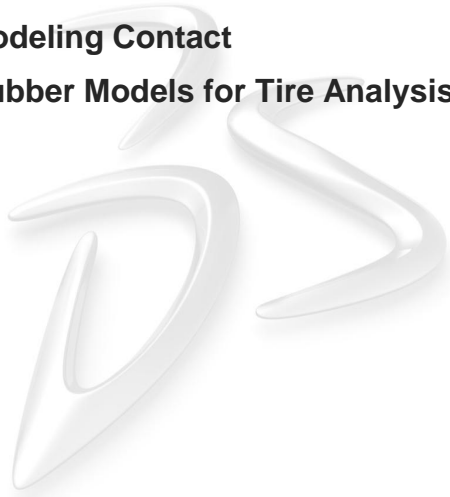
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## Day 2

- **Symmetric Model Generation and Results Transfer**
- **Three-dimensional Model Building**
  - Workshop 2: Three-dimensional tire models
  - Workshop 3: Visualization of three-dimensional tire models
- **Elements and Reinforcement**
- **Modeling Contact**
- **Rubber Models for Tire Analysis**



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# Revision Status

Lecture 1	5/11	Updated for 6.11
Lecture 2	5/11	Updated for 6.11
Lecture 3	5/11	Updated for 6.11
Lecture 4	5/11	Updated for 6.11
Lecture 5	5/11	Updated for 6.11
Lecture 6	5/11	Updated for 6.11
Lecture 7	5/11	Updated for 6.11
Workshop 1a	5/11	Updated for 6.11
Workshop 1b	5/11	Updated for 6.11
Workshop 1c	5/11	Updated for 6.11
Workshop 1d	5/11	Updated for 6.11
Workshop 1e	5/11	Updated for 6.11
Workshop 2	5/11	Updated for 6.11
Workshop 3	5/11	Updated for 6.11



# Tire Modeling Tools in Abaqus

Lecture 1

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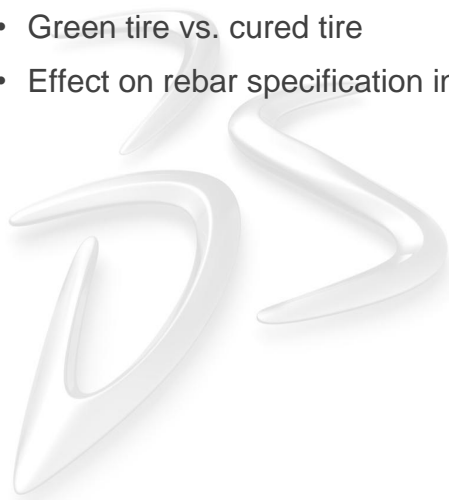
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## Overview

- **Introduction**
  - Prerequisites for the course (basic Abaqus/CAE and analysis knowledge)
- **Tire Analysis Capabilities**
- **How Tires are Made**
  - Green tire vs. cured tire
  - Effect on rebar specification in analysis models

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# Axisymmetric Model Building

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## Overview

- **Why Start with Axisymmetry?**
- **Creation of Rim, Carcass, Ply and Belt Geometries**
  - Workshop 1a
- **Reinforcement Modeling**
- **Material Properties and Assignment**
  - Workshop 1b
- **Contact and Constraints**
- **Boundary Conditions and Loads**
- **Steps and Output Requests**
  - Workshop 1c
- **Meshing**
  - Workshop 1d
- **Job Submission**
- **Results Visualization**
  - Workshop 1e

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# Symmetric Model Generation and Results Transfer

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## Overview

- Introduction
- Smooth/Ribbed Tires: Symmetric Model Generation
- Smooth/Ribbed Tires: Symmetric Results Transfer
- Treaded Tires

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# Three-dimensional Model Building

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## Overview

- **Introduction**
  - What is SMG/SRT? (flattened model requirement etc.)
- **3D Model Definition**
  - Element types (general vs. cylindrical)
  - Circumferential discretization
  - Model generation (road, tread surface)
- **Step and Output Requests**
  - Equilibrating step
  - 2-step approach to footprint analysis (displacement control followed by load control)
- **Contact, Boundary Conditions, and Loads**
- **Job Submission and Results Visualization**
- **Overview of the Tire Wizard Plug-In**
- **Workshop 2**
- **Workshop 3**

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# Elements and Reinforcement

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## Overview

- Introduction
- Element Selection
- Modeling Reinforcement
- Rebar Layers
- Embedded Elements

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# Modeling Contact

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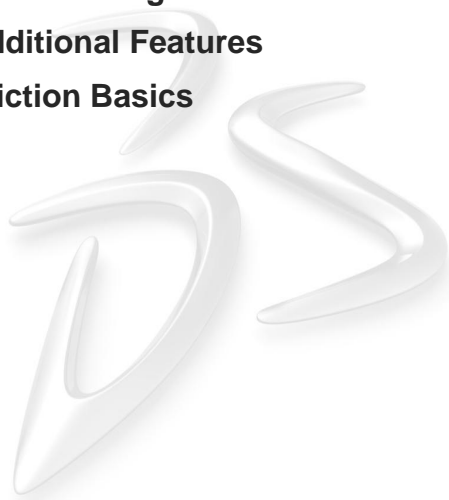
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## Overview

- Overview of Contact
- Contact Discretization
- Contact Enforcement
- Finite Sliding of Deformable Bodies against Each Other
- Finite Sliding of Deformable Bodies against Rigid Bodies
- Additional Features
- Friction Basics

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# Rubber Models for Tire Analysis

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## Overview

- Introduction
- Stress and Strain Measures
- Material Directions
- Temperature and Field Variable Dependence
- Hyperelasticity

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