

Introduction to Creo Simulate 4.0

Overview

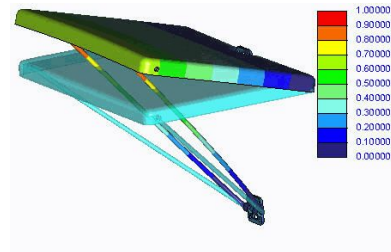
Course Code TRN-5104-T

Course Length 40 Hours

In this course, you will learn how to test, validate, and optimize product designs with the Creo Simulate module. Creo Simulate enables you to simulate structural and thermal loads on product designs. You will complete comprehensive, hands-on lab exercises that simulate realistic analysis and design optimization activities. You will also be introduced to advanced topics such as dynamic analyses, combined mechanical and thermal analyses, and Optimization Studies. After completing the course, you will be able to run engineering analyses and optimizations on your product design models.

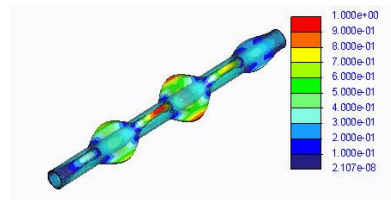
At the end of each module, you will complete a set of review questions to reinforce critical topics from that module. At the end of the course, you will complete a course assessment in Pro/FICIENCY intended to evaluate your understanding of the course as a whole.

This course has been developed using Creo Simulate 4.0



Course Objectives

- Understand the basic Simulate analysis process
- Understand theory and simulate model topics
- Explore results
- Explore materials and material properties
- Understand and use Simulate idealizations
- Understand and use structural loads
- Understand and use structural constraints
- Run structural analyses
- Understand convergence
- Analyze assemblies with Simulate
- Complete design and sensitivity studies
- Run optimization studies
- Understand the basics of Thermal analysis



Prerequisites

- Three months of Pro/ENGINEER Wildfire 5.0 or Creo Parametric experience

Audience

- This course is intended for design engineers and mechanical designers. People in related roles will also benefit from taking this course.
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Agenda

Day 1

Module 1 Introduction to Creo Simulate

Module 2 Theoretical Foundations

Module 3 Simulation Models

Module 4 Materials and Material Properties

Module 5 Structural Constraints

Module 6 Structural Loads

Day 2

Module 7 Meshing

Module 8 Convergence

Module 9 Structural Analysis

Module 10 Introduction to Results Evaluation

Day 3

Module 11 Refining the Design

Module 12 Basic Model Debugging

Module 13 Singularities

Day 4

Module 14 Analyzing Assemblies

Module 15 Shells

Module 16 Idealizations

Day 5

Module 17 Thermal Analysis

Module 18 Advanced Analysis

Module 19 Project

Course Content

Module 1. Introduction to Creo Simulate

- i. Simulate Analysis Functionality
- ii. Simulate Model Functionality
- iii. The Simulate Application
- iv. The Simulate User Interface Functionality
- v. The Typical Simulation Process

Knowledge Check Questions

Module 2. Theoretical Foundations

- i. The Finite Element Method
- ii. The h- and p-Versions of Finite Elements
- iii. The p-Method
- iv. Structural Mechanics — Stress Definitions and Hooke's Law
- v. Structural Mechanics — Strain Energy and Failure Theories

Knowledge Check Questions

Module 3. Simulation Models

- i. Preparing a CAD Model
- ii. Using Inheritance and Remove Features
- iii. Managing Units
- iv. Understanding Model Types
- v. Element Types Overview
- vi. Defining Simulate Model Geometry
- vii. Using Simulate Coordinate Systems
- viii. Using Surface Regions
- ix. Using Volume Regions
- x. Controlling the Display of Simulation Entities
- xi. Using Measures

Knowledge Check Questions

Module 4. Materials and Material Properties

- i. Understanding Material Properties
- ii. Defining Linear Elastic Materials
- iii. Understanding Failure Criteria
- iv. Creating Materials
- v. Using 3-D Material Orientation
- vi. Using 2-D Material Orientation
- vii. Understanding Material Libraries

Knowledge Check Questions

Module 5. Structural Constraints

- i. Defining Constraints
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- ii. Understanding Displacement Constraints
- iii. Understanding Planar, Pin, and Ball Constraints
- iv. Understanding Mirror Symmetry Constraints
- v. Understanding Cyclic Symmetry Constraints

Knowledge Check Questions

Module 6. Structural Loads

- i. Understanding Structural Loads
- ii. Defining Global Loads
- iii. Defining Forces, Moments, and Pressure
- iv. Defining Loads as Functions

Knowledge Check Questions

Module 7. Meshing

- i. Understanding Meshes
- ii. Understanding Mesh Options
- iii. Using AutoGEM Settings

Knowledge Check Questions

Module 8. Convergence

- i. Convergence Methods
- ii. Error Norms
- iii. Comparing Convergence Methods
- iv. Selecting a Convergence Method
- v. Understanding P-Level Plots
- vi. Recommendations for Memory Allocation

Knowledge Check Questions

Module 9. Structural Analysis

- i. Fundamentals of a Linear Static Analysis
- ii. Defining a Linear Static Analysis
- iii. Understanding Modal Analysis
- iv. Defining Fatigue Studies and Properties
- v. Setting Up the Simulate Solver
- vi. Starting, Stopping, and Monitoring the Simulate Solver
- vii. Understanding the Batch Process

Knowledge Check Questions

Module 10. Introduction to Results Evaluation

- i. Ensuring Result Quality
 - ii. The Simulate Result Directory Structure
 - iii. Using the Postprocessor
 - iv. Reviewing the Results Window
 - v. Inserting Results
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- vi. Formatting Results
- vii. Performing Basic View Operations
- viii. Hiding and Unhiding Results
- ix. Editing, Copying, Deleting, Swapping, and Reordering Results Windows
- x. Using Results Templates
- xi. Using Annotations
- xii. Creating Fringe Results
- xiii. Creating Vector Results
- xiv. Creating Graph Results
- xv. Creating a Graph Preference File
- xvi. Creating Model Results
- xvii. Using Cutting and Capping Surfaces
- xviii. Using Results Mode Info and Query
- xix. Tying and Untying Results
- xx. Controlling Animations
- xxi. Exporting Results

Knowledge Check Questions

Module 11. Refining the Design

- i. Understanding Design Variables
- ii. Defining Design Studies
- iii. Understanding Standard Design Studies
- iv. Understanding Local Sensitivity Design Studies
- v. Understanding Global Sensitivity Design Studies
- vi. Understanding Optimization Design Studies
- vii. Understanding Design Study Options

Knowledge Check Questions

Module 12. Basic Model Debugging

- i. The Diagnostic Tool
- ii. Debugging a Model

Knowledge Check Questions

Module 13. Singularities

- i. Understanding Singularities
- ii. Treating Singularities

Knowledge Check Questions

Module 14. Analyzing Assemblies

- i. Using Interfaces
 - ii. Reviewing Interfaces
 - iii. Understanding Connections
 - iv. Using End Welds
 - v. Using Perimeter Welds
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- vi. Using Spot Welds
- vii. Using Fasteners

Knowledge Check Questions

Module 15. Shells

- i. Understanding Shells
- ii. Using Shells on Quilts or Volume Surfaces
- iii. Using Shell Pairs for Midsurface Models
- iv. Using Connection Tools to Join Shell Midsurface Assemblies

Knowledge Check Questions

Module 16. Idealizations

- i. Creating Discrete Masses
- ii. Creating Rigid Links
- iii. Creating Weighted Links
- iv. Creating Springs
- v. Defining a Beam
- vi. Understanding Beam Results

Knowledge Check Questions

Module 17. Thermal Analysis

- i. Understanding Thermal Analysis
- ii. Creating Heat Loads
- iii. Creating Prescribed Temperature Boundary Conditions
- iv. Applying Traveling Heat Loads
- v. Applying Temperature Loads to a Simulate Structure Model

Knowledge Check Questions

Module 18. Advanced Analysis

- i. Understanding Static Analysis with Prestress
- ii. Understanding Modal Analysis with Prestress
- iii. Understanding Dynamic Analysis
- iv. Understanding Linear Buckling Analysis
- v. Understanding Nonlinear Stability Analysis: Snap-through
- vi. Understanding Contact Analysis
- vii. Understanding 2-D Plane Stress and Strain
- viii. Understanding Symmetry

Knowledge Check Questions

Module 19. Project

- i. The Journeyman's Piece



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