Mechanism Design using Pro/ENGINEER Wildfire 3.0

Course Code	TRN-1854-T
Course Length	1 Day

Overview

This course is designed for experienced users who want to add motion to their products. You will focus on learning advanced assembly skills in this comprehensive, hands-on course. Topics include creating mechanism connections, configuring the mechanism model, creating a kinematic analysis, and evaluating results. These topics will enable you to simulate the range of motion between components in your moving assemblies, create gear connections that simulate the gear ratios, create cam connections that enable Pro/ENGINEER parts to "push" other parts they come into contact with, and check for collisions between moving components. Furthermore, you learn about how you can use Design Animation to animate your product, how you can use Mechanism Dynamics to simulate reaction forces between components, and how you can use Behavioral Modeling to optimize your mechanism.

After completing this course, you will be prepared to work on mechanism designs using Pro/ENGINEER Wildfire Mechanism Design.

Pro/FICIENCY assessments will be provided in order for you to assess your understanding of the course materials. The assessment results will also identify the class topics that require further review. At the end of the class, you will either take an assessment via your PTC University account, or your instructor will provide training on how to do this after the class.

Prerequisites

- Introduction to Pro/ENGINEER Wildfire 3.0 or equivalent experience.

Audience

This course is intended for product designers. People in related roles will also benefit from taking this course.

Topics

- Identifying Differences between Mechanism Design Extension and Mechanism Dynamics Option
- Creating Bodies
- Creating Mechanism Connections in Pro/ENGINEER
- Creating Cam-Follower and Gear Pair Connections
- Applying Servo Motors to Assemblies
- Creating Position Analyses
- Creating Kinematic Analyses
- Evaluating Results
- Creating Trace Curves and Motion Envelopes

Agenda

Day 1

Module 1	Introduction to Mechanism Design
Module 2	Creating Mechanism Connections
Module 3	Configuring the Mechanism Model and Analysis
Module 4	Evaluating Results, Animating, and Optimizing the Mechanism
Module 5	Project

Table of Contents

Mechanism Design using Pro/ENGINEER Wildfire 3.0

INTRODUCTION TO MECHANISM DESIGN 1-1

Introduction 1-1
Objectives 1-1
Lecture Notes 1-2
Introduction to Mechanism Design 1-3
Identifying the Differences between MDX and MDO 1-4
Identifying the Mechanism Design Workflow and Components 1-5
Creating the Model and Verifying the Mechanism 1-6
Adding Mechanism Entities 1-7
Preparing for Analysis and Analyzing the Mechanism 1-8
Evaluating Results and Running Post-MDX Processes 1-10
Lab Exercises 1-12
Exercise 1: Running a Mechanism Analysis 1-12
Summary 1-19

CREATING MECHANISM CONNECTIONS 2-1

Introduction 2-1
Objectives 2-1
Lecture Notes 2-2
Creating Mechanism Bodies 2-3
Identifying the Differences between Constraints and Connections 2-5
Creating Joint Connections 2-7
Configuring Motion Axis Settings 2-12
Creating Slot Connections 2-14
Creating Connections on Skeleton Models 2-16
Calculating Redundancies and Degrees of Freedom 2-17
Lab Exercises 2-18
Exercise 1: Converting Constraints to Connections 2-18
Exercise 2: Configuring Motion Axis Limits 2-20
Exercise 3: Creating Slot Connections 2-26
Exercise 4: Creating Connections on Skeletons 2-32
Summary 2-39

CONFIGURING THE MECHANISM MODEL AND ANALYSIS 3-1
Introduction 3-1
Objectives 3-1
Lecture Notes 3-2
Creating Cam-Follower Connections 3-3
Creating Gear Connections 3-7
Creating Servo Motors 3-10
Identifying the Different Types of Mechanism Analyses 3-24
Configuring Analysis Preferences and Motors 3-26
Lab Exercises 3-28
Exercise 1: Configuring the Cam Model 3-28
Exercise 2: Analyzing the Skeleton Model 3-32
Exercise 3: Creating and Analyzing Geometry Motors 3-34
Exercise 4: Creating Gear Connections 3-38
Summary 3-42

EVALUATING RESULTS, ANIMATING, AND OPTIMIZING THE MECHANISM 4-1
Introduction 4-1
Objectives 4-1
Lecture Notes 4-2
Running Mechanism Analyses 4-3
Evaluating Playback Results 4-4
Evaluating Playback Results for Collisions 4-6
Identifying Post-MDX Options - MDO 4-7
Identifying Post-MDX Options - DAO 4-8
Identifying Post-MDX Options - BMX 4-9
Lab Exercises 4-10
Exercise 1: Evaluating a Kinematic Analysis 4-10
Exercise 2: Synthesizing Cam Profiles 4-14
Summary 4-20

PROJECT 5-1
Introduction 5-1
Objectives 5-1
Lecture Notes 5-2
Project - Analyzing the Truck Storage Box 5-3
Lab Exercises 5-4
Exercise 1: Analyzing the Truck Box 5-4
Summary 5-12