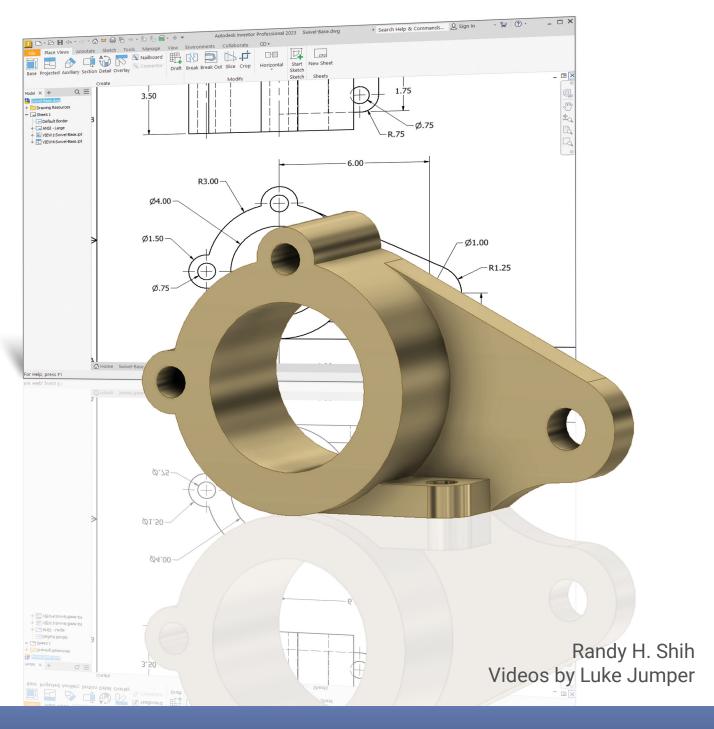
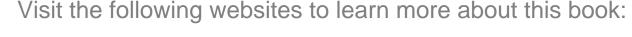
## Includes Extensive

# Parametric Modeling with Autodesk Inventor 2023

















### **Table of Contents**

Preface Acknowledgments Table of Contents Autodesk Inventor Certified User Examination Overview	i ii iii xiii
Chapter 1 Getting Started	
Introduction Development of Computer Geometric Modeling Feature-Based Parametric Modeling Getting Started with Autodesk Inventor The Screen Layout and Getting Started Toolbar The New File Dialog Box and Units Setup The Default Autodesk Inventor Screen Layout File Menu Quick Access Toolbar Ribbon Tabs and Tool Panels Online Help Panel 3D Model Toolbar Graphics Window Message and Status Bar Mouse Buttons [Esc] - Canceling Commands Autodesk Inventor Help System Data Management Using Inventor Project files Set up of a New Inventor Project File Leaving Autodesk Inventor	1-3 1-3 1-7 1-8 1-9 1-10 1-11 1-12 1-12 1-13 1-13 1-13 1-14 1-15 1-16 1-17 1-20 1-20
Chapter 2 Parametric Modeling Fundamentals	
Introduction The Adjuster Design Starting Autodesk Inventor The Default Autodesk Inventor Screen Layout Sketch Plane – It is an XY Monitor, but an XYZ World Creating Rough Sketches Step 1: Creating a Rough Sketch Graphics Cursors Geometric Constraint Symbols	2-3 2-4 2-4 2-6 2-7 2-9 2-10 2-11

Step 2: Apply/Modify Constraints and Dimensions Dynamic Viewing Functions – Zoom and Pan Modifying the Dimensions of the Sketch Step 3: Completing the Base Solid Feature Isometric View Dynamic Rotation of the 3D Block - Free Orbit Dynamic Viewing - Quick Keys Viewing Tools – Standard Toolbar Display Modes Orthographic vs. Perspective Disable the Heads-Up Display Option Step 4-1: Adding an Extruded Feature Step 4-2: Adding a Cut Feature Step 4-3: Adding another Cut Feature Save the Model Review Questions Exercises	2-12 2-15 2-15 2-16 2-17 2-18 2-20 2-21 2-25 2-25 2-26 2-27 2-31 2-34 2-36 2-38 2-39
Chapter 3 Constructive Solid Geometry Concepts Introduction Binary Tree The Locator Design Modeling Strategy - CSG Binary Tree Starting Autodesk Inventor Base Feature GRID Display Setup Model Dimensions Format Modifying the Dimensions of the Sketch Repositioning Dimensions Using the Measure Tools Completing the Base Solid Feature Creating the Next Solid Feature Creating a Placed Feature Creating a Rectangular Cut Feature Save the Model Review Questions Exercises	3-3 3-4 3-5 3-6 3-7 3-8 3-9 3-12 3-12 3-13 3-14 3-17 3-18 3-22 3-25 3-27 3-29 3-30 3-31
Chapter 4 Model History Tree	

Introduction 4-3

	Table of Contents
The Saddle Bracket Design	4-4
Starting Autodesk Inventor	4-4
Modeling Strategy	4-5
The Autodesk Inventor Browser	4-6
Creating the Base Feature	4-6
Adding the Second Solid Feature	4-9
Creating a 2D Sketch	4-10
Renaming the Part Features	4-12
Adjusting the Width of the Base Feature	4-13
Adding a Placed Feature	4-14
Creating a Rectangular Cut Feature	4-16
History-Based Part Modifications	4-17
A Design Change	4-18
Assigning and Calculating the Associated Physical Properties	4-21
Review Questions	4-23
Exercises	4-24
Chapter 5 Parametric Constraints Fundamentals	
Constraints and Relations	5-3
Create a Simple Triangular Plate Design	5-3
Fully Constrained Geometry	5-4
Starting Autodesk Inventor	5-4
Displaying Existing Constraints	5-5
Applying Geometric/Dimensional Constraints	5-7
Over-Constraining and Driven Dimensions	5-11
Deleting Existing Constraints	5-12
Using the Auto Dimension Command	5-13
Constraint and Sketch Settings	5-18
Parametric Relations	5-19
Dimensional Values and Dimensional Variables	5-21
Parametric Equations	5-22
Viewing the Established Parameters and Relations	5-24
Saving the Model File	5-25
Using the Measure Tools	5-26
Review Questions	5-30
Exercises	5-31
Chapter 6 Geometric Construction Tools	
Introduction	6-3
The Gasket Design	6-3

Modeling Strategy

6-4

vi Parametric Modeling with Autodesk Inventor	
Starting Autodesk Inventor	6-5
Create a 2D Sketch	6-6
Edit the Sketch by Dragging the Sketched Entities	6-8
Add Additional Constraints	6-10
Use the Trim and Extend Commands	6-11
The Auto Dimension Command	6-13
Create Fillets and Completing the Sketch	6-15
Fully Constrained Geometry	6-16
Profile Sketch	6-18
Redefine the Sketch and Profile	6-19
Create an Offset Cut Feature	6-23
Review Questions	6-26
Exercises	6-27
Chapter 7	
Parent/Child Relationships and the BORN Technique	
Introduction	7-3
The BORN Technique	7-3
The U-Bracket Design	7-4
Sketch Plane Settings	7-5
Apply the BORN Technique	7-6
Create the 2D Sketch for the Base Feature	7-8
Create the First Extrude Feature	7-11
The Implied Parent/Child Relationships	7-12
Create the Second Solid Feature	7-12
Create a Cut Feature	7-16
The Second Cut Feature	7-17
Examine the Parent/Child Relationships	7-19
Modify a Parent Dimension	7-20
A Design Change	7-21
Feature Suppression	7-22
A Different Approach to the Center_Drill Feature	7-23
Suppress the Rect_Cut Feature	7-25
Create a Circular Cut Feature	7-26
A Flexible Design Approach	7-28
View and Edit Material Properties	7-29
Review Questions	7-31
Exercises	7-32
Chantar 9	

### Chapter 8 Part Drawings and 3D Model-Based Definition

Drawings from Parts and Associative Functionality	8-3
3D Model-Based Definition	8-4

vii

	Table of Contents	ix
Set Up the Display of the Sketch Plane	12-5	
Create the 2D Sketch for the Base Feature	12-6	
Create a Revolved Feature	12-9	
Create Offset Work Planes	12-10	
Start 2D Sketches on the Work Planes	12-11	
Create a Lofted Feature	12-14	
Create an Extruded Feature	12-16	
Complete the Extruded Feature	12-18	
Create 3D Rounds and Fillets	12-19	
Create a Shell Feature	12-20	
Create a Pattern Leader	12-21	
Create a Rectangular Pattern	12-24	
Create a Swept Feature	12-26	
Define a Sweep Path	12-26	
Define the Sweep Section	12-28	
Complete the Swept Feature	12-30	
Review Questions	12-32	
Exercises	12-33	
Chapter 13 Sheet Metal Designs		
Sheet Metal Processes	13-3	
Sheet Metal Modeling	13-5	
K-Factor	13-6	
The Actuator Bracket Design	13-7	
Starting Autodesk Inventor	13-8	
Sheet Metal Defaults	13-9	
Create the Base Face Feature of the Design	13-12	
Using the Flange Command	13-15	
Mirroring Features	13-19	
Create a Cut Feature	13-20	
Create a Fold Feature	13-22	
Create the Associated Flat Pattern	13-25	
Confirm the Flattened Length	13-26	
Create a 2D Sheet Metal Drawing	13-27	
Review Questions	13-34	
Exercises	13-35	
Chapter 14		
Assembly Modeling - Putting It All Together		
Introduction	14-3	
Assembly Modeling Methodology	14-4	
The Shaft Support Assembly	14-5	

Additional Parts	14-5
(1) Collar	14-5
(2) Bearing	14-6
(3) Base-Plate	14-6
(4) Cap-Screw	14-7
Starting Autodesk Inventor	14-8
Placing the First Component	14-9
Placing the Second Component	14-10
Degrees of Freedom and Constraints	14-11
Assembly Constraints	14-12
Apply the First Assembly Constraint	14-15
Apply a Second Mate Constraint	14-16
Constrained Move	14-17
Apply a Flush Constraint	14-18
Placing the Third Component	14-20
Applying an Insert Constraint	14-21
Assemble the Cap-Screws	14-22
Exploded View of the Assembly	14-23
Editing the Components	14-25
Adaptive Design Approach	14-26
Delete and Re-apply Assembly Constraints	14-30
Set up a Drawing of the Assembly Model	14-32
Creating a Parts List	14-34
Edit the Parts List	14-35
Change the Material Type	14-37
Add the Balloon Callouts	14-39
Completing the Title Block Using the iProperties option	14-39
Bill of Materials	14-41
(a) BOM from Parts List	14-41
(b) BOM from Assembly Model	14-42
Review Questions	14-43
Exercises	14-44
Chapter 15	
Content Center and Basic Motion Analysis	
Introduction	15-3
The Crank-Slider Assembly	15-4
Create the Required Parts	15-4
Starting Autodesk Inventor	15-6
Placing the First Component	15-7
Placing the Second Component	15-8
Apply the Assembly Constraints	15-9
Apply a Second Mate Constraint	15-10
Constrained Move	15-11
Place the Third Component	15-11
1	

	Table of Contents
Assemble the CS-Rod Part	15-14
Make a Copy of the Pin	15-15
Assemble the CS-Slider Part	15-16
Add an Angle Constraint to Fully Constrain the Assembly	15-21
Interference Analysis	15-23
Basic Motion Analysis	15-24
3D Grip Editing the CS-Slider Part	15-27
Review Questions	15-31
Exercises	15-32
Exercises	13 32
Chapter 16	
2D Design Reuse, Collision and Contact	
Introduction	16-3
The Geneva CAM Assembly	16-4
Download the Geneva-Wheel DWG File	16-4
Opening AutoCAD DWG File in Inventor	16-5
Switch to the AutoCAD DWG Layout	16-6
2D Design Reuse	16-8
Complete the Imported Sketch	16-12
Create the First Solid Feature	16-14
Create a Mirrored Feature	16-15
Circular Pattern	16-16
Complete the Geneva Wheel Design	16-17
Additional Parts	16-18
Start a New Assembly	16-20
Placing the Second Component	16-21
The Assembly Joint Command	16-22
Create a Joint Connection	16-23
Constrained Move	16-24
Placing a Copy of the Geneva-Driver Part	16-24
Create a Second Joint Connection	16-25
Assemble the Geneva-Pin Part	16-26
Repositioning the Pieces	16-28
Animation with Drive Tool	16-29
Use the Inventor Contact Solver	16-31
Constrained Move with Contact Solver	16-33
Review Questions	16-34
Exercises	16-35
Chapter 17	
Introduction to Stress Analysis	
Introduction	17-2
Problem Statement	17-4

xi

Preliminary Analysis	17-4
Maximum Normal Stress	17-4
Maximum Displacement	17-5
Finite Element Analysis Procedure	17-6
Create the Autodesk Inventor Part	17-7
Create the 2D Sketch for the Plate	17-7
Assigning the Material Properties	17-10
Switch to the Stress Analysis Module	17-11
Apply Constraints and Loads	17-14
Create a Mesh and Run the Solver	17-16
Refinement of the FEA Mesh – Global Element Size	17-18
Refinement of the FEA Mesh – Local Element Size	17-20
Comparison of Results	17-23
Create an HTML Report	17-24
Geometric Considerations of Finite Elements	17-25
Conclusion	17-26
Summary of Modeling Considerations	17-26
Review Questions	17-27
Exercises	17-28

#### **Appendix**

#### Index