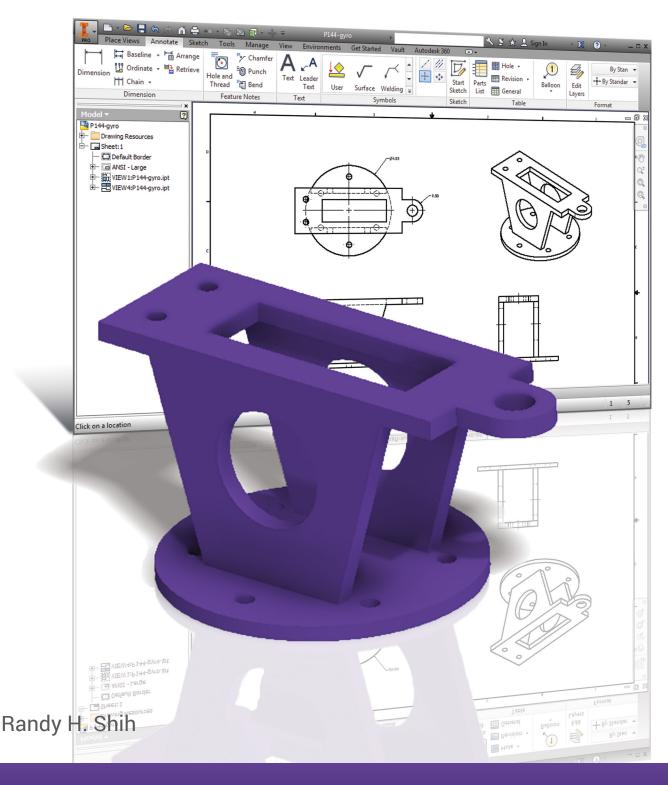
Parametric Modeling with Autodesk Inventor 2016





Visit the following websites to learn more about this book:



amazon.com





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 Default Autodesk Inventor Screen Layout Application Menu Quick Access Toolbar Ribbon Tabs and Tool Panels Online Help Panel Create Toolbar Graphics Window Message and Status Bar Mouse Buttons [Esc] - Canceling Commands Autodesk Inventor Help System Data Management using Inventor Project files Setup of a New Inventor Project File Leaving Autodesk Inventor Chapter 2	1-3 1-3 1-7 1-8 1-9 1-10 1-11 1-12 1-12 1-12 1-13 1-13 1-14 1-14 1-15 1-16 1-17 1-20
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 Step 2: Apply/Modify Constraints and Dimensions Dynamic Viewing Functions – Zoom and Pan	2-3 2-4 2-4 2-6 2-7 2-9 2-10 2-11 2-12 2-15

Modifying the Dimensions of the Sketch	2-15
Step 3: Completing the Base Solid Feature	2-16
Isometric View	2-17
Dynamic Rotation of the 3-D block - Free Orbit	2-18
Dynamic Viewing - Quick Keys	2-20
Viewing Tools – Standard Toolbar	2-21
Display Modes	2-25
Orthographic vs. Perspective	2-25
Disable the Heads-Up Display Option	2-26
Step 4-1: Adding an Extruded Feature	2-27
Step 4-2: Adding a Cut Feature	2-32
Step 4-3: Adding another Cut Feature	2-35
Save the Model	2-38
Review Questions	2-39
Exercises	2-40
Chapter 3	
Constructive Solid Geometry Concepts	
·	
Introduction	3-3
Binary Tree	3-4
The Locator Design	3-5
Modeling Strategy - CSG Binary Tree	3-6
Starting Autodesk Inventor	3-7
Base Feature	3-8
GRID intervals Setup	3-9
Model Dimensions Format	3-12
Modifying the Dimensions of the Sketch	3-12
Repositioning Dimensions	3-13
Using the Measure Tools	3-14
Completing the Base Solid Feature	3-17
Creating the Next Solid Feature	3-18
Creating a CUT Feature	3-22
Creating a PLACED FEATURE	3-25
Creating a Rectangular Cut Feature	3-27
Save the Model	3-29
Review Questions	3-30
Exercises	3-31
Chautau 4	
Chapter 4	
Model History Tree	
Introduction	4-3
The Saddle Bracket Design	4-4
Starting Autodesk Inventor	4-4
Modeling Strategy	4-5
The Autodesk Inventor Browser	4-6

Table of Contents	V
-------------------	---

Creating the Base Feature Adding the Second Solid Feature Creating a 2D Sketch Renaming the Part Features Adjusting the Width of the Base Feature Adding a Placed Feature Creating a Rectangular Cut Feature History-Based Part Modifications A Design Change Assigning and Calculating the Associated Physical Properties Review Questions Exercises	4-6 4-9 4-10 4-12 4-13 4-14 4-16 4-17 4-18 4-21 4-23 4-24
Chapter 5 Parametric Constraints Fundamentals	
CONSTRAINTS and RELATIONS Create a Simple Triangular Plate Design Fully Constrained Geometry Starting Autodesk Inventor Displaying Existing Constraints Applying Geometric/Dimensional Constraints Over-Constraining and Driven Dimensions Deleting Existing Constraints Using the Auto Dimension Command Constraint and Sketch Settings Parametric Relations Dimensional Values and Dimensional Variables Parametric Equations Viewing the Established Parameters and Relations Saving the Model File Using the Measure Tools Review Questions Exercises	5-3 5-3 5-4 5-4 5-5 5-7 5-11 5-12 5-13 5-18 5-19 5-21 5-22 5-24 5-25 5-26 5-30 5-31
Chapter 6 Geometric Construction Tools	
Introduction The Gasket Design Modeling Strategy Starting Autodesk Inventor Create a 2D Sketch Edit the Sketch by Dragging the Sketched Entities Add Additional Constraints Use the <i>Trim</i> and <i>Extend</i> Commands The <i>Auto Dimension</i> Command	6-3 6-3 6-4 6-5 6-6 6-8 6-10 6-11 6-13

Create Fillets and Completing the Sketch Fully Constrained Geometry	6-15 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
Γhe BORN Technique	7-3
Γhe U-Bracket Design Sketch Plane Settings	7-4 7-5
Apply the BORN Technique	7-5 7-6
Create the 2-D Sketch of 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 the First 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 7-22
Feature Suppression A Different Approach to the CENTER DRILL Feature	7-22 7-23
Suppress the Rect Cut Feature	7-25 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
Chapter 8	
Part Drawings and Associative Functionality	
Drawings from Parts and Associative Functionality	8-3
Starting Autodesk Inventor	8-4
Drawing Mode - 2D Paper Space	8-4
Drawing Sheet Format	8-6
Using the Pre-Defined Drawing Sheet Formats	8-8
Delete, Activate, and Edit Drawing Sheets	8-10
Add a Base View	8-11
Create Projected Views Adjust the View Scale	8-12 8-13
Repositioning Views	8-13
repositioning views	0 17

	Table of Contents
Display Feature Dimensions	8-15
Repositioning and Hiding Feature Dimensions	8-17
Add Additional Dimensions – Reference Dimensions	8-19
Add Center Marks and Center Lines	8-20
Complete the Drawing Sheet	8-23
Associative Functionality – Modifying Feature Dimensions	8-24
3D Annotations in Isometric Views	8-27
Review Questions	8-35
Exercises	8-36
Chapter 9	
Datum Features and Auxiliary Views	
Work Features	9-3
Auxiliary Views in 2D Drawings	9-3
The Rod-Guide Design	9-3
Modeling Strategy	9-4
Starting Autodesk Inventor	9-5
Apply the BORN Technique	9-5
Creating the Base Feature	9-7
Create an Angled Work Plane	9-9
Create a 2D Sketch on the Work Plane	9-10
Use the Projected Geometry Option	9-10
Complete the Solid Feature	9-14
Create an Offset Work Plane	9-15
Create another Cut Feature Using the Work Plane	9-16
Start a New 2D Drawing	9-18
Add a Base View	9-19
Create an Auxiliary View	9-20
Display Feature Dimensions	9-22
Adjust the View Scale	9-24
Retrieving Dimensions in the Auxiliary View	9-25
Add Center Marks and Center Lines	9-28
Complete the Title Block with iProperties	9-31
Edit the Isometric view	9-33
Review Questions	9-34
Exercises	9-35
Chapter 10	
Symmetrical Features in Designs	
Introduction	10-3
A Revolved Design: PULLEY	10-3
Modeling Strategy - A Revolved Design	10-4
Starting Autodesk Inventor	10-5
Set up the Display of the Sketch Plane	10-5
Create the 2-D Sketch for the Base Feature	10-6

vii

Create the Revolved Feature Mirroring Features Create a Pattern Leader Using Construction Geometry Circular Pattern Examine the Design Parameters Drawing Mode – Defining New Border and Title Block Create a Drawing Template Create the Necessary Views Retrieve Dimensions – Features Option Associative Functionality – A Design Change Add Center Lines to the Pattern Feature Complete the Drawing Review Questions	10-10 10-11 10-13 10-18 10-20 10-20 10-24 10-25 10-28 10-30 10-32 10-33 10-36
Exercises	10-37
Chapter 11 Advanced 3D Construction Tools	
Introduction A Thin-Walled Design: Dryer Housing Modeling Strategy Starting Autodesk Inventor Set Up the Display of the Sketch Plane Create the 2-D Sketch for the Base Feature Create a Revolved Feature Create Offset Work Planes Start 2D Sketches on the Work Planes Create a Lofted Feature Create an Extruded Feature Create an Extruded Feature Complete the Extruded Feature Create 3D Rounds and Fillets Create a Shell Feature Create a Pattern Leader Create a Rectangular Pattern Create a Swept Feature Define a 2D Sweep Path Define the Sweep Section Complete the Swept Feature Review Questions Exercises	11-3 11-3 11-4 11-5 11-5 11-6 11-9 11-10 11-11 11-14 11-16 11-18 11-19 11-20 11-21 11-24 11-26 11-26 11-28 11-30 11-32 11-33
Chapter 12 Shoot Motal Dosigns	
Sheet Metal Designs Sheet Metal Processes Sheet Metal Modeling K-Factor	12-3 12-5 12-6

	Table of Contents
The Actuator Bracket Design	12-7
Starting Autodesk Inventor	12-8
Sheet Metal Defaults	12-9
Create the Base Face Feature of the Design	12-12
Using the Flange Command	12-15
Mirroring Features	12-19
Create a Cut Feature	12-20
Create a Fold Feature	12-22
Create the Associated Flat Pattern	12-25
Confirm the Flattened Length	12-26
Create a 2D Sheet Metal Drawing	12-27
Review Questions	12-34
Exercises	12-35
Chapter 13	
Assembly Modeling - Putting It All Together	
Introduction	13-3
Assembly Modeling Methodology	13-4
The Shaft Support Assembly	13-5
Additional <i>Parts</i>	13-5
(1) Collar	13-5
(2) Bearing	13-6
(3) Base-Plate	13-6
(4) Cap-Screw	13-7
Starting Autodesk Inventor	13-8
Placing the First Component	13-9
Placing the Second Component	13-10
Degrees of Freedom and Constraints	13-11
Assembly Constraints	13-12
Apply the First Assembly Constraint	13-15
Apply a Second Mate Assembly Constraint	13-16
Constrained Move	13-17
Apply a Flush Constraint	13-18
Placing the Third Component	13-20
Applying an Insert Constraint	13-21
Assemble the Cap-Screws	13-22
Exploded View of the Assembly	13-23
Editing the Components	13-25
Adaptive Design Approach	13-26
Delete and Re-apply Assembly Constraints	13-30
Set up a Drawing of the Assembly Model	13-32
Creating a Parts List	13-34
Edit the Parts List	13-35
Change the Material Type	13-37
Add the Balloon Callouts	13-39
Complete the Title Block Using the iProperties option	13-39

Bill of Materials (a) BOM from Parts List (b) BOM from Assembly Model Review Questions Exercises	13-41 13-41 13-42 13-43 13-44
Chapter 14 Content Center and Basic Motion Analysis	
Introduction The Crank-Slider Assembly Create the Required Parts Starting Autodesk Inventor Placing the First Component Placing the Second Component Apply the Assembly Constraints Apply a Second MATE Constraint Constrained Move Place the Third Component Assemble the CS-Rod Part Make a Copy of the PIN Part Assemble the CS-Slider Part Add an Angle Constraint to Fully Constrain the Assembly Interference Analysis Basic Motion Analysis 3D Grip Editing the CS-Slider Part Review Questions Exercises	14-3 14-4 14-4 14-6 14-7 14-8 14-9 14-10 14-11 14-11 14-14 14-15 14-16 14-21 14-23 14-24 14-27 14-31
Chapter 15 2D Design Reuse, Collision and Contact	
Introduction The Geneva CAM Assembly Internet Download the Geneva-Wheel DWG File Opening AutoCAD DWG File in Inventor Use the Measuring Tools Switch to the AutoCAD DWG Layout 2D Design Reuse Complete the Imported Sketch Create the First Solid Feature Create a Mirrored Feature Circular Pattern	15-3 15-4 15-4 15-5 15-6 15-8 15-10 15-14 15-16 15-17

Table of Contents xi

Complete the Geneva Wheel Design	15-19
Additional Parts	15-19
Start a New Assembly	15-22
Placing the Second Component	15-23
The Assembly Joint Command	15-24
Create a Joint Connection	15-25
Constrained Move	15-26
Placing a Copy of the Geneva-Driver Part	15-26
Create a Second Joint Connection	15-27
Assemble the Geneva-Pin Part	15-28
Repositioning the Pieces	15-30
Animation with Drive Tool	15-31
Use the Inventor Contact Solver	15-33
Constrained Move with Contact Solver	15-35
Review Questions	15-36
Exercises	15-37
Chapter 16	
Introduction to Stress Analysis	
Introduction	16-2
Problem Statement	16-4
Preliminary Analysis	16-4
Maximum Normal Stress	16-4
Maximum Displacement	16-5
Finite Element Analysis Procedure	16-6
Create the Autodesk Inventor Part	16-7
Create the 2D Sketch for the Plate	16-7
Assigning the Material Properties	16-10
Switch to the <i>Stress Analysis</i> Module Create an FEA Simulation	16-11 16-12
Apply Constraints and Loads	16-12
Create a Mesh and Run the Solver	16-14
Refinement of the FEA Mesh – Global Element Size	16-18
Refinement of the FEA Mesh – Local Element Size	16-20
Comparison of Results	16-23
Create an HTML Report	16-24
Geometric Considerations of Finite Elements	16-25
Conclusion	16-26
Summary of Modeling Considerations	16-26
Review Questions	16-27
Exercises	16-28

Appendix

Index