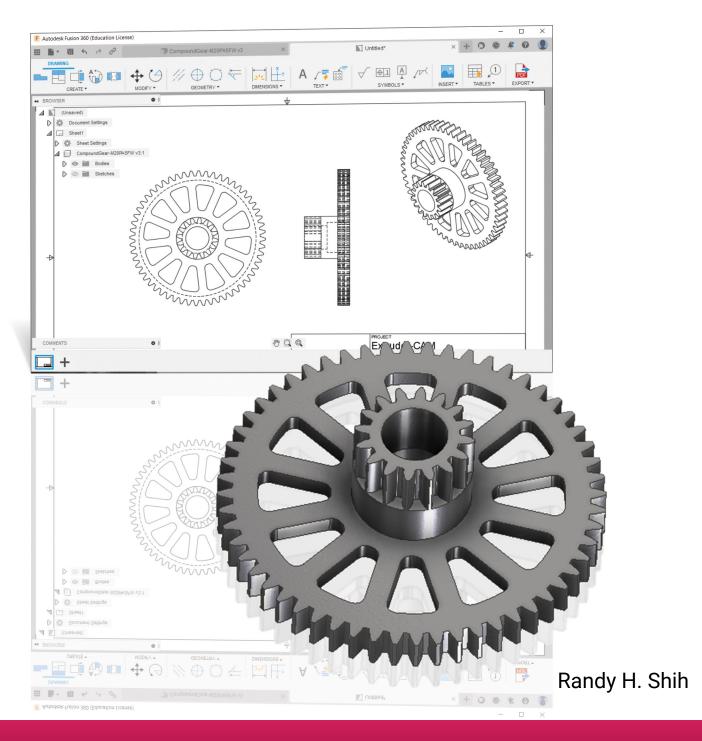
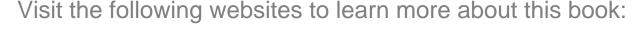
# Parametric Modeling with Autodesk Fusion 360

Spring 2022 Edition













### **Table of Contents**

Acknowledgments Table of Contents	i ii iii
Chapter 1 Introduction - Getting Started	
Introduction Development of Computer Geometric Modeling Feature-Based Parametric Modeling Getting Started with Autodesk Fusion 360 The Autodesk Fusion 360 Screen Layout Quick Access Toolbar Ribbon Tool Panels Display Control Panel View Cube Comments Panel Mouse Buttons [Esc] - Canceling Commands Autodesk Fusion 360 Help System Autodesk Fusion 360 Data Management Browser Access to Fusion 360	1-2 1-2 1-6 1-7 1-8 1-9 1-9 1-9 1-10 1-10 1-11 1-12
Chapter 2 Parametric Modeling Fundamentals	
Introduction The Adjuster Design Starting Autodesk Fusion 360 The Autodesk Fusion 360 Screen Layout Units Setup 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 Modifying the Dimensions of the Sketch Step 3: Completing the Base Solid Feature Dynamic Rotation of the 3D Object - Free Orbit Dynamic Viewing - Quick Keys Viewing Tools – Display Control Bar and View Cube	2-2 2-3 2-3 2-4 2-5 2-6 2-8 2-9 2-10 2-11 2-14 2-14 2-15 2-17 2-19 2-20

2-22 2-22 2-23 2-27 2-30 2-34 2-35 2-36
3-2 3-3 3-4 3-5 3-6 3-7 3-8 3-11 3-12 3-14 3-15 3-19 3-22 3-24 3-26 3-27 3-28
4-2 4-3 4-3 4-4 4-5 4-5 4-8 4-9 4-11 4-12

Table of Contents	V

Create a Rectangular Cut Feature A Design Change - Edit the 2D sketches Edit the Sketch through the Timeline Control Direct Part Modifications Assigning and Calculating the Associated Physical Properties Review Questions Exercises	4-14 4-16 4-18 4-19 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 Fusion 360 Display and Hide Existing Constraints Autodesk Fusion 360 Geometric Constraints Over-Constraining and Driven Dimensions Delete Existing Constraints Add the Location Dimensions Parametric Relations Dimensional Values and Dimensional Variables Parametric Equations Viewing the Established Parameters and Relations Use the Measure Tools Review Questions Exercises	5-2 5-2 5-3 5-3 5-4 5-5 5-9 5-10 5-11 5-16 5-19 5-20 5-21 5-23 5-26 5-27
Chapter 6 Geometric Construction Tools	
Introduction The Gasket Design Modeling Strategy Starting Autodesk Fusion 360 Create the first 2D Sketch Edit the Sketch by Dragging the Sketched Entities Adding Dimensions and Constraints Use the Trim and Extend Commands Create Fillets and Completing the Sketch Fully Constrained Geometry Profile Sketch Redefine the Sketch and Profile Create an Offset Cut Feature Review Questions Exercises	6-2 6-2 6-3 6-4 6-5 6-8 6-9 6-10 6-12 6-13 6-14 6-15 6-18 6-22 6-23

## **Chapter 7 Parent/Child Relationships and the BORN Technique**

The BORN Technique The U-Bracket Design 7-3 Apply the BORN Technique Create the 2D Sketch for the Base Feature 7-6 Create the First Extrude Feature The Implied Parent/Child Relationships 7-10 Create the Second Solid Feature 7-10 Create the Rectangular Cut Feature 7-14 The Second Cut Feature 7-15 Examine the Parent/Child Relationships 7-17 Modify a Parent Dimension 7-18 A Design Change Feature Suppression Redefine the sketch plane of the Center_Drill Feature Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties Predefined keyboard and mouse shortcuts in Fusion360 Review Questions Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space Add a Base View 8-5 Create Projected Views 8-6 Adjust the View Scale
Apply the BORN Technique Create the 2D Sketch for the Base Feature Create the First Extrude Feature 7-6 Create the First Extrude Feature 7-9 The Implied Parent/Child Relationships 7-10 Create the Second Solid Feature 7-10 Create the Rectangular Cut Feature 7-14 The Second Cut Feature 7-15 Examine the Parent/Child Relationships 7-17 Modify a Parent Dimension 7-18 A Design Change 7-19 Feature Suppression 7-20 Redefine the sketch plane of the Center_Drill Feature Suppress the Rect_Cut Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality Drawings from Parts and Associative Functionality  Drawings from Parts and Associative Functionality S-2 Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views 8-5
Create the 2D Sketch for the Base Feature Create the First Extrude Feature 7-9 The Implied Parent/Child Relationships 7-10 Create the Second Solid Feature 7-10 Create the Rectangular Cut Feature 7-14 The Second Cut Feature 7-15 Examine the Parent/Child Relationships 7-17 Modify a Parent Dimension 7-18 A Design Change 7-19 Feature Suppression 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality Drawings from Parts and Associative Functionality  S-2 Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space 8-3 Add a Base View Create Projected Views 8-5 Create Projected Views
Create the First Extrude Feature The Implied Parent/Child Relationships 7-10 Create the Second Solid Feature 7-10 Create the Rectangular Cut Feature 7-14 The Second Cut Feature 7-15 Examine the Parent/Child Relationships 7-17 Modify a Parent Dimension 7-18 A Design Change 7-19 Feature Suppression 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space Add a Base View Create Projected Views 8-5 Create Projected Views
The Implied Parent/Child Relationships Create the Second Solid Feature Create the Rectangular Cut Feature The Second Cut Feature The Second Cut Feature Tolid Relationships Tolid Relation
Create the Second Solid Feature Create the Rectangular Cut Feature The Second Cut Feature The Second Cut Feature Tolid Relationships Tolid Relatio
Create the Rectangular Cut Feature The Second Cut Feature 7-15 Examine the Parent/Child Relationships 7-17 Modify a Parent Dimension 7-18 A Design Change Feature Suppression Redefine the sketch plane of the Center_Drill Feature 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Drawing Mode - 2D Paper Space Add a Base View 8-5 Create Projected Views 8-6
The Second Cut Feature  Examine the Parent/Child Relationships  7-17  Modify a Parent Dimension  7-18  A Design Change Feature Suppression  Redefine the sketch plane of the Center_Drill Feature  Suppress the Rect_Cut Feature  7-21  Suppress the Rect_Cut Feature  7-22  Create a Circular Cut Feature  7-23  A Flexible Design Approach  View and Edit Material Properties  Predefined keyboard and mouse shortcuts in Fusion360  Review Questions  Exercises  7-30  Chapter 8  Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Drawing Mode - 2D Paper Space  Add a Base View  8-5  Create Projected Views
Examine the Parent/Child Relationships  7-17 Modify a Parent Dimension 7-18 A Design Change 7-19 Feature Suppression 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views
Modify a Parent Dimension A Design Change Feature Suppression Redefine the sketch plane of the Center_Drill Feature 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space Add a Base View 8-5 Create Projected Views
A Design Change Feature Suppression Redefine the sketch plane of the Center_Drill Feature 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views
Feature Suppression 7-20 Redefine the sketch plane of the Center_Drill Feature 7-21 Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality 8-2 Starting Autodesk Fusion 360 8-3 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views 8-6
Redefine the sketch plane of the Center_Drill Feature  7-21 Suppress the Rect_Cut Feature  7-22 Create a Circular Cut Feature  7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  8-2 Starting Autodesk Fusion 360 8-3 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views
Suppress the Rect_Cut Feature 7-22 Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion 360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality 8-2 Starting Autodesk Fusion 360 8-3 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views 8-6
Create a Circular Cut Feature 7-23 A Flexible Design Approach 7-25 View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality 8-2 Starting Autodesk Fusion 360 8-3 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views 8-6
A Flexible Design Approach View and Edit Material Properties 7-26 Predefined keyboard and mouse shortcuts in Fusion360 7-28 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space Add a Base View 8-5 Create Projected Views
View and Edit Material Properties Predefined keyboard and mouse shortcuts in Fusion360 Review Questions 7-29 Exercises 7-30  Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space Add a Base View 8-5 Create Projected Views
Predefined keyboard and mouse shortcuts in Fusion360  Review Questions  7-29  Exercises  7-30  Chapter 8  Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360  Drawing Mode - 2D Paper Space  Add a Base View  8-5  Create Projected Views
Review Questions  Exercises  7-29  Chapter 8  Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  8-2  Starting Autodesk Fusion 360  Drawing Mode - 2D Paper Space  Add a Base View  8-5  Create Projected Views  8-6
Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360 Drawing Mode - 2D Paper Space Add a Base View 8-5 Create Projected Views  7-30
Chapter 8 Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360  Drawing Mode - 2D Paper Space  Add a Base View  8-5 Create Projected Views
Part Drawings and Associative Functionality  Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360  Drawing Mode - 2D Paper Space  Add a Base View  8-5  Create Projected Views
Drawings from Parts and Associative Functionality  Starting Autodesk Fusion 360  Drawing Mode - 2D Paper Space  Add a Base View  8-5  Create Projected Views  8-6
Starting Autodesk Fusion 360 8-3 Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views 8-6
Drawing Mode - 2D Paper Space 8-3 Add a Base View 8-5 Create Projected Views 8-6
Add a Base View 8-5 Create Projected Views 8-6
Create Projected Views 8-6
3
rajust the view beare
Repositioning Views 8-7
Add and adjust Center Marks 8-8
Add and adjust Centerline Bisectors 8-10
Dimensioning the Drawing 8-11
Repositioning Dimensions and 2D views 8-13
Drawing Dimensions Format 8-14
Complete the Drawing Sheet 8-15
Associative Functionality – Modifying Feature Dimensions 8-16
Review Questions 8-20
Exercises 8-21

Table of Contents

Chapter 9 Datum Features and Auxiliary Views	
Work Features	9-2
Auxiliary Views in 2D Drawings	9-2
The Rod-Guide Design	9-2
Modeling Strategy	9-3
Starting Autodesk Fusion 360	9-4
Creating the Base Feature	9-4
Create an Angled Work Plane	9-7
Create a 2D Sketch on the Work Plane	9-8
Use the Projected Geometry Option	9-8
Complete the Solid Feature	9-12
Create an Offset Work Plane	9-13
Create another Cut Feature Using the Work Plane	9-14
Start a New 2D Drawing	9-16
Add a Base View	9-17
Create an Auxiliary View	9-18
Adjust the View Scale	9-23
Aligning the top View and the Auxiliary View	9-24
Add Dimensions	9-26
Complete the Drawing Sheet	9-27
Review Questions	9-29
Exercises	9-30
Chapter 10 Introduction to 3D Printing	
What is 3D Printing?	10-2
Development of 3D Printing Technologies	10-3
Primary Types of 3D Printing Processes	10-6
Stereolithography	10-6
Fused Deposition Modeling & Fused Filament Fabrication	10-7
Laser Sintering / Laser Melting	10-8
Primary 3D Printing Materials for FDM and FFF	10-9
From 3D Model to 3D Printed Part	10-1
Starting Autodesk Fusion 360	10-12
Export the Design as an STL file	10-13
Using the 3D Printing software to create the 3D Print	10-16
Review Questions	10-24
Chapter 11 Symmetrical Features in Designs	
Introduction	11-2
A Revolved Design: PULLEY	11-2

Introduction

Create the Revolved Feature Mirroring Features Create a Pattern Leader Using Construction Geometry Circular Pattern Start a New 2D Drawing Add a Base View Create a Section View Create an Isometric View Add Center Mark on Patterned feature Complete the Drawing Sheet Review Questions Exercises  Chapter 12 Advanced 3D Construction Tools  Introduction A Thin-Walled Design: Dryer Housing Modeling Strategy Starting Autodesk Fusion 360	11-8 11-9 11-12 11-18 11-20 11-21 11-22 11-24 11-25 11-26 11-28 11-29 12-2 12-2 12-2 12-3 12-4
Create a Revolved Feature Create Offset Work Planes Start 2D Sketches on the Work Planes Create a Lofted 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 Sweep Path Define the Sweep Section Complete the Swept Feature Review Questions Exercises	12-4 12-7 12-8 12-9 12-12 12-14 12-16 12-17 12-18 12-19 12-22 12-24 12-24 12-24 12-26 12-27 12-29 12-30

13-2

	Table of Contents	ix
The Crank and Slider Assembly	13-2	
Assembly Modeling Methodology	13-3	
Autodesk Fusion 360 Bodies and Components	13-4	
The Assembly Joint Command	13-4	
The Autodesk Fusion 360 Joint Origin	13-8	
Joint Creation order – "Put This, There."	13-8	
Starting Autodesk Fusion 360	13-9	
Creating the Base Feature	13-9	
Convert the first Body to the CS-Base Component	13-13	
Create the next Component	13-14	
Create the CS-Rod Component	13-16	
Create the CS-Slider Component	13-17	
Assemble the First Component	13-19	
Assemble the Second Component	13-21	
Constrained Move	13-24	
Assemble the CS-Rod Component	13-24	
Assemble the CS-Slider Component	13-27	
Apply another Joint Connection	13-30	
Animate the Assembly Model	13-32	
Review Questions	13-33	
Exercises	13-34	

#### Index