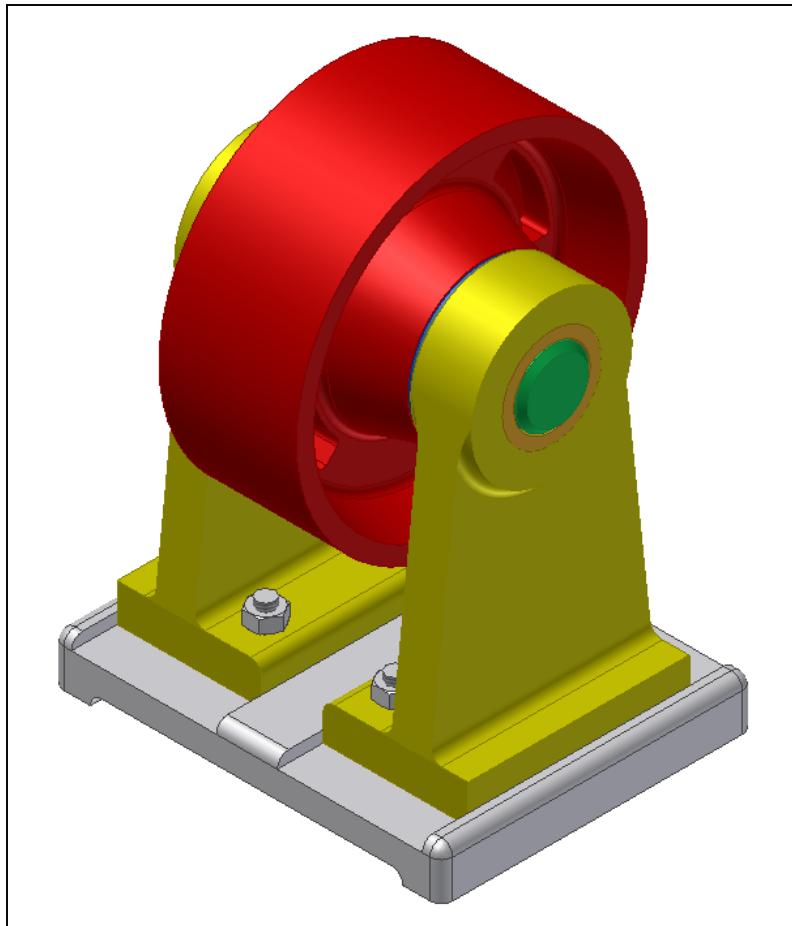


# Mastering Autodesk Inventor



**Hui Zhang, Ph.D.**  
**Chin-Sheng Chen, Ph.D.**

Table of Contents

<b>Introduction to Autodesk Inventor .....</b>	<b>1</b>
<i>What is Autodesk Inventor? .....</i>	<i>1</i>
<i>3D Solid Model .....</i>	<i>2</i>
<i>Feature Based .....</i>	<i>3</i>
<i>Parametric .....</i>	<i>4</i>
<i>Bi-directional Data Linkage .....</i>	<i>4</i>
<i>3D Modeling Processes .....</i>	<i>4</i>
<i>Inventor File System .....</i>	<i>4</i>
<i>User Interface of Inventor .....</i>	<i>5</i>
<i>Sketching Tools and Symbols .....</i>	<i>5</i>
<i>Part Modeling Tools .....</i>	<i>7</i>
<i>Sheet Metal Tools .....</i>	<i>8</i>
<i>Assembly Tools .....</i>	<i>8</i>
<i>Weldment Assembly Tools .....</i>	<i>8</i>
<i>Drawing Tools .....</i>	<i>10</i>
<i>Presentation Tools .....</i>	<i>10</i>
<b>Lesson 1 Sketch and Extruded Features .....</b>	<b>11</b>
Objectives of this lesson: .....	11
<i>Sketch .....</i>	<i>11</i>
What is a Sketch? .....	11
Sketching a Shape .....	12
Changing a Sketch Geometry Style .....	12
Entering Precise Values .....	13
Modifying a Sketch .....	13
Adding or Removing Constraints .....	14
Placing Dimensions .....	15
Exit Sketching Environment .....	17
<i>Extruded Feature .....</i>	<i>17</i>
<i>Project: Dovetail Slide .....</i>	<i>22</i>
Work Flow .....	22
Task 1: Create a Base Feature (127x130x197 block) .....	23
Task 2: Cut Vertical Slots .....	27
Task 3: Create a Dovetail Slot .....	29
Task 4: Cut Side Slots .....	31
Task 5: Set Part Properties and Get Mass Properties .....	33

# Table of Contents

---

---

<b>Lesson 2 Holes .....</b>	<b>35</b>
<i>Objectives of this Lesson: .....</i>	35
<i>Hole Tool .....</i>	35
<i>Project: Pillow Block.....</i>	42
Task 1 : Create Base Feature .....	43
Task 2: Round the Edges of Base Feature .....	46
Task 3: Create Two Mounting Holes.....	48
Task 4: Create a Thread Hole .....	50
Task 5: Create a Bottom Slot.....	51
<b>Lesson 3 Fillets, Chamfers and Shared Sketch .....</b>	<b>55</b>
<b>OBJECTIVES of this lesson: .....</b>	55
<i>Fillets .....</i>	55
<i>Chamfers.....</i>	62
<i>Shared Sketch.....</i>	64
<i>Project: Support.....</i>	65
Task 1: Create Support Body.....	66
Task 2: Set up Shared Sketch and Create Bushing Housing .....	69
Task 3: Create Foot Mount .....	71
Task 4: Create Fillets .....	73
Task 5: Create Holes.....	73
Task 6: Create Chamfers.....	76
<b>Lesson 4 Work Features.....</b>	<b>77</b>
<b>OBJECTIVES of this lesson:.....</b>	77
<i>Work Planes .....</i>	77
Work Plane by 3 Points.....	78
Work Plane Tangent to a Face through an Edge.....	78
Work Plane Normal to an Axis/Edge through a Point.....	78
Work Plane Normal to a Face through an Edge .....	79
Work Plane through Two Coplanar Edges .....	79
Offset Work Plane.....	80
Face-Angle Work Plane.....	80
Work Plane Parallel to a Face through a Point .....	81
Work Plane Tangent to a Curve and Parallel to a Face .....	81
<i>Work Axis .....</i>	82
<i>Work Points.....</i>	83
<i>Project: Spacer Arm .....</i>	84
Task 1: Create Fork Body.....	85
Task 2: Create an Offset Work Plane for Fork Slot.....	86
Task 3: Establish a Relation.....	87

## Table of Contents

---

---

Task 4: Create Fork Slot .....	87
Task 5: Create Fork Arm .....	89
Task 6: Create Holes .....	91
Task 7: Create Fillets .....	93
<i>Project: Wel ding Fixture Base</i> .....	93
Task 1: Create Base Feature .....	94
Task 2: Create an Angled Work Plane.....	96
Task 3: Create Angled V-Support.....	97
Task 4: Create Bottom Slot.....	100
Task 5: Create Four Holes .....	101
Task 6: Drill Two Thread Holes .....	102
Task 7: Create Fillets .....	103
<b>Lesson 5 Mirror Features</b> .....	<b>105</b>
<b>OBJETI VES of this lesson:</b> .....	105
<i>Mirror</i> .....	105
<i>Project: Jig Body</i> .....	107
Task 1: Create Base Feature .....	108
Task 2: Create a Boss on the Base Feature .....	111
Task 3: Create Ribs .....	112
Task 4: Drill Five Counterbore Holes and a Screw Hole .....	115
Task 5: Mirror the Top Hole.....	117
Task 7: Create Fillets around the Edges of Base, Ribs and Boss .....	118
<b>Lesson 6 Patterns</b> .....	<b>121</b>
<b>OBJETI VES of this lesson:</b> .....	121
<i>Patterns</i> .....	121
Rectangular Pattern.....	121
Circular Pattern .....	126
<i>Project: Base</i> .....	127
Task 1: Create a Base Feature.....	128
Task 2: Create Bottom Slot and Fillet.....	130
Task 3: Cut Top Slot and Mirror it .....	131
Task 4: Drill a Hole and Create a Rectangular Pattern.....	133
<i>Project: Spindle Index</i> .....	135
Task 1: Create Hexagn Base .....	136
Task 2: Create First Cylinder Boss .....	138
Task 3: Create a Second Cylinder Boss .....	139
Task 4: Drill A Through H ole.....	140
Task 5: Drill a Hole on the Hexagon Base and Create a Circular Pattern .....	140
<b>Lesson 7 Revolved Features</b> .....	<b>143</b>

## Table of Contents

---

---

OBJECTIVES of this lesson: .....	143
<i>Revolved Features</i> .....	143
<i>Project: Wheel</i> .....	145
Task 1: Create a Wheel Using the Revolve Tool.....	146
Task 2: Cut a Slot on the Wheel Web, and Create Fillets on the Slot Corners.....	150
Task 3: Generate a Circular Pattern for the Slot.....	151
<b>Lesson 8 Sweep Feature.....</b>	<b>153</b>
<i>Sweep Features</i> .....	153
<i>Project: Bucket</i> .....	155
Task 1: Create a Foot Mount .....	157
Task 2: Create Linkage using Sweep Feature.....	158
Task 3: Create Flange .....	161
Task 4: Cut a Circular Slot and Pattern It.....	163
Task 5: Drill a Hole on the Foot Mound and Pattern It .....	166
<b>Lesson 9 Loft Features.....</b>	<b>167</b>
<i>OBJECTIVES of this lesson:</i> .....	167
<i>Loft Features</i> .....	167
<i>Project: Chisel</i> .....	172
Task 1: Create Chisel Blade using a Loft Feature .....	173
Task 2: Create Chisel Neck using Loft Feature .....	175
Task 3: Create Chisel Head using a Revolve Feature.....	177
Task 4: Drill a Hole on the Chisel Head.....	178
<b>Lesson 10 Face Draft, Shell, and Text Extrusion.....</b>	<b>179</b>
<i>OBJECTIVES of this lesson:</i> .....	179
<i>Draft</i> .....	179
<i>Shell</i> .....	183
<i>Text Extrusion</i> .....	185
<i>Project: Enclosure</i> .....	185
Task 1: Create an Enclosure Body using Extrude and Face Draft Features ...	187
Task 2: Shell the Enclosure Body using Shell Feature .....	189
Task 3: Create Enclosure Boss using the Extrude Feature .....	190
Task 4: Draft the Enclosure Boss Surface .....	192
Task 5: Mirror Enclosure Boss to Form Four-Boss Pattern .....	193
Task 6: Create Text Extrusion and Fillets.....	194
<b>Lesson 11 Feature Modification .....</b>	<b>197</b>
<i>Change an existing feature by modifying dimensions</i> .....	197
<i>Redefine a feature</i> .....	198

## Table of Contents

---

---

<i>Suppress and unsuppress features</i> .....	200
<i>Change a feature's order</i> .....	201
<i>Delete features</i> .....	201
<i>Copy and Paste features</i> .....	202
<i>Change the Color of a Feature and a Part</i> .....	203
<i>Project: Base Angle</i> .....	208
Task 1: Create a Base Feature .....	209
Task 2: Create the V-cut .....	210
Task 3: Cut off One Corner .....	211
Task 4: Cut a Rectangle Slot .....	213
Task 5: Modify Corner Cut Dimension .....	214
Task 6: Redefine the V-Cut to a Rectangle Cut .....	215
<b>Lesson 12 iFeatures, Embosses, and Decals</b> .....	<b>215</b>
<i>OBJECTIVES of this lesson:</i> .....	215
<i>iFeatures</i> .....	215
Create iFeatures .....	215
View and Edit iFeatures .....	217
Insert iFeatures .....	218
Tips for Creating an iFeature .....	220
Add Placement Help to an iFeature .....	220
<i>Emboss</i> .....	223
<i>Decal</i> .....	225
<i>Project: Double A</i> .....	227
Task 1: Create a Letter A as an Extruded Feature .....	227
Task 2: Define an iFeature for the Letter A .....	229
Task 3: Insert an iFeature of Letter A into the Part .....	230
<b>Lesson 13 Rib, Thread and Coil</b> .....	<b>231</b>
<i>OBJECTIVES of this lesson:</i> .....	231
<i>Ribs and Webs</i> .....	231
<i>Threads</i> .....	234
<i>Coils</i> .....	236
<i>Project: Clamp Arm</i> .....	239
Task 1: Create base cylinder of the arm using an extruded feature .....	240
Task 2: Create head cylinder of the arm using an extruded feature .....	241
Task 3: Create web-link using an extruded feature .....	243
Task 4: Create a rib between two cylinders using a rib feature .....	244
Task 5: Drill two holes on the cylinders using a hole feature .....	245
Task 6: Create thread on the head cylinder hole using a thread feature .....	246

## Table of Contents

---

---

Task 7: Create chamfers and fillets using chamfer and fillet features .....	247
<i>Project: Tasi on Spring</i> .....	248
Task 1: Create a spring using the Coil feature .....	249
Task 2: Create start end hook using Sweep feature .....	251
Task 3: Create end hook using the Sweep feature .....	254
<b>Lesson 14 Sheet Metal .....</b>	<b>257</b>
<i>OBJECTIVES of this lesson:</i> .....	257
<i>Sheet Metal Styles</i> .....	257
<i>Face</i> .....	263
<i>Flange</i> .....	266
<i>Contour Flange</i> .....	269
<i>Cut</i> .....	271
<i>Hem</i> .....	273
<i>Bend</i> .....	274
<i>Corner Seam</i> .....	276
<i>Fold</i> .....	279
<i>Punch Tool</i> .....	281
<i>Flat Pattern</i> .....	283
<i>Project: Sheet Metal</i> .....	284
Task 1: Create a face .....	285
Task 2: Create a contour flange .....	286
Task 3: Add a flange and a corner seam. ....	287
Task 4: Create second face .....	288
Task 5: Add a bend between two faces .....	289
Task 6: Fold the second face .....	290
Task 7: Create a hem .....	292
<b>Lesson 15 Inventor Project and Bottom-up Assembly .....</b>	<b>291</b>
<i>OBJECTIVES of this lesson:</i> .....	291
<i>Inventor Project</i> .....	291
<i>File Check Out and Check In</i> .....	295
<i>Adding a Component</i> .....	296
<i>Changing the Position of a Component</i> .....	304
<i>Replacing a Component</i> .....	306
<i>Creating a Pattern of Components</i> .....	306
<i>Mirror and Copy Components</i> .....	309

## Table of Contents

---

---

<i>Driving a Constraint</i> .....	311
<i>Project: Wheel Assembly</i> .....	312
Task 1: Create Project and Place The First Component: Base .....	314
Task 2: Assemble The Support.....	314
Task 3: Assemble the Sleeve .....	316
Task 4: Assemble the Spacer .....	316
Task 5: Assemble the Spindle.....	317
Task 6: Assemble the Wheel.....	318
Task 7: Place Constraints for Unconstrained Spacer, Sleeve, and Support....	318
Task 8: Assemble Bolt and Nut, and Pattern Them.....	320
Task 9: Create In-place Component .....	322
Task 10: Apply an Equation to the Drive Constraint and Create Animation	323
<b>Lesson 16 Derived Parts, iPart, iMate, and Adaptive Parts .....</b>	<b>325</b>
<i>OBJECTIVES of this lesson:</i> .....	325
<i>Derived Part</i> .....	325
Create a Derived Part: Flange from a Part .....	327
Create a Derived Assembly Component.....	331
Unlink a Derived Part from the Original Part.....	335
<i>iPart</i> .....	335
Create a Standard iPart Factory (Flat Washer) .....	336
Create a Custom iPart Factory (Square Key).....	338
Place Standard and Custom iPart Factories in an Assembly .....	339
<i>iMate</i> .....	341
Create an iMate.....	342
Place iMates with the Place Constraint tool .....	344
Place iMates using drag and drop .....	345
Place iMates automatically .....	346
<i>Adaptive Part</i> .....	346
Create an Adaptive Part (An undimensioned Pin).....	347
Make a Part Adaptive in an Assembly.....	349
<b>Lesson 17 Top-down Assembly and Weldment Assembly .....</b>	<b>351</b>
<i>OBJECTIVES of this lesson:</i> .....	351
<i>These topics will be presented:</i> .....	351
<i>Top-down Assembly</i> .....	351
Task 1: Create Support Block.....	351
Task 2: Create Support Sleeve.....	354
Task 3: Create a Roller .....	356
Task 4: Make Copies of Support Block and Sleeve in Assembly .....	357
Task 5: Constrain the Copied Support Block and Sleeve.....	358
<i>Weldment Assembly</i> .....	359



## Table of Contents

---

---

<i>Preparation Features</i> .....	361
<i>Weld Beads Features</i> .....	363
<i>Post-weld Machining Features</i> .....	370
<i>Weld Assembly Project: Bearing Support</i> .....	371
Task 1: Create Bearing Support Assembly.....	371
Task 2: Create Preparation Features .....	375
Task 3: Create Weld Features.....	376
Task 4: Create Post-Machining Features .....	379
<b>Lesson 18 Sheet Format, Border, and Title Block</b> .....	<b>385</b>
<i>OBJECTIVES of this lesson</i> :.....	385
<i>Drawing Standard</i> .....	385
<i>Sheet Format</i> .....	387
Standard Format.....	387
Create a Customized Format.....	389
<i>Drawing a Border</i> .....	390
Default Drawing Border .....	390
Create a Customized Drawing Border .....	391
Add a Drawing Border to a Drawing Sheet.....	392
<i>Title Block</i> .....	392
Default Title Block .....	393
Create a Customized Title Block .....	393
Add a Title Block to a Drawing Sheet.....	396
<i>Create a drawing template</i> .....	396
<b>Lesson 19 Orthographic Drawing Views</b> .....	<b>397</b>
<b>and Annotations</b> .....	<b>397</b>
<i>OBJECTIVES of this lesson</i> :.....	397
<i>Orthographic Projection and Drawing Views</i> .....	397
Create a Base View or a Pictorial View.....	398
Create Projected Views.....	400
<i>Dimensions</i> .....	400
Using Model Dimensions .....	401
Create Drawing Dimensions .....	402
Change Dimensions .....	402
<i>Annotation</i> .....	404
General Dimension .....	404
Ordinate Dimension Set.....	404
Ordinate Dimension.....	405
Baseline Dimension Set and Baseline Dimension .....	406

## Table of Contents

---

Hole/Thread Notes .....	407
Center Mark .....	408
Center Line.....	408
Center Line Bisector .....	408
Centered pattern .....	408
Surface Texture Symbol .....	409
Weld Symbol .....	410
Feature Control Frame .....	411
Feature Identifier Symbol .....	412
Datum Identifier Symbol .....	413
Datum Target .....	413
Text .....	414
Leader Text .....	414
Add Balloon .....	415
Part List.....	416
Hole Table.....	419
Caterpillar and End Treatment.....	422
Revision Table and Revision Tag.....	424
Symbols.....	427
<i>Sketch Overlay</i> .....	429
<i>Project: Pillow Block Drawing</i> .....	429
Task 1: Set up Drafting Standard and Sheet Format.....	429
Task 2: Create a Base View (Front View).....	430
Task 3: Create a Top View and an Isometric View .....	431
Task 4: Get Model Dimensions and Add a Dimension .....	432
Task 5: Create a Thread Note .....	433
Task 6: Create Center Marks and Center Lines .....	434
Task 7: Modify the Dimension Format.....	434
Task 8: Create Surface Texture Symbols.....	435
Task 9: Create Geometric Tolerance .....	436
Task 10: Create a Note.....	437
<b>Lesson 20 Auxiliary, Section, Detailed, and Broken Views .....</b>	<b>437</b>
<i>OBJECTIVES of this lesson:</i> .....	437
<i>Auxiliary Views</i> .....	437
Create an Auxiliary View .....	437
Edit an Auxiliary View .....	438
<i>Sections</i> .....	439
Create a Section View.....	439
Modify Cutting Line Location.....	440
Modify Hatch .....	441
Remove Hatch Lines from a Section .....	442
<i>Detailed Views</i> .....	442
<i>Broken Views</i> .....	443

## Table of Contents

<i>Break Out View</i> .....	445
<i>Project: Welding Fixture Base Drawing</i> .....	447
Task 1: Create Base and Projected Views .....	447
Task 2: Create an Auxiliary View .....	448
Task 3: Create Dimensions and Annotations.....	448
<i>Project: Jig Body</i> .....	450
Task 1: Create a Top View and an Isometric View .....	450
Task 2: Create a Section View .....	451
Task 3: Edit Cutting Line.....	452
Task 4: Create a Detailed View .....	452
Task 5: Add Dimensions and Annotations .....	453
<b>Lesson 21 Assembly Drawing .....</b>	<b>455</b>
<i>OBJECTIVES of this lesson:</i> .....	455
<i>Parts List</i> .....	455
<i>Balloons</i> .....	459
<i>Project: Wheel Assembly Drawing</i> .....	460
Task 1: Set up Drafting Standard.....	460
Task 2: Create Views .....	462
Task 3: Create a Parts List .....	463
Task 4: Modify Part Hatches .....	464
Task 5: Create Balloons .....	464
Task 6: Create Annotations.....	465
Task 7: Create a Sketch Overlay.....	465
Task 8: Change Part List Order .....	466
<b>Lesson 22 Presentations.....</b>	<b>469</b>
<i>OBJECTIVES of this lesson:</i> .....	469
<i>Create a Presentation View</i> .....	469
<i>Tweak Components</i> .....	471
<i>Edit and Delete a Tweak</i> .....	472
<i>Modify a Trail</i> .....	473
<i>Precise View Rotation</i> .....	474
<i>Animate</i> .....	474
<i>Project: Wheel Assembly Presentation</i> .....	476
Task 1: Create a Presentation View .....	476
Task 2: Tweak Nuts .....	477
Task 3: Tweak Two Supports and their Child Components.....	478
Task 4: Tweak Supports.....	478
Task 5: Tweak Sleeves.....	478
Task 6: Tweak Spacers .....	479

## Table of Contents

---

---

Task 7: Tweak Wheel and Spindle .....	479
Task 8: Create Animation and AVI file .....	480
Task 9: Add the Exploded View into the Wheel Assembly Drawing .....	480