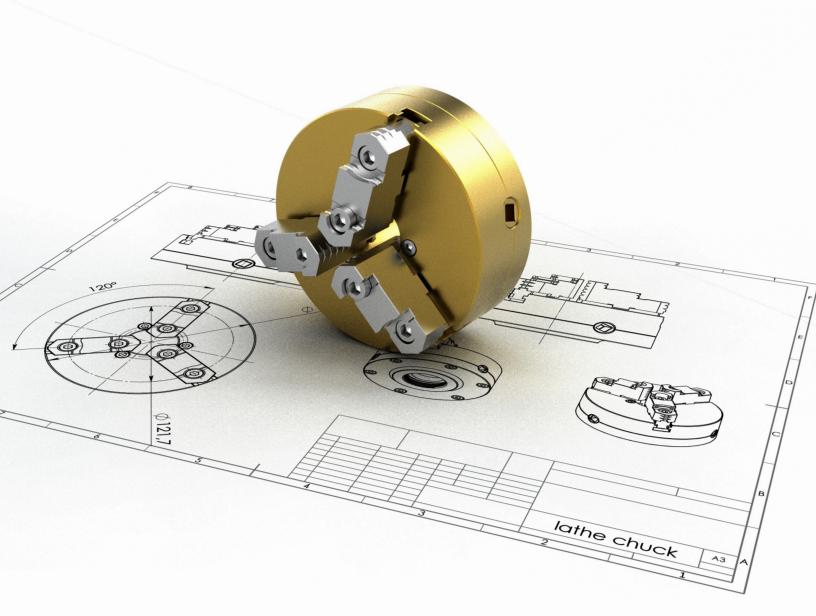
## Engineering Graphics with SOLIDWORKS 2020

A Step-by-Step Project Based Approach



David C. Planchard, CSWP, SOLIDWORKS Accredited Educator

## Visit the following websites to learn more about this book:









## TABLE OF CONTENTS

Introduction	I-1
About the Author	I-2
Acknowledgements	I-3
Contact the Author	I-4
Note to Instructors	I-4
Trademarks, Disclaimer and Copyrighted Material	I-4
References	I-5
Table of Contents	I-6
Overview of Chapters	I-16
Chapter 1: History of Engineering Graphics	I-16
Chapter 2: Isometric Projection and Multi View Drawings	I-16
Chapter 3: Dimensioning Practices, Scales, Tolerancing and Fasteners	I-17
Chapter 4: Overview of SOLIDWORKS and the User Interface	I-18
Chapter 5: Introduction to SOLIDWORKS Part Modeling	I-18
Chapter 6: Revolved Boss/Base Features	I-19
Chapter 7: Swept, Lofted, Rib, Mirror and Additional Features	I-19
Chapter 8: Assembly Modeling - Bottom-up method	I-19
Chapter 9: Drawing Fundamentals	I-20
Chapter 10: Introduction to the (CSWA) Exam	I-20
Chapter 11: Additive Manufacturing - 3D Printing	I-21
About the Book	I-22
Windows Terminology in SOLIDWORKS	I-23
Chapter 1 - History of Engineering Graphics	1-1
Chapter Overview	1-3
History of Engineering Graphics	1-3
Global and Local Coordinate System	1-6
2 Dimensional Cartesian Coordinate System	1-7
3 Dimensional Cartesian Coordinate System	1-8
Absolute Coordinates	1-10
Relative Coordinates	1-10
Polar Coordinates	1-11
Cylindrical and Spherical Coordinates	1-11
Freehand Sketching	1-12
General Sketching Techniques	1-13
Geometric Entities	1-14
Points	1-14
Lines	1-14
Planes	1-15
Circles	1-15
Arcs	1-16
Solid Primitives	1-16
Alphabet of Lines	1-17
Visible lines	1-17
Hidden lines	1-17
Dimension lines	1-18
Extension lines	1-18

Engineering Graphics with SOLIDWORKS® 2020	Introduction
Leader lines	1-19
Break lines	1-19
Centerlines	1-20
Phantom lines	1-20
Section lines	1-21
Cutting Plane lines	1-21
Precedence of Line Types	1-23
Alphabet of Lines Exercises	1-25
Projections in General	1-27
Projection Types	1-29
Parallel Projection	1-29
Perspective Projection	1-29
Orthographic Projection	1-29
Oblique Projection	1-29
Multi-view Projection	1-30
Orient and Select the Front View	1-30
Orthographic Projection (Third Angle)	1-31
Glass Box and Six Principal Orthographic Views	1-32
Height, Width and Depth Dimensions	1-35
Transferring Dimensions	1-35
Sheet Media	1-36
ANSI Standard Sheet Sizes	1-36
Orthographic Projection Exercises	1-37
Planes (Normal, Inclined and Oblique)	1-42
Plane Exercises	1-43
Chapter Summary	1-49
Questions/Exercises	1-51
Chapter 2 - Isometric Projection and Multi View Drawings	2-1
Chapter Overview	2-3
Isometric Projections	2-3
Isometric Sketching	2-5
Circles Drawn in Axonometric View	2-7
Additional Projections	2-9
Oblique Projection	2-9
Arrangement of Views	2-13
Two View Drawing	2-14
One View Drawing	2-16
Drawing - Exercises	2-19
Drawing Views - Advanced	2-21
Section View	2-21
Detail View	2-23
Broken out View	2-24
Break or Broken View	2-25
Crop View	2-26
Auxiliary View	2-27
Exercises  History of Computer Aided Design (CAD)	2-27
History of Computer Aided Design (CAD)  Realest Operations	2-28 2-29
Boolean Operations What is SOLIDWORKS?	2-29 2-31
Design Intent	2-31
Design intent	4-55

Design Intent in a Sketch	2-33
Design Intent in a Feature	2-34
Design Intent in a Part	2-34
Design Intent in an Assembly	2-35
Design Intent in a Drawing	2-35
Chapter Summary	2-36
Questions/Exercises	2-37
<b>Chapter 3 - Dimensioning Practices, Scales, Tolerancing and Fasteners</b>	3-1
Chapter Overview	3-3
American National Standards Institute (ANSI)	3-3
Dimensioning	3-4
Location Dimension	3-4
Size Dimension	3-4
Measurement - units	3-5
Metric/SI	3-5
English	3-5
Dual Dimensioning	3-6
Scale	3-7
Architect's Scale	3-7
Engineer's Scale	3-7
Linear Encoder	3-7
Linear Scale	3-7
Vernier Scale	3-7
Standards for Dimensioning	3-8
Linear Dimension	3-8
Stagger Dimension	3-8
Aligned Dimension	3-9
Angular Dimension	3-9
Chamfer Dimension	3-10
Slot Dimension	3-10
Radius Dimension (Leader line)	3-11
Simple Hole Dimension	3-12
Fastener Hole Dimension (Annotations)	3-13
Cylindrical Dimension	3-13
Equally Spaced Hole Dimension	3-15
Hole Dimension Location	3-15
Point/Center of a Circle Dimension	3-16
Arc Dimension	3-16
Order of Preference - Linear Dimension Line	3-17
Precision	3-17
Size Dimension	3-18
Continuous Dimensions	3-19
Principles of good Dimensioning	3-20
Precision and Tolerance	3-26
Tolerance for a Drawing	3-27
General Tolerance - Title Block	3-27
Local Tolerance - Dimension	3-28
Limit Tolerance	3-28
Unilateral Tolerance	3-29
Bilateral Tolerance	3-29

Engineering Graphics with SOLIDWORKS® 2020	Introduction
Formatting Inch Tolerances	3-29
Metric Dimension Specifications	3-30
Tolerance Parts and Important Terms	3-30
Fit - Hole Tolerance	3-30
Fit Types between Mating Parts	3-32
Clearance Fit	3-33
Interference Fit	3-33
Transition Fit	3-33
Fasteners in General	3-34
Representing External (Male) Threads	3-37
Cutting External (Male) Threads	3-38
Die	3-38
Lathe	3-38
Representing Internal (Female) Threads	3-39
Cutting Internal (Female) Threads	3-39
Taper	3-40
Plug	3-40
Bottoming	3-40
American National Standard and Unified Screw Threads	3-41
Single vs. Double or Triple Threads	3-41
Pitch and Major Diameter	3-42
Thread Class of Fit	3-42
Class 1	3-42
Class 2	3-42
Class 3	3-42
General Thread Notes	3-43
Dimensioning a CounterBore Hole	3-44
Dimensioning a CounterSunk Hole	3-44
Chapter Summary	3-45
Questions/Exercises	3-46
Chapter 4 - Overview of SOLIDWORKS and the User Interface	4-1
Chapter Objective	4-3
What is SOLIDWORKS?	4-3
Basic concepts in SOLIDWORKS	4-3
Start a SOLIDWORKS Session	4-4
Activity: Start a SOLIDWORKS Session	4-4 4-4
Welcome dialog box Home Tab	4-4 4-5
Recent Tab	4-3 4-5
Learn Tab	4-3 4-5
Alerts Tab	4-6
SOLIDWORKS User Interface (UI) and CommandManager	4-7
Menu Bar toolbar	4-8
Menu Bar menu	4-8
Drop-down menu	4-9
Create a New Part Document	4-9
Novice Mode	4-10
Advanced Mode	4-10
Graphic Window (Default)	4-11
View Default Sketch Planes	4-12

Open a Part	4-12
Part FeatureManager	4-13
FeatureManager Rollback Bar	4-13
Heads-up View toolbar	4-15
Dynamic Annotation Views	4-15
Zoom to Fit	4-15
Zoom to Area	4-15
Window-Select	4-15
Rotate	4-15
Front View	4-16
Right View	4-16
Top View	4-16
Trimetric view	4-16
SOLIDWORKS Help	4-16
SOLIDWORKS Tutorials	4-17
User Interface Tools	4-17
Right-click	4-18
Consolidated toolbar	4-18
System feedback icons	4-18
Confirmation Corner	4-19
Heads-up View toolbar	4-19
CommandManager (Default Part tab)	4-22
CommandManager (Default Drawing tab)	4-23
CommandManager (Default Assembly tab)	4-24
CommandManager (Float/Fit)	4-25
Selection Enhancements	4-25
FeatureManager Design Tree	4-26
FeatureManager design tree tab	4-26
PropertyManager tab	4-26
Configuration Manager tab	4-26
DimXpertManager tab	4-26
DisplayManager tab	4-26
CAM tab	4-26
Hide/Show tab	4-26
Sensors tool	4-26
Tags	4-27
Split	4-27
Fly-out FeatureManager	4-28
Task Pane	4-29
SOLIDWORKS Resources	4-29
Design Library	4-30
File Explorer	4-30
Search	4-31
View Palette	4-31
Appearances, Scenes and Decals	4-32
Custom Properties	4-32
SOLIDWORKS Forum	4-32
User Interface for Scaling High Resolution Screens	4-32
Motion Study tab	4-33
3D Views tab	4-34
Dynamic Reference Visualization	4-34

Engineering Graphics with SOLIDWORKS® 2020	Introduction
Mouse Movements	4-35
Single-Click	4-35
Double-Click	4-35
Right-Click	4-35
Scroll Wheel	4-35
Summary	4-36
Chapter 5 - Introduction to SOLIDWORKS Part Modeling	5-1
Chapter Overview	5-3
File Management	5-4
Start a SOLIDWORKS Session and Open a New Part Document	5-5
Part Template	5-5
BATTERY Part	5-11
BATTERY Part-Extruded Boss/Base Feature	5-13
BATTERY Part-Fillet Feature Edge	5-17
BATTERY Part-Extruded Cut Feature	5-19
BATTERY Part-Fillet Feature	5-21
BATTERY Part Extruded-Boss/Base Feature	5-22
BATTERYPLATE Part	5-28
Save As, Delete, Edit Feature and Modify	5-29
BATTERYPLATE Part-Extruded Boss Feature	5-31
BATTERYPLATE Part-Fillet Features: Full Round and Multiple Radius Options	5-32
Multi-body Parts and Extruded Boss/Base Feature	5-35
Chapter Summary	5-36
Questions/Exercises	5-38
Chapter 6 - Revolved Boss/Base Features	6-1
Chapter Overview	6-3
LENS Part	6-4
LENS Part Revolved Boss/Base Feature	6-5
LENS Part-Shell Feature	6-8
LENS Part-Extruded Boss/Base Feature and Convert Entities Sketch tool	6-9
LENS Part-Hole Wizard Feature	6-10
LENS Part-Revolved Boss Thin Feature	6-12
LENS Part-Extruded Boss/Base Feature and Offset Entities	6-14
LENS Part-Extruded Boss Feature and Transparency	6-16
LENS Part-Transparent Optical Property	6-16
BULB Part BULB Part-Revolved Base Feature	6-18 6-19
	6-19
BULB Part-Revolved Boss Feature and Spline Sketch tool BULB Part-Revolved Cut Thin Feature	6-23
BULB Part-Dome Feature	6-25
BULB Part-Circular Pattern Feature	6-26
BULB Part-Seed Cut Feature	6-26
BULB Part-Extruded Cut Feature	6-28
BULB Part-Circular Pattern Feature	6-29
Customizing Toolbars and Short Cut Keys	6-30
Chapter Summary	6-32
Questions/Exercises	6-33

Chapter Overview	7-1
Chapter Overview	7-3
O-RING Part-Swept Base Feature	7-4
SWITCH Part-Lofted Base Feature	7-7
SWITCH Part-Dome Feature	7-12
Four Major Categories of Solid Features	7-14
LENSCAP Part	7-14
LENSCAP Part-Extruded Boss/Base, Extruded Cut and Shell Features	7-15
LENSCAP Part-Revolved Thin Cut Feature	7-18
LENSCAP Part-Thread, Swept Feature and Helix/Spiral Curve	7-19
HOUSING Part	7-25
HOUSING Part-Extruded Base Feature	7-27
HOUSING Part-Lofted Boss Feature	7-28
HOUSING Part-Second Extruded Boss/Base Feature	7-32
HOUSING Part-Shell Feature	7-33
HOUSING Part-Third Extruded Boss/Base Feature	7-34
HOUSING Part-Draft Feature	7-35
HOUSING Part-Threads with Swept Feature	7-37
HOUSING Part-Handle with Swept Feature	7-42
HOUSING Part-Extruded Cut Feature with Up To Surface	7-47
HOUSING Part-First Rib and Linear Pattern Feature	7-49
HOUSING Part-Second Rib Feature	7-52
HOUSING Part-Mirror Feature	7-55
Chapter Summary	7-58
Questions/Exercises	7-60
Chapter 8 - Assembly Modeling - Bottom up method	8-1
	0-1
	8-3
Chapter Overview	
	8-3
Chapter Overview Assembly Modeling Overview	8-3 8-4
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques	8-3 8-4 8-6
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly	8-3 8-4 8-6 8-7
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Template	8-3 8-4 8-6 8-7 8-8
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template	8-3 8-4 8-6 8-7 8-8 8-8
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly	8-3 8-4 8-6 8-7 8-8 8-8
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-20
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues	8-3 8-4 8-6 8-7 8-8 8-9 8-10 8-14 8-16 8-20 8-26
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings Chapter Summary Questions/Exercises	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30 8-33
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings Chapter Summary Questions/Exercises  Chapter 9 - Fundamentals of Drawing	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30 8-33 8-34
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings Chapter Summary Questions/Exercises  Chapter 9 - Fundamentals of Drawing Chapter Overview	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30 8-33
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings Chapter Summary Questions/Exercises  Chapter 9 - Fundamentals of Drawing	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30 8-33 8-34
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings Chapter Summary Questions/Exercises  Chapter 9 - Fundamentals of Drawing Chapter Overview New Drawing and the Drawing Template Title Block	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30 8-33 8-34
Chapter Overview Assembly Modeling Overview FLASHLIGHT Assembly Assembly Techniques Assembly Template Assembly Templates-ASM-IN-ANSI Assembly Templates-ASM-MM-ISO LENSANDBULB Sub-assembly BATTERYANDPLATE Sub-assembly CAPANDLENS Sub-assembly FLASHLIGHT Assembly FLASHLIGHT Assembly-Addressing Interference Issues FLASHLIGHT Assembly-Exploded View FLASHLIGHT Assembly-Export Files and eDrawings Chapter Summary Questions/Exercises  Chapter 9 - Fundamentals of Drawing Chapter Overview New Drawing and the Drawing Template	8-3 8-4 8-6 8-7 8-8 8-8 8-9 8-10 8-14 8-16 8-20 8-26 8-27 8-30 8-33 8-34

BATTERY Drawing - Detail View	9-19
BATTERY Drawing - View Display	9-20
BATTERY Drawing - Insert Model Items and Move Dimensions	9-21
BATTERY Drawing - Insert a Note	9-23
New Assembly Drawing and Exploded View	9-25
FLASHLIGHT Drawing - Bill of Materials and Balloons	9-27
Part Numbers	9-29
FLASHLIGHT Drawing - ConfigurationManager	9-30
FLASHLIGHT Drawing - Update the Bill of Materials	9-30
Design Tables and O-RING Design-Table Drawing	9-32
O-RING Drawing	9-34
O-RING Drawing - Design Table	9-34
Add a Center of Mass point	9-36
Chapter Summary	9-37
Questions/Exercises	9-38
Chapter 10 - Introduction to the Certified SOLIDWORKS Associate (CSWA) Exa	ım 10-1
Chapter Objective	10-3
Introduction	10-3
Part 1 of the Exam	10-4
Basic Part Creation and Modification, Intermediate Part Creation and Modification	10-4
Assembly Creation and Modification	10-6
Part 2 of the Exam	10-7
Introduction and Drafting Competencies	10-7
Advanced Part Creation and Modification	10-7
Assembly Creation and Modification	10-9
Intended Audience	10-10
During the Exam	10-11
Drafting Competencies	10-12
Example 1	10-12
Example 2	10-12
Example 3	10-13
Example 4	10-13
Example 5	10-13
Example 6	10-13
Basic Part Creation and Modification, Intermediate Part Creation and Modification	10-14
Example 1	10-15
Example 2	10-16
Example 3	10-17
Example 4	10-18
Example 5	10-19
Example 6	10-20
Example 6A	10-22
Example 6B	10-22
Advanced Part Creation and Modification	10-23
Example 1	10-23
Example 2	10-25
Example 3	10-26
Example 4	10-27
Example 5	10-28
Example 6	10-30

Introduction

Engineering Graphics with SOLIDWORKS  $^{\otimes}$  2020

Example 6A	10-31
Assembly Creation and Modification	10-32
Example 1	10-33
1	
Chapter 11 - Additive Manufacturing - 3D Printing	11-1
Chapter Objective	11-3
Additive vs. Subtractive Manufacturing	11-4
3D Printer Technology	11-5
Fused Filament Fabrication (FFF)	11-5
StereoLithography (SLA)	11-8
Selective Laser Sintering (SLS)	11-10
Select the Correct Filament Material for FFF	11-11
PLA (Polylactic Acid)	11-12
Flex/Soft PLA	11-12
PLA Storage	11-13
PLA Part Accuracy	11-13
ABS (Acrylonitrile-Butadiene-Styrene)	11-13
ABS Storage	11-14
ABS Part Accuracy	11-14
Nylon	11-15
Nylon 618	11-15
Nylon 645	11-15
Nylon Storage	11-16
Nylon Part Accuracy	11-16
PVA (Polyvinyl Alcohol)	11-16
STereoLithography (*.stl) file	11-17
Save an STL (*stl) file	11-17
Additive Manufacturing (*amf) file	11-18
Save an Additive Manufacturing (*amf) file	11-18
3D Manufacturing Format (*.3mf) file	11-19
Save a 3D Manufacturing Format (*.3mf) file	11-19
What is a Slicer?	11-20
How does a Slicer Work?	11-20
Slicer Parameters	11-20
Layer Height	11-20
Shell (Wall) Thickness	11-21
Infill Density/Overlap	11-21
Infill Patterns	11-21
Print Speed	11-22
Support Types	11-22
Touching Buildplate	11-22
Everywhere	11-23
Bed Platform Adhesion	11-23
Raft	11-23
Skirt	11-23
Brim	11-23
Part Orientation	11-24
Example 1	11-24
Example 2	11-25
Optimize Print Direction	11-25
Thin Region	11-25

Engineering Graphics with SOLIDWORKS® 2020	Introduction
A was a f Ossault au a	11 25
Area of Overhang	11-25
Amount of needed Support Remove Model from the Build Plate	11-25 11-27
Non-heated Build Plate	11-27 11-27
Heated Build Plate  Heated Build Plate	11-27
	11-27
Know your Printer's Limitations	
Tolerance for Interlocking Parts	11-28
General Printing Tips	11-28
Reduce Infill/Overlap	11-28 11-29
Control Build Area Temperature Add Pads	11-29
Safe Zone Rule	11-30
	11-30
First Layer Not Sticking Level Build Platform	11-30
Minimize Internal Support	11-31
Design a Water Tight Mesh	11-31
Clearance	11-31
In General (FFF Printers)	11-31
Print Directly from SOLIDWORKS	11-32
Add-in	11-33
Certified SOLIDWORKS Associate Additive Manufacturing (CSWA-AM)	11-34
Summary	11-35
Summary	11-33
Appendix	
SOLIDWORKS Keyboard Shortcuts	A-1
Modeling - Best Practices	A-3
Helpful On-Line Information	A-5
SOLIDWORKS Document Types	A-6
Solis otale booment types	110
Glossary	G-1
Index	I-1

Download all needed model files (SOLIDWORKS-MODELS 2020 folder) from the SDC Publications website (<a href="https://www.SDCpublications.com/downloads/978-1-63057-315-7">www.SDCpublications.com/downloads/978-1-63057-315-7</a>). View the provided models to enhance the user experience. Additional projects are included in the exercise section.