

First Robotics Team 1719 CAD Lesson Directory for 2013/2014

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Green Highlighted Text (Also indicated with a ♦ so that you can see which ones are green if printing out the table in black and white) - indicates basic lessons that will be useful to all team 1719 students with interest in CAD Basics.

Yellow Highlighted Text – indicates more advanced lessons that will be required by members of the CAD Sub-team and any other team members that want to have a higher level involvement in part design, sheet metal design, virtual assembly and creating engineering drawings.

Un-highlighted Text – indicates lessons that are not likely going to be useful to Team 1719 Robotics design, at least not until the basics (green and yellow highlighted) are mastered. However, please feel free to peruse these lessons, at least briefly, once the yellow and green topics are mastered. Also, some of these topics may be referred to on an as needed basis for specific design needs.

I. Solid Modeling

Introduction ◆
Getting Started
The Open Dialog Box
Create a Project
Overview of the User Interface
The Heads Up Display
Create a Sketch
Sketch Constraints
Extruding a Profile
The In-Canvas Display
Mini-Toolbar Customization
The Marking Menu
Marking Menu Customization
Editing Profiles
View Cube and Navigation Bar
Sketches vs Profiles
Solid Bodies
Template View Orientation
Constraining Profiles
Creating Profiles From Solids
More Mini-Toolbars
Default Work Planes
Revolve a Feature
Trick for Constraining Sketches
Constraining the Axis of Revolution
Projecting Geometry
Creating Work Planes
Extruding to a Plane
Sharing Sketches
Construction Lines
Centerlines
Mirroring Features
Circular Feature Array
Rectangular Feature Array
Application Options
Creating Holes
Placing Holes Part I
Placing Holes Part II
Creating Hole Patterns Part I
Creating Hole Patterns Part II

Threaded Holes
Advanced Thread Settings
Finishing Features
Clearance Holes
Pipe Thread Holes
Fundamentals of the Shell Command ◆
Using the Shell Command
3D Construction Stage I
3D Construction Stage II
3D Construction Stage III
Breaking Rules
Ribs Parallel to Sketch
Ribs Perpendicular to Sketch
Draft and Ejector Pads
Control Vertex Splines
Bridge Curve Splines
Interpolation Splines
Constraining Splines
Tweaking Splines
Bowties
Fit and Tension
Sweep
Sweep Path and Guide Rail
Sweep Path and Guide Surface
Introduction to 3D Sketches
Using 3D Sketches
3D Splines and Coils
Mirroring Sketch Geometry
Editing Mirrored Sketches
Automating Patterns
Linear Slots
Arced Slots
Lofts
Loft Conditions
Loft Transition and Point Mapping
Lofts with Rails
Rails on Cylindrical Lofts
Tricks for Round Spline Sweeps
Square Sweeps
Centerline Lofts
Skin Bodies

Adjusting Color
Closed Loop Lofts
Area Lofts
Loft Strategies
The Lip Command
Coils and Springs
Parameters and Tolerances
Linking Excel Spreadsheets
Threads
Importing Points
The Bend Part Command
Bending Conical and Loft Parts
Moving Faces
The Emboss Command
The Boss Command Part I
The Boss Command Part II
Ribs on Bosses
The Rest Command
The Grill Command
Rule Fillets
Replacing and Splitting Faces
The Sculpt Command
Modifying and Stitching Surfaces
Patch Stitch IGES Files I
Patch Stitch IGES Files II
Editing a Solid - Move Faces
Editing a Solid - Offset
Editing a Solid - Extend Contract
2D Equation Curves
3D Equation Curves
Conclusion

II. Assemblies and Advanced Concepts

Introduction ◆
Sketch Origin Node
Using and Creating Templates
Sketch Origin Node
Creating Derived Parts
Intro to the Assy Environment ◆
Degrees of Freedom
Driving Constraints
Explicit Reference Vectors
Adaptive Parts and Sketches
Adaptive Constraint Strategies
Creating Adaptive Parts I
Creating Adaptive Parts II
Using Constraint Strategies
Removing Adaptivity
Driving Adaptive Assemblies
The Content Center ◆
The Symmetry Constraint
Ball Joints
Planar Joints
Joint Alignment Details
Cylindrical Joints
Slider Joints
Rotational Joints
Rigid and Automatic Joints
Mirrored Assemblies
Mirrored and Copied Constraints
Flexible Assemblies
Copied Assemblies
Pattern Components
Advanced Viewing
Assembly Viewing
Motion Constraints
Animating Gears
Transitional Constraints
Collision Detection
Contact Solver
Checking for Interferences

Creating Compressible Springs
Driving Adaptive Springs
Positional Representations
Creating Presentations
Editing Tweaks
Animating Presentations
iFeature Design
Inserting iFeatures
Reusing Part Features
Advanced iFeature Design
Reducing Dangling Geometry
Creating iPart Factories
iPart Members
Editing the iPart Author
iMates and iParts
Custom iParts
Creating iPart Assemblies
Updating iParts
Threaded iParts
iMates and the Content Center
Identifying and Using iMate
Glyphs
Inferred iMates
Scaling Parts
Combining Parts I
Combining Parts II
Subtracting and Splitting Parts
Deleting Faces
Strategy for Splitting Parts
Trick for Measuring Interferences
Prep for Design Accelerator
Bolted Connections
Generating Bearings
Generating Shafts Part I
Generating Shafts Part II
Generating Shafts Part III
Generating Gears
Generating Keyways

Working with Large Assemblies
Level of Detail
Shrinkwrapping Components
Skeletal Modeling Introduction
Make Part and Components
Kinematics
Sketch Blocks
Advanced Top Down Design
Blocks and Assemblies
Modeling Techniques I
Modeling Techniques II
Flexible Block Assemblies
Hybrid Design Methods
Alternate Slice Method
Import Assy to Part File
Middle Out Design
Exporting Bodies to an Assembly
Replacing Assemblies
The Assemble Command
Sinusoidal Conical Sweeps
Alternate Split Part Methods
Appearances on Derived
Features
Selecting a Design Strategy
Practice with Relationships
Inverted Text
Conclusion

III. 2D Drafting and Customization

Introduction Introduction to Drawings Drawing Views Custom Predefined Template Views Customizing Backgrounds Custom Borders Custom Title Blocks Property Field Types File iProperties Drawing Projects Bill of Materials Content Center Parts in BOMs BOM Levels and Part Lists BOM Structures Replacing Content Center Parts Exporting BOMs Parts Lists Editing a Parts List
Customizing a Parts List Balloons Break Out Views Overlay Views Crop Command Slice Command View Alignment Hole Tables

Administration Projects Custom Parts List Style Custom Drafting Styles Custom Dimensioning Style Part I Custom Dimensioning Style Part II Notes and Leader Callouts More Drafting Styles Custom Text Styles Dimensioning Drawings Part I Dimensioning Drawings Part II Dimensioning Drawings Part III Bolt Circles and Section Lines Sketched Symbols and Notes Templates and Styles Part I Templates and Styles Part II
Migrating Inventor Drawing Styles
Custom Material Libraries Customizing Materials Material Projects Custom Appearance Libraries Using Custom Appearances Details of Appearance Settings
Custom Physical Assets Appearances From Images Materials From Scratch Migrating Older Styles

Custom Ribbon Panels Shortcut Keys and Command Aliases Customizing the Marking Menu User Interface Visibility Object Visibility Constraint Options and Persistence
Applying Your Skills Part I Applying Your Skills Part II Applying Your Skills Part
Opening and Modifying AutoCAD DWGs Creating Solids from AutoCAD DWGs Inventor DWG Files Exporting and Importing DWG Files Translating AutoCAD to Inventor Conclusion

IV. Sheet Metal Design

Introduction ♦
The Sheet Metal Environment
Styles and Templates
K-Factors
Creating Bend Tables
The Flange Command ♦
Bend Reliefs and Remnants
Bend and Sheet Metal Styles
Unfold Methods
Corner Seams
Corner Seam Reliefs
Bend Transitions and Flat Patterns
Custom Sheet Metal Templates
Styles and Templates
The Contour Flange Command
Looped Contour Flanges
Shells and Ripped Seams
Editing Flat Patterns
Using the Hem Command
Introduction
Multiple Plates in Assemblies I
Multiple Plates in Assemblies II
Extended Surfaces
Using the Punch Tool
Custom Punches
Flat Pattern Punch Representations
Custom Extruded Louver Punch
Dangling Geometry in Punches
Custom Extruded Dimple Punch I
Custom Extruded Dimple Punch II
Custom Revolved Dimple Punch
Sheet Metal Commands and Punches

Surfaces
G2 Fillets
Tabs
Double Bends and Bend Allowances
Applying Bend Allowances
Knockouts
Flat Patterns on Drawings
Custom Sweep Punches
Complex Shapes
Sheet Metal Cone
Contour Roll Unrolling Unfolding
Press Break Lofted Flanges
Square to Round Transitions
Adding Flanges to Lofted Flanges
Editing with Unfold and Refold
Lofted and Rolled Part Strategies
Formed Punches and Features
Custom Structural Shapes I
Custom Structural Shapes II
Publishing Multiple Shapes
Frame Skeletons
Generating Custom Shape Frames I
Generating Custom Shape Frames II
Generating Custom Shape Frames III
Generating Custom Shape Frames IV
Trimming Members
Model Frame Skeletons
More Frame Generator Concepts
Editing Frames
Preparations and Welds
Fillet and Post Weld Operations
Multi-Body Sheet Metal Modeling
Features on Multi-Body Sheets

Multi-Body Sheet Metal Bends
More Multi-Body Practice
Multi-Body Sheet Metal Assembly
Modifying Multi-Body
Components
Finalizing the Design
Convert to Sheet Metal Parts
Sheet Metal Drawings
Export Flat Pattern to DXF
Custom Exported Layers
Details of Exported DXF Files
Converting Down Bends to Up
Bends
Edit Flat Pattern Definition
Bend Callouts and Tables
Bend Order
Flat Pattern Extents
Compare Drawing to DXF
Conclusion