

# LATHROP ENGINEERING

Name: \_\_\_\_\_

## UNIT 5: AUTODESK














Introduction to Engineering & Design

Unit Due Date: **November 27, 2019**

Welcome to the fifth unit of Introduction to Engineering & Design! This unit is all about Autodesk and learning the many very specific tools available to us in this computer modeling software. At a minimum, you've had the chance to build your puzzle cube pieces in Autodesk. This work should have gotten you used to simple tools like the *line*, *rectangle*, and *extrude* tools. Now we'll get to learn about even cooler tools and use them to recreate our Automoblox cars within Autodesk. This unit is all about these tools and how to use them. In the end, the expectation is that you learn the following:

- How to use Autodesk Inventor tools: extrude, holes, fillets, chamfers
- How to use Autodesk Inventor tools: geometric constraints
- How to use Autodesk Inventor tools: iProperties
- How to use Autodesk Inventor to create detailed 3D parts
- How to use Autodesk Inventor to create complex assemblies

As we move through this unit, you are responsible for making adequate progress through the assignments, and for being done by the Unit Due Date (**November 27, 2019**). You are also responsible for completing each part before moving on to the next. Our unit is broken up into three main parts:




Part 1: <b>Autodesk Basics</b> (15 pts) Approx. 1 days	
The first part of our unit gets back to the basics. You'll start by reviewing the simple parts of Autodesk and extrusions. Nothing really new. But then you'll get to look at how to create holes, fillets, and chamfers. You'll then practice these tools in the creation of the HFC Practice Part.	 Basic Autodesk Notes
	 Notes on Holes, Fillets, Chamfers
	 HFC Practice Part
	 Check-off From Mr. Benshoof
Part 2: <b>Constraints</b> (30 pts) Approx. 1 days	
The second part of this unit is all about geometric constraints. In Autodesk designs, the best models are built with constraints. Here you'll get to learn how all the different constraints work. We'll do two quick tutorials after you've taken some notes. The first tutorial will guide you through the use of the main geometric constraints. The second tutorial will demonstrate the iProperties tab within Autodesk using the Sketch Plane Cube.	 Notes on Geometric Constraints
	 Geometric Constraints Tutorial
	 iProperties Tutorial
	 Take the Unit 5 Quiz
	 Check-off from Mr. Benshoof
Part 3: <b>Automoblox Re-creation</b> (85 pts) Approx. 6 days	
Finally, your job is to use all the tools of Autodesk that we've seen over the last few challenges to recreate the many parts of your Automoblox car. Earlier in the semester you made fully dimensioned sketches of your chosen car, and here we'll work hard to recreate every part of the Automoblox car – and every detail on it – in Autodesk. Once they have all been created, your next job will be to assemble all the parts together into a complete Assembly.	 Automoblox in Autodesk Notes
	 Create Automoblox Parts
	 Create Automoblox Assembly
	 Check-off from Mr. Benshoof



(15 pts) Approx. 1 day

The first part of our unit is a return to the basics of Autodesk and some cool new tools. The last unit ended with the modeling of our many puzzle cube pieces and the assembling of those pieces into a complete puzzle cube. Here we'll start back with the extrude tool and think about the different options available within that tool. We'll then expand our understanding of Autodesk functions by looking at the holes, fillets, and chamfer tools before practicing them in the creation of the HFC Practice Part.

1. Start out by watching the *Sketches & Extrusions* presentation. It will be a good review of things from last unit, and should point to the ideas of extruding again. Take a full page of notes. I know it will feel like there isn't that much to write about, but here you need to take careful notes on ALL the detailed options that are available when extruding. The video will help a little bit, and you'll want to open Autodesk and play with the tool a bit to learn what each option can do – make sure to write down the details!
2. Then, watch the *Holes, Fillets & Chamfers* presentation. Again, take a full page of notes. In these notes, focus on the options available with the hole, fillet, and chamfer tools. Describe what each does and the different choices you have when using each one.
3. The last part of this section is to create the HFC Practice Part. Start a new part in Autodesk and build it using the rectangle, extrude, hole, fillet, and chamfer tools. In the end, your part should meet the following criteria:
  - a. Start with a cube that is 1" x 1" x 1"
  - b. One face should have a hole drilled all the way through it
  - c. One side of the whole should be counter-sunk using the hole tool
  - d. The other side of the hole should have a chamfered edge
  - e. One face of the cube should have a square piece extruded away from it
  - f. The edges of the extruded square should be filleted
  - g. One fact of the cube should have a triangle extruded away from it
  - h. The edges of the extruded triangle should be chamfered
4. Share your completed HFC Practice Part with Mr. Benshoof before continuing!





Part 1: Tasks	5 points	4-3 points	2-1-0 points
 Basic Autodesk Notes	+ You took a full page of notes on Autodesk modeling + Your notes include details about ALL the options in the extrude function	- Your notes are less than a page - You did not include details about the extrude function options	- Your notes are missing - Your notes are very brief
 Holes, Fillets, and Chamfers Notes	+ You took a full page of notes on Holes, Fillets, and Chamfers + Your notes include details about all the options available in each of these new tools	- Your notes are less than a page - You did not include details about the tool options	- Your notes are missing - Your notes are very brief
 HFC Practice Part	+ You built the "Holes, Fillets, Chamfers" (HFC) Practice Part. + Your part matches the description above	- Your part does not match all of the descriptions above	- Your part is very incomplete - You did not make the HFC Practice Part



(30 pts) Approx. 1 days

For the second part of our unit, we'll look at some of the trickier tools in Autodesk. There are lots of tools for creating special shapes, but some other tools help define and inspect the various mathematical properties of the 3D object. The first thing we'll look at are geometric constraints; constraints limit the size and shape of objects to make them fit together in specific ways like exactly perpendicular, parallel, equal, or vertical. When we're done exploring various constraints, we'll look briefly at iProperties and see that Autodesk can calculate a lot of things for us about our 3D part.

1. **Autodesk Notes** – watch the *Geometric Constraints* and *Geometric Constraints Tutorial*. Start a page of notes (you can add to it with the iProperties information later). Make sure that your notes list different constraints that you see used, and that you end up using yourself. Take a full page of notes total for this part of the unit.
2. **Geometric Constraints Tutorial** – Download the “Geometric Constraint Practice” from the Part 2 section of our website. You can open this drawing in Autodesk and then choose “Sketch1 → Edit” from the browser to make the shapes editable.
3. With the Geometric Constraint Practice drawing open, use the geometric constraints to satisfy each drawing. In each case, the drawing needs to be adjusted using only one (1) of the geometric constraint buttons.
4. **Autodesk Notes** – watch the *iProperties* and *iProperties Tutorial* presentations. Add to your notes from before, and be sure to include details about what information the iProperties tool gives, as well as where that tool can be found!
5. **iProperties Tutorial** – Get the *iProperties Tutorial Assignment* and work through it. In there, you'll make a very basic part and then be able to use the iProperties tool to confirm that you built the part correctly. Use that tool to confirm you have the right volume, surface area, and other parameters.

Part 2: Tasks	4 points	3-2 points	1-0 points
 Notes on Geometric Constraints	+ You took a full page of notes on geometric constraints + Your notes include specific details about each of the geometric constraint tools!	- You did take a full page of notes - Your notes do not address specific tools	- Your notes are missing
 Geometric Constraints Tutorial	+ You completed the Geometric Constraints Tutorial + Your completed tutorial is saved on your jump drive	- You did not finish all of the tasks in the constraints tutorial - Your tasks are not completed correctly	- Your tutorial is incomplete or missing - Your tasks are not done correctly
 iProperties Tutorial	+ You completed the iProperties Tutorial + You build the iProperties Part + The necessary properties match between your part and the tutorial part	- You did not finish the iProperties Tutorial - Your iProperties Part is incorrect - Your properties don't match	- Your tutorial is incomplete or missing - Your part is missing - Your properties are not even close
 Take the Unit 5 Quiz	+ You took the Unit 5 Quiz by the due date + Your grade is based on the number you get correct	N/A	- You did not take the quiz by the due date



(85 pts) Approx. 6 days




The final part of our unit is to use all the tools of Autodesk to build the different parts of your favorite Automoblox car in the software. This part of the unit will be very time consuming because the different automoblox parts are pretty complex; but the unit as a whole is meant to give you a chance to learn all the different tools, features, and work flows available in Autodesk. Take your time, and take some notes along the way!

1. **Automoblox/Autodesk Notes** – Watch the first three presentations on the website: *Example Body Block Build*, *Example Wheel Build*, and *Example Automoblox Windshield*. These videos will NOT be showing you exactly how to build the part for YOUR Automoblox car, but they will be showing how to build representative Automoblox pieces. Take a full page of notes (especially on the wheel and windshield).
2. **Create Automoblox Parts** – Select your Automoblox car and dismantle it. A few weeks ago you should have taken a lot of measurements on these parts, and now it’s time to put them to use. Refer to your earlier drawings and use a caliper to get dimensions from each piece. Your job is to recreate every part of the Automoblox car in as much detail as possible. This means you need to make a new part file for every Automoblox part, and then create it with every rounded edge, headlight, post, peg, and groove on it. You can even change the color of the part or parts to match the color of the actual car. One important thing to keep track of is making sure that all the connecting pegs and holes are in the correct spots on the blocks. If any of the holes or pegs are misplaced, the car won’t look right when it’s assembled. This will all take a long time, and getting 1 or 2 Automoblox parts modeled per class period will be a challenge! Be patient, and make sure your models are looking good!

**SAVE YOUR AUTOMOBLOX PARTS AS .IPT FILES ON YOUR JUMP DRIVE!**

3. **Automoblox Assembly** – Now, watch the last presentation *Example Automoblox Assembly* and add to your notes from earlier. This video will show how to use constraints to assemble an example Automoblox car, but probably not YOUR Automoblox car. Using the proper constraints, assemble all the parts of your Automoblox car so it is fully together in the computer. When you’re done, your computer model should look almost exactly like your actual car!

**SAVE YOUR AUTOMOBLOX ASSEMBLY AS A .IAM FILE ON YOUR JUMP DRIVE!**

Part 3: Tasks	10 points	8-6 points	5-0 points
 Automoblox in Autodesk Notes	+ You took a full page of notes on how to create Automoblox parts in Autodesk + Your notes include details about how to make wheels and windshields	- Your notes are not a full page - Your notes do not include details on the wheels and windshields	- Your notes are missing
 Create Automoblox Parts	+ You created a new Autodesk part for every part on your Automoblox + Your modeled parts are very precise, the right size, and all the proper details (ridges, grooves, etc) are included	- You missed a part - Your parts do not include full details - Your parts have holes/pegs in the wrong locations	- Your parts are very incomplete - Your parts are missing
 Create Automoblox Assembly	+ Your parts are all assembled properly into the final car + Your final car looks a lot like the actual model + You assembled the car with the proper constraints	- Your assembly is incomplete - Your assembly is missing some parts	- You did not use constraints to make your assembly - Your assembly is missing

