

LATHROP ENGINEERING

Name: _____

UNIT 9: AUTOMATA

Introduction to Engineering & Design

Unit Due Date: **March 6, 2020**

Welcome to the ninth unit of *Introduction to Engineering & Design*! In this unit you get to combine some of the modelling methods we learned in previous units with some of the building activities we've been wanting to do for a while! You'll start by planning and drawing out your own Automata design. Then you'll model the main moving parts in Autodesk. Once that's finished, you'll go to the makerspace and build your actual model! In the end, the expectation is that you learn the following:

- How to follow your idea from the drawing/design phase through the modeling phase, and into production
- How to create a careful diagram to get your building plans confirmed
- How to create a moving Autodesk Assembly from scratch
- How to build a simple moving machine (your Automata) in the makerspace

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 (**March 6, 2020**). 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: Design & Model (40 pts) Approx. 3 days	
The first part of our unit is all about planning and designing. You'll start with a careful, detailed, scale drawing in your engineering notebook. You need to fully plan out your Automata including how many cams you'll use, as well as what shape and size they'll be. Also be sure to design the decorative part for the top of the Automata. Then you'll need to go into Autodesk and model the functional pieces of your Automata and get them assembled and working.	 Notes on Automata Challenge
	 Research & Brainstorm
	 Plan & Draw Automata
	 Autodesk Model
	 Autodesk Diagram
	 Check-off From Mr. Benshoof

Part 2: Build It! (40 pts) Approx. 4 days	
The second part of the unit is to follow your plan and Autodesk assembly to make your Automata in the Makerspace! Be sure to consider what kinds of materials are available (talk to Benshoof) and get things assembled! You'll be able to 3D Print the cams to make them perfect, and we'll build the rest in the Makerspace. Wrap things up with a written reflection in your engineering notebook!	 Building Plan
	 Build in Makerspace!
	 Automata Reflection
	 Check-off from Mr. Benshoof



(40 pts) Approx. 3 days

The first part of this unit requires doing a lot of thinking, brainstorming, and planning so that the final construction of your Automata runs smoothly! Here you get to think about the kinds of materials and tools available to you before you research and brainstorm the different kind of things you might build. When you have an idea, you'll get it carefully drawn out on paper, then modeled in Autodesk before moving on!

1. **Notes:** Start by watching the videos *Automata Introduction* and *Automata Overview*. Take a full page of notes on the ideas and challenge. Include a list of Makerspace materials that you might use in your design!
2. **Research & Brainstorm:** Next, do a Google Image Search for "Automata Project" and look through some of the complex designs other people have built. Your design **does not** have to be as complicated as theirs. Use these ideas to generate your own. Brainstorm at least 10 ideas for your Automata project and write them down in your engineering notebook.
3. **Plan & Draw Automata:** Finally you get to actually design and draw out your Automata. Make a plan for your design that fits the following criteria:
 - a. Must use at least 2 cams of different shapes
 - b. Must have an axle and handle so it turns nicely
 - c. The box must be no larger than 12" wide and 8" tall
4. **Autodesk Model:** Create an accurate model of your design in Autodesk and get it assembled so it moves correctly
5. **Autodesk Diagram:** Finally, create an Autodesk diagram of your design and include full dimensioning so that you can use it as a reference while you build!

Part 1: Tasks	5 points	4-2 points	1-0 points
 Notes on Automata Challenge	+ You took a full page of notes on the <i>Automata Introduction</i> and <i>Automata Overview</i> + Your notes include a list of available materials from the lab for your Automata!	- Your notes are missing a major part	- Your notes are missing entirely
 Research & Brainstorm	+ You did a Google search for "Automata Project" and looked through the different ideas there + You brainstormed at least 10 ideas for your own Automata	+ Your brainstormed list is missing some ideas	+ Your brainstormed list has fewer than 5 ideas
 Plan & Draw Automata	10-8 points + You made a very careful drawing of your Automata design in your notebook + Your drawing includes dimensions and labels	7-5 points - Your drawing is not very detailed - Your drawing is missing dimensions or labels	4-0 points - Your drawing is missing many important elements
 Autodesk Model	+ Your Autodesk model shows the moving parts of the cam & follower rods + Your Autodesk model does NOT show your decorative parts on top	- Your Autodesk model is not complete - Your Autodesk model does not have properly modeled cams	- Your Autodesk model is missing important elements - Your Autodesk model does not move properly
 Autodesk Diagram	+ You used your assembly to create an Autodesk diagram + Your Autodesk diagram is fully dimensioned	- Your Autodesk diagram is hard to read - Your Autodesk diagram is missing dimensions	- Your Autodesk diagram is missing completely



(40 pts) Approx. 4 days

The second part of our unit will be making your model a reality! By now, you should have created a working Autodesk Assembly that models what you want your Automata to look like and how it should function. You may not have modeled in detail every single decoration, but the moving parts (crank, cams, followers) should all be functioning correctly in Autodesk before you start building!

Here, you'll use your Autodesk Diagram as a blueprint for building as you get into the makerspace and build your machine!

1. **Building Plan:** Start by writing out a plan for how you want to build your Automata! Your plan should include:
 - a. A picture of what you're trying to build
 - b. A list of the order in which you should build/assemble things
 - c. Dimensions and materials labeled so you know how big to make things
 - d. A list of the machines you'll need to use
 - e. Ideas for theme or decoration
2. **Build in Makerspace:** Next, you get to head back to the makerspace and *actually do it!* Follow your plan to build and perfect your Automata! Get it running smoothly, and be sure to talk to Mr. Benshoof when you have questions about the tools or need help getting things working!
3. **Automata Reflection:** In your engineering notebook, write a full-page reflection on the process you followed to design, model, and build your working Automata. As you write your reflection, answer the following questions:
 - a. What was the hardest part about the project?
 - b. What was the easiest part?
 - c. What makes your Automata extra cool?
 - d. If you were going to build another one, what information would help you do it better?
 - e. What did you learn in the process that you want to remember for future work?

Part 2: Tasks	10-8 points	7-5 points	4-0 points
 Building Plan	+ You made a written plan of how you would build your machine + Your plans include details about dimensions, parts, pieces, and process!	- Your plan is missing important aspects	- Your plan is completely missing
 Build in Makerspace	+ You built your Automata! + Your Automata works as intended + You followed your plan closely	- Your Automata does not function properly - Your Automata is sloppy - You did not really follow your plan	- Your Automata is missing essential elements
 Automata Reflection	+ You completed a Product Disassembly Chart for your complex object as you took it apart	- Your Disassembly Chart is not fully filled out	- Many major components missing from your chart

