LATHROP ⚙L ENGINEERING

Name:

UNIT 8: SIMPLE MACHINES

Introduction to Engineering & Robotics   Unit Due Date: **February 16, 2018**

Welcome to the eighth unit of *Introduction to Engineering & Robotics*! This unit is all about basic physics, simple machines, and complex machines. Engineers need to know all about machines of different kinds, and here we will look at six machines that give engineers a mechanical and mathematical advantage when trying to get work done! In the end, the expectation is that you learn the following:

- What the six simple machines are: levers, pulleys, inclined planes, wedges, screws, and wheels & axles
- How the six simple machines create mathematical advantages
- How simple machines can be combined to make complex machines
- How the complex machines in our engineering lab use simple machines
- How to create your own complex machines within the criteria and constraints of a design breif

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 (**February 16, 2018**). Our unit is broken up into three main parts:

Part 1: **Simple Machines** *(30 pts) Approx. 3 days*	
The first topic of this unit is the study of the six simple machines. You'll start by watching four videos that summarize how the 6 simple machines work. Once you have a good understanding for what they are, we'll review some mathematics as it applies to the simple machines. Finally, you'll complete a simple machine scavenger hunt in our engineering lab!	🗔 Simple Machines Notes
	🗔 Simple Machines Math Assign.
	⊕ Simple Machines Scavenger Hunt
	☆ Check-off from Mr. Benshoof

Part 2: **Complex Machines** *(20 pts) Approx. 2 days*	
The second part of our unit is about the complex machines. A complex machine is a combination of multiple simple machines. Cars, drills, computers, and phones are all examples of complex machines. In this part of the unit you'll watch some videos of cool complex machines and take notes on how they work. Then, you'll complete a short assignment. Finally, you'll make a careful diagram of one of the large complex machines in our lab and identify the simple machines that make it work.	🗔 Complex Machine Notes
	⊕ Complex Machine Assignment
	🗔 Complex Machine Diagram
	☆ Check-off From Mr. Benshoof

Part 3: **Rube Goldberg Challenge** *(20 pts) Approx. 3 days*	
The final step is to put your knowledge of simple machines to the test! Here, you and a partner will have to build a small Rube Goldberg Machine that can keep a marble in motion and off the table for exactly 11 seconds. Your machine will need to use all 6 simple machines and be precise within ± 0.5 seconds. This will require a lot of planning and troubleshooting as you get it nailed down!	🗔 Brainstorm, Plan, Design
	⊕ Prototype Machine
	⊕ Test & Evaluate Machine
	☆ Check-off from Mr. Benshoof
☆*Achievement:* Get your Rube Goldberg Challenge Machine to work 5 times in a row.	

(30 pts) Approx. 3 days

To begin our conversation about types of machines and the mechanics of different types of machines,we have to start with the 6 simple machines. Whether you're studying physics or engineering, the concepts behind the 6 simple machines are essential to understand. In the first part of our unit here, your job will be to learn about the 6 simple machines, do some mathematics, and then complete a scavenger hunt in our lab to find simple machines in action!

1. **Notes:** Start by watching the 4 Simple Machine videos linked on the website. As you watch the videos – each of them are pretty long – be sure to take notes about how the simple machine works. Your notes should also include any details or drawings that help explain some of the mathematical concepts behind those machines.
2. Take a FULL 2 PAGES of notes on the 6 simple machines. There is a nice one-page summary of each of the simple machines in addition to videos on the topics. The first video discusses the *inclined plane, wedge,* and *screw* all in one video. The other videos are clearly labeled as *levers*, *wheels & axles,* and *pulleys*. Make sure that your notes cover all 6 simple machines.
3. **Simple Machine Math Assignment:** Get the *Simple Machines Math Assignment* from Mr. Benshoof. Use the equations given on that sheet to calculate all the needed forces. Think about how an engineering might use these mathematical ideas to build better machines!
4. **Scavenger Hunt:** Title a new page in your engineering notebook "Simple Machine Scavenger Hunt". Your scavenger hunt is to find 6 distinct examples of each of the 6 simple machines in our lab. You might find wedges at work in the robotics room…. Or maybe inclined planes in the Makerspace. Take some time to wander the whole engineering lab and record the things you find in your engineering notebook. As you record them, keep your lists organized so Mr. Benshoof can tell which items fall into which categories.

Part 1: Tasks	10-8 points	7-4 points	3-0 points
▭ Simple Machine Notes	+ You took a full page of notes on the 6 simple machines + Your notes include details on ALL 6 of the simple machines + Your notes make it clear you watched the videos	- Your notes are missing one of the simple machines. - Your notes are lacking details from the videos	- Your notes are missing more than one simple machine
▭ Simple Machine Math	+ You completed the *Simple Machines Math Assignment* + You showed your work on the entire assignment + You checked your work with the answer key	- You did not complete the entire assignment	- You were missing large parts of the assignment
⊕ Scavenger Hunt	+ You found 6 examples of every simple machine + Your examples are listed clearly in your engineering notebook + Your lists are organized in an understandable way	- You have fewer than 6 examples for each simple machine - Your examples are poorly organized	- You have fewer than 4 examples for each simple machine - Your examples are missing completely (0 pts)