

LATHROP ENGINEERING

Name: _____

UNIT 4: EXPLORATION










Engineering, Design & Development (Senior Design)




Unit Due Date: **November 8, 2019**

Our fourth unit is all about learning a new machine. Good engineers definitely need to know how to use lots of machines, but more importantly they need to learn *how to learn* new machines and tools. In this unit, you'll have the job of choosing a machine from our lab and makerspace that you haven't used much (or at all). Then, you'll research and learn how the machine works, how to use the corresponding software for the machine. Once you understand the machine, you'll do a simple project with it and follow that up. In the end, the expectation is that you learn the following:

- How to learn new machines using a variety of tools and resources
- How to learn new software using a variety of tools and resources
- How to use a new machine in our Makerspace/Lab to make something cool
- How to organize a learning task for younger students

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 8, 2019**). You are also responsible for completing each part before moving on to the next. Our unit is broken up into two main parts:

Part 1: Exploration & Prototyping (100 pts) Approx. 8 days	
This project is intended to give you a chance to learn a new type of machine! In this unit, you'll be given the time and freedom to investigate how one of our makerspace machines works. You'll choose a machine in our lab that is new to you. Then, you'll research how it works before making plans for building something cool with it. You'll need to do some simple testing at first, but then try and make something awesome. In the end, you'll give a presentation to the class about both how you used the machine as well as how you learned how to use the machine.	 Machine Notes
	 Software Notes
	 Process Notes
	 Approval from Mr. Benshoof
	 Build Your Prototype
	 Prototype Feedback
	 15-Minute Presentation
	 Check-off from Mr. Benshoof
 Achievement: Make a simple introductory assignment to teach freshmen how to use your machine	

Part 2: College Tasks (20 pts) Approx. 3 days*	
For these next few units, you'll be writing some scholarship essays that will help complete applications for various scholarships later next semester. By getting them done now you'll have time to edit them, and you'll be setting yourself up for an easy application season in the future. Take your time on the essays, but don't get behind because there will be more coming up each unit!	 Scholarship Essay #1
	 Scholarship Essay #2
	 Check-off from Mr. Benshoof



(100 pts) Approx. 8 days

This fourth unit is all about learning a new machine. On the surface, this is a unit in learning how to use a machine in our lab/makerspace that you haven't used much before – in reality, it's also a unit in *how to learn*. Great students and engineers are conscious of their own learning process, and are able to apply a strategy similar to the Engineering Design Process. Here, you'll take the time to learn a new machine, the corresponding software, and to make something cool; you'll also work to develop a process for learning things in the future.

1. To get started, consider the following analogy. I think that the *process of learning* is very similar to the *engineering design process*. Think about the following:











Engineering Design Process	Define the Problem	Research & Brainstorm	Choose a Solution	Build a Prototype	Test & Evaluate	Communicate
Learning Process	Identify what it is you're trying to learn or do	Research how other people have done it (YouTube, Wikis, talk to people, etc)	Identify which processes and software are worth trying out	Try and use the machine/skill to build something simple	See if your product matches your needs and expectations. Try and build something bigger/more complex	Share your work with others, and receive feedback

2. Think about the two processes above and what adjustments you might make to help them better reflect your own learning processes. Then, take a page of notes including thoughts on how you learn new things as well as notes on the *Exploration Overview* and *Machine Options* presentations.
3. Next, you'll need to choose one of the machines in our lab. You can choose whatever you want, but the intent is for you to choose a machine you've almost never used before. This is a good chance to learn something very new! Consider each of the following machines:

Laser <i>Tormach (Mill)</i>	<i>Vinyl Cutter</i> 3D Printers	CNC Router <i>Voxel 3D Printer</i>	<i>CNC Plasma Cutter</i> Latex Printer	Denford MicroMill <i>Roland 3D Scanner/Mill</i>
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4. Once you've chosen a machine to learn and work on, it's time to start some research! Go online and look up the exact machine that we have in the lab. Check places like YouTube, Wikis, Company Websites, DIY Blogs, etc. Find some reliable resources and start learning what processes and tools are used to make your machine function. Take at least 1 full page of notes (though 2 seems more appropriate) on how the machine works.
5. Then, find out what software is needed to run the machine and make cool things. Do the same kind of research on the software you'll need to learn. Make sure you understand how that software works for your machine. Find examples and get some practice using that software. Take at least 1 full page of notes (though 2 seems more appropriate) on how that software works.
6. Use your new knowledge to make something SIMPLE with your machine. Record your process in your notebook!
7. Get some feedback on your simple prototype and plan from Mr. Benshoof and your fellow students. Think about what could be improved.
8. Plan a more complex build project and see if you can make something really cool with your machine. Draw up your idea, be specific as you plan, and make something carefully that you'll actually be proud of. Record your process in your engineering notebook!
9. Give a 10-minute presentation to the class about how you learned the new machine, what it does, and how you made your final (second) prototype.



Part 1: Exploration Tasks		5 points	4-3 points	2-1-0 points
 Machine Notes		+ You took notes on how the machine works + Your notes reflect extensive research on the use of the machine	- Your notes are limited - Your notes do not reflect good research	- No notes - No research apparent
 Software Notes		+ You took notes on how the needed software works + Your notes reflect extensive research on the use of the software	- Your notes are limited - Your notes do not reflect good research	- No notes - No research apparent
		4 points	2 points	0 points
PROTOTYPING	 Process Notes	+ You have a page of notes that summarizes the process of creating something on your machine + Your notes include a flow-chart	- Your notes are limited - Your notes do not include a flow chart of the process	- No notes
	 Build Plan 1	+ You planned out your first (SIMPLE) prototype + Your plan includes dimensions and all the needed information for a successful build	- Your plan does not include enough details for you to repeat the work later	- Your plan is missing - Your plan has no picture
	 Build Your First Prototype	+ You followed your plan to build your first prototype + Your first prototype is close enough to your intent that we can see what worked and what didn't	- Your prototype is noticeably incomplete - You did not follow your plan	- Your prototype is missing - You did not follow your plan at all
	 Build Plan 2	+ You planned your second (COOLER) prototype + Your plan includes dimensions and all the needed information to be successful	- Your plan does not include enough details for you to repeat the work later	- Your plan is missing - Your plan has no picture
	 Build your Second Prototype	+ You followed your plan to build your second prototype + Your second prototype is close enough to your intent that we can see what worked and what didn't	- Your prototype is noticeably incomplete - You did not follow your plan	- Your prototype is missing - You did not follow your plan at all
		10-7 points	6-3 points	2-1-0 points
 Prototype Feedback		+ You got feedback on both of your prototypes (the simple one and the more complex one) + Your feedback is included in your engineering notebook	- Your feedback only came from one person - Your feedback is limited in scope	- You did not get feedback - Your feedback is not recorded
 Exploration Presentation		+ You gave a good 15-minute presentation to your class + Your presentation covered how you learned the machine as well as how you used the machine	- Your presentation missed some important parts - Your presentation did not cover HOW you learned the machine	- Your presentation was too short - Your presentation did not cover the necessary material
 Achievement		+ Make an introductory assignment appropriate for freshmen engineering students that could give them exposure to the machine you've been exploring		



(20 pts) Approx. 3 days

For the remainder of our semester, the college work will focus on writing essays for future scholarships. During the spring semester, there are a wide range of scholarships that we'll apply to. Historically, Lathrop Engineering students do very well with these scholarships, and I think a large part of that is that we write the essays early on so that while your peers are stressing over scholarship applications, you can simply spend time putting things in envelopes. Good work and preparation now while your schedule is a little less hectic can make for great success next semester.

I really do think that senior design students such as yourselves should be graduating from Lathrop with at least one "free" option for college. You have enough experiences and successes on your resumes that at least one college – even if it's UAF – should be willing to give you a free undergraduate education. A big part of making that possible is applying to as many scholarships as you can to ensure that your college costs are covered if you want them to be. We'll start that work here and see it payoff (literally) next semester.

THINGS TO THINK ABOUT WHEN WRITING SCHOLARSHIP ESSAYS:

1. **Spelling & Grammar Count!** As you write your essays, pay attention to the quality of your writing. You should be writing as well as you would if you wanted to impress Ms. Bouta, Mrs. Robinson, Mr. Stoddard, and Mr. Brown. You've had a great writing education here at Lathrop, and now's the time to flex those muscles. *Write well*, and give yourself time to edit and revise.
2. **Word Count Counts!** If a wealthy donor wants to give money to college students, they want to give it to a college student that *cares*. To demonstrate that you care, you should always be within 95% of the allowed word count.
3. **SCHOLARSHIP ESSAY 1:** There are many scholarships offered through UAF, and many of them are targeted at specific groups of students. Below is the essay prompt for one such scholarship:



Christina's Hope Memorial Scholarship

"For incoming freshmen from Lathrop High School in Fairbanks who have financial need. Complete a 1,000-word essay addressing the following: What do you consider the largest current social problem plaguing Fairbanks today, and list 3-5 possible solutions for it. How could you be part of one solution?"

4. **SCHOLARSHIP ESSAY 2:** Other essays are for specific audiences. The following essay prompt is for the Alaska Engineering Education Foundation who provide a variety of scholarships to Alaskan students who are interested in studying engineering in college:

AEEF Scholarship

"Describe your interest in an engineering education/career"

Part 2: College Tasks	10-8 points	7-4 points	3-0 points
 Scholarship Essay 1: "Problems in Fairbanks"	+ You wrote a good scholarship essay that was between 950 and 1000 words + You had Mr. Benshoof edit your essay	- Your essay was outside of the word count - Mr. Benshoof did not edit your essay	- Your essay is missing
 Scholarship Essay 2: "Engineering Interest"	+ You wrote a good scholarship essay that was between 475 and 500 words + You had Mr. Benshoof edit your essay	- Your essay was outside of the word count - Mr. Benshoof did not edit your essay	- Your essay is missing

