

## UNIT 6: INDIVIDUAL MINI-PROJECT

Engineering, Design & Development (Senior Design)

Unit Due Date: **December 12, 2019**

Our sixth unit is all about the engineering design process, as our whole semester has been. In this unit, you'll be given the freedom to build a simple prototype of anything you want. The best projects will start to think toward next semester and your senior capstone project. This mini-project is the perfect time to do a quick 'rough draft' version of what you might want to work on next semester. In doing so, you'll very quickly recognize what some of the biggest challenges will be with that topic as a project. It's a good way to get a feel for what you're getting into, and to think about what factors you'll need to take into consideration. In the end, the expectation is that you learn the following:

- How to use the engineering design process to plan out the production of an initial prototype
- How to use the tools in the Lathrop Makerspace to build a prototype
- How to evaluate the success of your work and consider improvements
- How to communicate your results with others

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 (**December 12, 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: Individual Mini-Project (100 pts) Approx. 8 days	
<p>This project is meant to give you the time to complete a very quick rough-draft of your senior year engineering capstone project. To do this, you'll want to start thinking about what you might want to tackle for your second semester project. What problem might you want to solve?</p> <p>Once you've come up with an idea (or at least the start of one), you'll work through the entire engineering design process quickly to think through what your project would be like over the course of a whole semester. You'll build a very simple prototype to illustrate the concept, and then test and evaluate your success. The goal here is to identify what you'll need to learn next semester to make your project a success, and to predict what parts of the project will be challenging.</p>	📅 Project Brainstorm
	📅 Design Brief
	📅 Brainstorm
	📅 Choose A Solution
	⊕ Build the Prototype
	⊕ Test & Evaluate
	📅 Reflection
	⊕ Communication
	★ Check-off from Mr. Benshoof
<p>★ <b>Achievement:</b> Complete a rough draft prototype of your likely senior design project by the deadline</p>	

Part 2: College Tasks (20 pts) Approx. 3 days*	
<p>In this unit, your college task is to look at the schools you want to apply to and to make a careful plan for yourself. There are lots of deadlines coming up: school application deadlines, scholarship deadlines, testing deadlines, FAFSA deadlines, etc. Here you'll take the time to make out a plan for what needs to get done and when for all the schools you're wanting to apply to.</p>	📅 College Deadlines Brainstorm
	📅 College Planning Worksheet
	★ Check-off from Mr. Benshoof



(100 pts) Approx. 6 days










This unit is about how to use the engineering design process as a tool to prepare for a long term project. The best projects here will be the ones that address a possible topic for your second semester engineering capstone project. By now, you don't have to have nailed down *exactly* what your second semester project will be, but you will need to have some kind of idea. Then, choose a part of that problem or a related problem to try and solve in our short time-frame. You'll work through the engineering design process to tackle this problem and get an idea of whether or not it's a topic you want to continue with next semester.

1. **Problem Brainstorm:** Here you need to brainstorm 10 *problems* that you might want to try and solve with your long-term project. The brainstorm here can – and should – include a wide range of ideas, even if some are too big for the time, materials, and space available. In the end, you'll need to settle on a problem that can be reasonably solved by you in a semester. Then, *choose a problem to work with!*
2. **Design Brief:** As always, define the problem with a complete design brief. The design brief should be written out in your engineering notebook and needs to include the usual parts: problem statement, justification, deadlines, criteria, constraints, and audience.
3. **Solutions Brainstorm:** Next, you'll brainstorm different solutions to your chosen problem. This will probably go along with some internet research, but in the end you need to have at least 15 ideas for possible solutions brainstormed in your notebook.
4. **Choose a Solution:** From your many brainstormed and researched ideas, you eventually need to settle on one specific thing to try and build or model. Select your solution and then draw a detailed diagram of what you want to build. Your diagram needs to include dimensions and a materials list so that we know where it's all headed.
5. **Build the Prototype:** Actually BUILD IT! You know what tools, machines, and resources we have available – it's your job to make a basic prototype. Your prototype may not fully meet the need of the problem, and that's okay. With only 2 weeks to do the entire project/process we have to be reasonable in our expectations. What DOES need to happen is you need to make a prototype that helps demonstrate the principles at play, helps illustrate the solution your driving toward, and gives ideas for improvements.
6. **Test & Evaluate:** As much as your initial prototype will allow, test and see how well it works. Write some notes about what can improve in both the building process and the effectiveness of the prototype. Share your work with the other students in senior design – even those in different periods – and get feedback on how things can improve. Write your feedback in your engineering notebook.
7. **Reflection:** Write a full-page reflection on the entire process and project. What went well and what didn't? What was fun and interesting? How might this work for a 17-week long term project next semester? Do you still think it's a good idea? How can this develop into a really cool project, what are some next steps?
8. **Communication:** You'll be asked to share your work in a 10 minute presentation to our class. In this presentation, you should describe your entire engineering design process including the positives and negatives of your prototype and your process. Look for good feedback (and record it) from the class.

Really you just worked through the engineering design process again. But at the end of this short unit, you should have a good idea about whether or not you want to keep working on this idea next semester for your long-term project. Think about what might be fun and what might be boring if you kept working on this idea. What parts of the project would likely be easy and what would be hard. Think also about what research you might be able to do (a required part of the long-term project), and how that might be done. At this point, if you decide that the topic is boring or not worth continuing with, that's fine – better to figure that out now rather than in February!

Talk with Mr. Benshoof about your project topic and ideas to get some thoughts on how to make it doable and awesome!



<b>Part 1: Project Tasks</b>		<b>10-8 points</b>	<b>7-5 points</b>	<b>4-0 points</b>
 Problem Brainstorm	+ You brainstormed at least 10 ideas in your notebook for problems that need solving	- You brainstormed less than 10 ideas	- You brainstormed less than 5 ideas	
 Design Brief	+ You created a complete design brief that details the problem and your expected parameters	- Your design brief is missing some elements	- Your design brief is missing many elements	
 Solutions Brainstorm	+ You took detailed notes brainstorming different solutions to your problem! + You brainstormed at least 15 different solutions + Your notes include pictures where appropriate	- Your notes do not include pictures - Your notes are superficial - You brainstormed less than 15 solutions	- You brainstormed less than 10 solutions - No notes about brainstorming	
 Choose a Solution	+ You clearly chose a solution to work with + You made a plan and picture of your proposed solution in your engineering notebook + Your plan includes a list of materials and dimensions	- Your plan does not include a picture - Your plan is missing important information	- Your plan is missing	
		<b>20-15 points</b>	<b>14-9 points</b>	<b>8-0 points</b>
 Build the Prototype	+ You followed your written plan and diagram to create a prototype in the Makerspace + Your prototype illustrates the idea and gives us lots to think about	- Your prototype doesn't really address the problem - Your prototype differs from the plan significantly for no reason	- You did not finish your prototype - What prototype?	
 Test & Evaluate	+ You test out your prototype as best as possible + You evaluate the success of your prototype and get feedback from your other Senior Design peers	- You only got trivial feedback - You did not fully test your prototype (within reason)	- You did no testing - You got no feedback - You didn't record feedback in your notebook	
		<b>10-8 points</b>	<b>7-5 points</b>	<b>4-0 points</b>
 Reflection	+ You wrote a full page reflection that addresses all the prompts listed on the previous page + Your reflection thinks about positives and negatives of your prototype	- Your reflection is less than a page - Your reflection does not address all prompts - Your reflection is generic	- Your reflection is missing - Your reflection is significantly lacking	
 Communication	+ You gave a short 10-minute presentation about your problem and proposed solution + You showed your prototype to the class and talked about your process	- Your presentation was too short - Your presentation did not discuss an important aspect of your process	- You did not give a presentation - Your presentation was extremely brief or superficial	
 Achievement	+ Your prototype is a clear first-draft of a possible senior design project			



(20 pts) Approx. 3 days

The last part of our college work for the semester is to think through what you still need to do to finish the college application process! The job of applying to college is more than just filling out a single application the day before school starts in the fall. In order to be setup for college, you need to have completed an application to the school in December, January, or February (dates differ by school). You also need to complete various scholarship applications, required federal applications, and have done some important testing. It’s even worth picking up a phone and actually calling the people in charge of the program you want to enter and introducing yourself!

As you make plans to get those things done over the next few months, you’ll need to start with a brainstorm and research about all the deadlines coming up. We’ll then complete a calendar or listing of all the things that need to get done and when they need to get done.

**THINGS TO THINK ABOUT WHEN BRAINSTORMING DEADLINES:**

**Schools:** What schools are you interested in and actually planning to apply to? For each of them, look up:

- a. Their application deadline (ex: UAF’s application deadline is February 15)
- b. Their school’s scholarship deadline (ex: UAF’s scholarship deadline is February 15)
- c. What external scholarships are available for that school (there are usually LOTS)
- d. What are the deadlines for those external scholarships?

**Other Scholarships:**



- a. You should be able to go to school (mostly) for free. What other scholarships are out there that can make that happen? (ex: Alaska Engineering Education Foundation Scholarship)
- b. When are those other scholarships due?

**Other Paperwork:**

- a. What other paperwork do you need to put together? Transcripts? Resumes? Recommendations?
- b. Don’t forget the FAFSA (due along with most college applications)

**COLLEGE APPLICATIONS PLAN:**

Your job is to complete the College Planning Worksheet (basically make yourself a calendar) that lists all the deadlines you need to meet to get yourself fully applied to college and scholarships. As you do so, make sure that you include all the deadlines for every school you plan on applying to (or have applied to). Also make sure to include as many scholarship deadlines as you can stomach. We have had students applying to a scholarship a night for most of December/January.... And they usually walk away with close to literally a million dollars in scholarships earned. Challenge yourself to earn free college!

Part 2: College Tasks	10 points	5 points	0 points
 College Deadlines Brainstorm	+ You brainstormed a full list of possible college-related deadlines in your notebook	- Your brainstormed list misses obvious deadlines	- Your list is missing
 College Planning Worksheet	+ You completed the College Planning Worksheet + Your plan includes deadlines and details about each university you are considering applying to	- Your college planning does not reference deadlines for all your colleges of interest	- Your college planning sheet is not finished

