

ME 328 Machine Design Project Description, Spring 2020

Pedagogical Purpose of the machine design project: *Engineering design is fundamentally different than solving closed-formed problems that are typically solved engineering analysis courses (problems with a single correct answer). Different skills and processes are required. Practicing engineers work on teams for many months or even many years to solve large, complex problems with no single correct answer – or even a single “best” answer. The machine design project provides “guided practice” intended to help students take the “next step” towards professional engineering. You will:*

- *Make sense out of an open and ambiguous problem*
- *Have meetings with your team – but you will have more responsibilities and there will be more structure than you may have experienced on previous team projects.*
- *Formally evaluate your peers and read and reflect upon your peers’ evaluation of you. This is common practice in industry.*
- *Use knowledge you gain by conducting testing/experimenting to improving your design. Little guidance will be provided.*
- *Apply analysis to help guide your design, but to use testing as the “answer book” answer. Since theory never precisely matches testing, you will need to apply judgment to reach a meaningful conclusion.*
- *Develop ability to have confidence in your engineering decisions.*
- *Properly document your work at each step of the process. This will make the final report simple to compile.*

Now onto a description of the project...

Scenario: *Lulay Sisters* is a not-for-profit organization with no in-house engineering skill. Their mission statement is:

Our mission is to evaluate and provide appropriate technology to improve the lives of sub-Saharan Africans.

To support their mission, *Lulay Sisters* is looking for an engineering company to team with on future projects. The ideal engineering company will demonstrate:

- deep commitment to engineering responsibility and ethics
- excellence in technical engineering skills of testing, analysis and design.

The Machine Design project is your chance to demonstrate to *Lulay Sisters* both of these attributes. To do so, *Lulay Sisters* have proposed a test-project for you. It may or may not be a project that ever gets brought to fruition - just like many other engineering projects. As the trial, they would like you to design a transmission for a winch. The winch will be used to pull a plow and may be used for some other purpose. The project will involve three primary phases:

- 1 - Lulay Sisters wants to know if you have an awareness of the world around you; that you are not just technically savvy. They want to know if there is a viable need for a winch-like device in sub-Saharan Africa and what its potential impact (social, political, etc.) may be.
- 2 - Small scale testing and analysis to demonstrate your engineering skills. You will be provided a specific electric motor to pull a small test plow in their test facility. Through testing and analysis, you will determine an appropriate transmission ratio to meet certain criteria. You will test the ratio to validate your previous testing and analysis.
- 3 - Scaled up testing. You will then validate your ability to scale up and modify the design (but still not full scale).

Based on your final recommendation at the completion of the class project, Lulay Sisters will decide if this project is worth pursuing further or not. Based on the quality of your work, they will determine if your team would be hired for future work – this will translate into a course grade:

- A: *Lulay Sisters* would likely hire you for future projects because your technical and non-technical work was clear and sound engineering judgement was used to reach meaningful conclusions.
- B: (between “A” and “C”)
- C: *Lulay Sisters* would hesitate to hire you for future projects because your technical and non-technical work was not well organized or well presented, and it lacked sound engineering judgment (it had questionable conclusions).
- D/F: Please, none nothing below a C.

{NOTE TO STUDENTS: if there is any word, phrase or description above that you are not 100% sure you know what it means, look it up ASAP. Some things you may not be familiar with may include: not-for-profit organization and non-profit organization (what are they and are they the same thing?), sub-Saharan Africa, mission statement. You may have encountered other words you not 100% confident about their meaning. You do not need to turn anything in for this, but this is something you should practice throughout your life.}

Details for the deliverables will be provided elsewhere.