

Lab #1 - Units and Teamwork

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Technical Objectives

In this lab, the goal will be to get acquainted with your classmates and the resources available with your computer lab. That means we are going to:

- *Recognize* resources available to undergraduate engineering students.
- *Brainstorm* ways to relate units to real world scenarios.
- *Estimate* based on known amounts of units.
- *Perform* unit conversions and calculations.

The Basics – CSU ENS

One of the interesting things about how CSU's *Engineering* network is setup is that you can log into any engineering computer and have the exact same computer session. We have our own IT department, **E**ngineering **N**etwork **S**ervices (ENS). You can think of this like google drive but instead of just having a document in the cloud, your entire Windows desktop session is in the cloud. This has some advantages and disadvantages. The good news is that you can *rely* on this account. CSU has good network security protocols in place to prevent hackers and they also regularly back up the hard drives. That means as long as your homework / papers / etc are stored on your U: drive, you are safe (and don't have an excuse when your homework is late). The downside is that all that safety means you have to jump through a few hoops to access this if you are off campus. Overall, it is worth your time to learn these tools and how they work.

Log into your **Engineering** account, which brings up the thin client home. If you do not have one set up, do so at (or google): <https://www.engr.colostate.edu/ens/info/accountinfo/>

Check that your thin client is mapped to the printers in the lab. You can map printers in other labs (if the one you are in has a broken printer). Find your printing credits.

Research virtual lab at (or google):

<https://www.engr.colostate.edu/ens/tools/virtuallab/>

Things to note about virtual lab:

You must either be connected to the [CSU network through a VPN](#) or be on campus. This will bring up the same thin client you are currently working on (can print, save to U drive, etc.) regardless of where you are in the world.

Open up your U drive and check it out at (or google):

<https://www.engr.colostate.edu/ens/how/connect/mapdrives.html>

Things to note about the U drive:

- You can access the U drive off campus by connecting to a VPN then mapping the drive. (Detailed information can be found on the ENS website).
- The U drive is backed up.
- It is **NOT** unlimited.

Finally you should note that ENS is a good resource and more can be found at (or google):

<https://www.engr.colostate.edu/ens/> As engineers, we have better resources than most other undergraduates on campus, so make sure to utilize this resource!

Teamwork Assignment – What is a Joule?

When you are instructed, your TA or LA will break your lab up into teams of two (or three). Your group will then select one item from the “box of real world items”. Your group will have to use that item to answer the questions “What is a Newton?”, “What is a Joule?”, and “What is a Watt?” You will get at most 15 minutes to answer these questions and the TA or LA will select two groups to present in front of the laboratory. You should be able to do this estimation without a calculator! *This is an estimation assignment.* The TA/ LA will record the answers on the board (ex: “one Joule is stretching this band ten centimeters”).

Estimations and Conversions

After the teamwork assignment, work with your team to answer the following questions. It may require you and your teammates to look up equations and concepts that were not explicitly covered in class. [Hint in brackets]

1. How much energy is lost over the course of 1 km to wind resistance travelling at 80 mph versus 50 mph on the highway if the difference in resistance is 2 N/m^2 . You are driving a large truck which has a profile of 3 m^2 in area. Give the answer in Joules.
[Work]
2. How many Watts are required to raise a baseball against Earth's gravity when a major league baseball player hits a home run? Assume a baseball has a mass of 150 g and it takes 1 second to reach a maximum height of 30 m. [Power]
3. What is the pressure applied to a surface if an object with mass of 5 kg is placed on a rectangle of area 10 mm squared? Use the appropriate prefix.
4. How many GJ (Giga Joules) are applied to a rocket over the first 50 ft with mass of 5,000,000 lbm? Assume the acceleration due to gravity over the 50 ft does not change.
5. What are the dimensions of flowrate if it is given in gal/sec (gallons per second)?
[acceleration in m/s^2 would be L/T^2]
6. Convert 28 mpg (miles per gallon) to m/L (meters per liter).

7. Darcy's Law characterizes the rate of flow of a fluid through a porous medium (like water through soil or a sponge). It is given as the following:

$$Q = -kAP/\mu L$$

Where Q is volumetric flow rate in L/sec, A is area in m², P is pressure in Pa, μ is viscosity in Pa-sec, and L is length in m. What are the units of permeability k?