This assignment comes in two parts. For both parts, you are allowed to consult with anyone you like, and you may use any reference materials.

*Back-of-the-envelope estimation* is a crucial engineering skill. Provide estimated answers for the following three questions. Show your reasoning clearly, be clear about the information required, and acknowledge all your sources. If you make a sketch to solve the problem, turn in the sketch.

1. Consider an electric generator that runs off compressed air, and imagine connecting it to a standard scuba tank in such a way that the diver would be able to breathe the air after it flows through the generator. How much useful electricity could such a device produce on the air used by a diver from one tank in a single dive?

2. Using two “D” cell batteries as the sole source of power, how much tea could you heat from room temperature to a desirable temperature for drinking?

3. Consider a bed of rollers that might be used as a gravity conveyor to move packages from a truck bed to the ground. Making whatever assumptions you want about dimensions and other parameters, how long will it take a package released from the top of the conveyor to reach the bottom?

*Solid modeling* is an important part of an engineer’s job, especially when working with industrial designers. This assignment is to determine your background in solid modeling. The department has Pro-E, but if you know another program you 1) should be able to learn Pro-E quickly, and 2) may use the other program for this assignment.

The assignment is to create the most accurate solid model you can of a push-pin (any push-pin is fine, but make sure you keep the one you use – it will be used for comparison to your solid model). It is not important that you get the dimensions exactly right at this point, but it is important that your model 1) look like the push-pin, and 2) be easily modified to the exact dimensions, if they are available.

Important Disclaimer: I am aware that some of you have not yet taken ME447, and that even if you have taken ME447, you may not have had to do anything like this. It is not necessary that you be able to complete this assignment at this point to contribute and do well in the class. This assignment has nothing whatsoever to do with your grade. Rather, it will be used to balance teams and to help me know what sort of instruction I will need to provide.
What if you have no clue where to start? Pro-E is a software program. It has tutorials, it has on-line help, and there are plenty of people around who can give you a brief intro, if you’re nice to them (I am off-limits in this regard!). If you have no background at all, see if you can figure out how to model something that looks kind of like a push-pin. I am assessing both your experience with Pro-E and your ability to learn it on the fly.

Access to Pro-E: Accounts will be set up as soon as possible for you to use the Pro-E on the computers in 1083ERF, and we will attempt to ensure that the lab is open and staffed for your use.

The back-of-the-envelope calculations must be submitted in hard copy, and indeed it is preferable that you turn it in exactly as you solved it. No electronic copy is required.

The solid model should be submitted electronically via ftp to design.me.uic.edu. If you use Pro-E, a part file is fine, if you use another program, use a standard format like IGES that Pro-E can use. Your file should be named following the conventions presented in class. In addition, please print and submit a hard copy of the best view of the part that you can get from your solid modeler. On this hard copy, please tell me your experience with Pro-E or other solid modelers (examples: “No experience”, “took ME447”, “6 months working with SolidWorks but no Pro-E”). Also note the amount of time it took you to do the assignment. All hard copy is due in class on Sep. 7, and all electronic files should be uploaded by that time.

This assignment is not meant to be burdensome. Spend a reasonable amount of time on it, and get the best results you can within that timeframe.