Final Project

The final project for this course will be a team based project where you design your own experiment and decide upon what you will be measuring. Some of the projects will be deployed in the field and thus there are variables which are difficult to control for which might make your final data collection fail. Some of the projects are challenging and the team may find more difficulties than expected. The following plan will allow you systematically develop and test an experimental platform such that you can still get an A on your project even if the world conspires against you.

The following plan will also allow you to complete a set of milestones such that you will have confidence that your system will actually work. Some of the projects require recording data over long periods of time, thus you want to be sure that everything works the first time.

All deliverables will be submitted as a team. In the end we will survey each team to make sure that the team feels the workload was balanced among the team members. Except in the case where there is evidence that the work was uneven among team members, all team members will receive the same grade for the project.

Week 1, Formal proposal

After your first week, your team will submit a formal proposal that will explain in detail, what you plan to do. The proposal should contain the following:

1. Executive summary. You should summarize in sufficient detail, what you hope to measure and how you plan to go about this. The summary should include general plans for system design, sensors, and experimental plan. This summary will be an elaboration of the pre-proposal that you submitted before spring break. The summary should clearly state what the objective is. How will we know if your project is successful?
2. System design. This section should clearly explain the system design. Be as specific as possible. This section should explain how the experiment as a whole will work, not just the electronics. This section may be longer or shorter depending on the nature of the project. You should include relevant sketches and drawings of any needed mechanical systems. You may use solidworks if appropriate or simply provide clear and neat hand sketches. You should also include details about any parts that are not standard and can easily be bought locally. Will you build everything on a protoboard or will you want a printed circuit board?
3. Safety and regulations. You should include any issues of safety which you may or may not have resolved at this time. For example, hooking up wires to human subjects requires certain fail-safes. Launching a weather balloon has many regulations. Please address any issues in your proposal. If you are unsure how to address them, just highlight the issues and we will help you.
4. Circuits. You should draw and explain any circuits that you will need to build. Your circuit diagram should include parts (e.g. op-amp LMC6484) and values (R=100 ohms). You may use the student version of PSpice (http://wb.olin.edu/mc/ecs/fall_09/labs/lab9/91pspstu.exe) use

LTSpice (http://www.linear.com/designtools/software/#LTspice), or sketch the circuits neatly by hand. You will also need to include details of how you will power your system.

5. Sensors and electronic components selected. You should provide a table of any parts/sensors you need purchased from Digikey. Include a simple table which includes Digikey part number, description, quantity, and price. We will order all the parts for all teams after you submit the proposal.
6. Testing plan. This section should detail how you plan to test your system before deploying it in the field. A logical thing to do would be to build all your circuits and sensors in the lab. You should test each measurement one at a time, carefully making sure each designed circuit is working. If you are doing a field measurement, you should then have a mock test that you can conduct on campus but closely resembles the final environment. This section is more critical for projects requiring field deployment or the use of a printed circuit board.
7. Experimental plan. This section should detail your final experimental plan. Questions you will want to answer are; How long will your test last? How much data will you record? At what rate? When will you conduct your test? What do you hope to learn?
8. Budget: Please include an approximate budget for your project. If you don't have exact prices for all the small components, you can estimate.

Proposals are Due April 3 and April 6 for the Tues and Fri sections respectively. This proposal will count for 25% of your final grade for the project. A perfectly executed experiment with no proposal cannot get an A.

Preliminary data report:

A report on your preliminary data is due April 17 and April 20 (for the Tues and Fri sections respectively). This progress reports will count for 12.5% of your final grade.

In the second and third week you should work to develop first a lab prototype and then a field prototype of your final system. Depending on your experiment, the details of this activity will vary. In the fourth week you should work to develop, test, and debug your final system and begin collecting your final data.

This report should briefly detail your progress to date. Please include photos of any hardware or circuits you have constructed, initial data from your prototypes that prove proof of concept, and any change to your plans that has come up due to challenges you may have encountered. You should certainly have some preliminary data at this time. These reports need only be a few pages to be effective, they are not a final report. You simply should provide us with evidence that you are making good progress on your project and tell us how you are meeting your goals such that we can help teams that might be encountering unforeseen difficulties.

Final report

Your final report will be due during the final week, on the day of our final, May 8.

Your final report should detail your final system and circuit design and experimental protocol in enough detail that a student wanting to replicate your experiment could do so. Please include pictures of your final experimental apparatus.

You should include a summary of your system testing and preliminary work detailing how you were certain that your final system would work.

Finally, you should include your final data and its interpretation.

If your experiment was not successful or original objective not met, then simply explain what went wrong. If you properly conducted all your testing, then a failed final experiment is not a project failure. Please explain what you would do differently if you had additional time.

The final report grade will be based on execution of the project and the writing of the report. A perfect project but poor report cannot get an A. Further, the degree of difficulty will be taken into account.

The final report is 67.5% of the grade for the project (the remaining components are the proposal and mid-term report).

Demo Day

The final for the course is officially scheduled for 8-11 am on May 8. During this time block (though only from 9:30-11:00) we will have an informal demo/poster day. On this day, we will set up on the fourth floor of the AC (in the classroom and out in the hallways). Each team will have some table space and will set up either a demo or make a simple poster based on their report. We will then have a chance to see what the other teams did and we will invite other students and faculty to attend. This is meant to be informal and fun, there should not be any serious additional work. The posters/demos are not graded. However, it will be a good chance for you to show us your project and give us the pitch in person before reading your report.