PG1 and PG2 for EECS 498: Design specification assignments

This document covers the first two project group assignments (called PG1 and PG2). These documents will be used to clearly specify the problem you are solving and the engineering requirements of that design. Large parts of these documents will be reused in your final proposal.

PG1 is due on Tuesday 9/18 by 10pm and, PG2 is due on Tuesday 9/25 by 10pm. They should be e-mailed to brehob@umich.edu and nashj@umich.edu as a pdf files. A team name, the names of all members the member's unique names should appear at the top of both assignments.

1. Project Group Assignment 1

For this assignment you will turn in a document with three sections.

1. A statement of purpose, also called a statement of "***design intent***"
2. A list of four to seven ***design requirements***.
3. A ***team agreement***.

In addition, you may find it useful to include a drawing or sketch of your product

Design intent

This section should generally be four to six sentences that describe the problem being solved. It should be something of an "elevator pitch" where you would describe to a potential investor or partner what your idea is and why it's interesting. It ideally includes the problem being solved, why your solution is interesting and (perhaps) why there is a market for your idea.

> **Automotive accidents are a leading cause of death in the United States, resulting in over 32,000 deaths in 2010, with over 1500 of those deaths blamed on drowsy driving. The automotive industry has long tried to use expensive sensors and GPS systems to build active safety systems which could reduce the rate and severity of accidents. We propose to build an active safety system for under $100, which, while not as comprehensive as more sophisticated systems, would still have a significant impact on accident rates by doing something as simple as alerting a highway driver they are approaching stopped traffic. Such systems could be easily retrofitted to older vehicles, creating a potentially enormous market as well as having a significant societal impact.**

Design requirements

This section will list high-level requirements of your system. It should largely avoid numbers, though in some cases numbers might be fundamental to the proposal. Some of these requirements will be basic functionality but others will include restrictions such as cost, power and weight. It may seem that numbers are *necessary* at this point, but try to think about the user's needs and where the requirements are coming from. For example "can easily and comfortably fit in a shirt pocket" is preferred rather than "less than 2cm square and less than 3oz". For a portable logic analyzer you might end up with:

- **Capable of monitoring a handful of digital signals and a couple of analog signals simultaneously**
- **Can observe even the highest speed serial buses and provides decoding of standard serial protocols**
- **Fits easily into a shirt pocket**
- **Cost comparable to USB logic analyzers such as Saleae's "logic" line**
- **Can display signals in an easy-to-use and interactive way including storing a useful amount of history.**

Group agreement

This section should include things like:

- How many hours/week are expected per person.
- When during the week each person is generally free and when they are not.
- When the team plans on doing most of its work.
- When and on what the team members will work as a group and when they will work individually.
- Who will be largely responsible for which tasks. This should include technical things (mechanical drawing, soldering, programming) as well as non-technical things (scheduling meetings, taking minutes, requirements gathering)
- Known conflicts that will take each person away from school for a while (interviews, family gatherings, holidays, weddings, MCAT, etc.) or other major class deadlines that will likely take a person away from the project for more than a day.
- When and where team meetings will be held. We recommend scheduling at least one non-work meeting a week to touch base and two might be better. Holding such meetings over lunch is often a good idea.

Each person should sign this section indicating that they have read and agree with it. Of course things will change, but changes should be either made with group consensus (moving meetings etc.) or made clear to the group as quickly as possible (leaving town for an interview, etc.)

2. Project Group Assignment 2

For this assignment you will turn in the first two parts of PG1 again. Any changes (and the explanation for those changes) are to be noted in an introductory paragraph.

In addition you will provide a set of ***engineering specifications***. These specifications *will* often involve numbers. You are laying out how you will know if your design is successful. This should be divorced from *implementation* issues. That is, things like "C5515 processor communicates with base station" wouldn't be a design criterion, but "vehicle's status reliably communicated to base station at highway speeds with less than 3 seconds latency" would be. This may include cost, power/energy or other things. But it should be about the *design* not the *implementation.* Criteria are ideally stated in very few words, but some may be multiple sentences. Generally engineering specifications should be clearly related to the design requirements and in some cases may be identical to a design requirement.

- **Can monitor six digital signals and two analog signals and is capable of displaying a least four signals simultaneously (no matter if analog or digital).**
- **Can monitor any digital signal which changes no more than every 100ns and uses TTL logic levels.**
- **Can sample analog values at a rate of at least 100kHz with no worse than a .05V resolution and able to handle any signal with no more than a 24V range.**
- **Weighs less than 3oz and is less than 2 inches by 2 inches by 0.75 inches.**
- **Can manage two hours of continuous use between charges after a year of daily use.**
- **Can display signals in an easy-to-use and interactive way including storing and being able display at least one second of data from all channels in all cases.**
- **Cost of less than $100 in quantities of 10,000.**

3. Final words

Both of these assignments should be quite short. We'd guess both will be close to two pages in length. But your group should work carefully on both of these documents, PG2 in particular. It is these requirements that you will be in part graded on. And while there will be room to change the specification as needed, the intent is that by the time these occur in your formal proposal (PG3) they will be very unlikely to need to change. In addition, your group agreement will end up being an extremely important document. Setting expectations for the group is really important. If someone has conflicts on certain days or weeks or times, you want that all hashed out now, not right before things are due.