ECE 491 Mechatronic Systems Design Laboratory

Project Proposal Guidelines

Due: Tuesday Feb. 14th, 2017 5:00 pm CST before start of class or in TA's mailbox

The purpose of the project proposal is to give you early feedback on your design ideas, to help to steer you away from some of the common design flaws. A good motto to keep in mind is "measure twice, drill once". The pace of the rest of the course is quite fast, and now is the time to plan what equipment you want, and where it should be mounted. It can be very difficult to try to squeeze in one more chip, or one more switch after your whole system has been constructed. The project proposal is a non-trivial amount of work; we would like to see 10h of effort per team member. Read the NXP cup rules, available on the class website. Here is an outline for you to follow:

1. Team Name (5%)

You need a name for your group (team) that captures the "spirit" of your group, and the strategy that your team pursues to win. Acronyms are fine, just make sure they are pronounceable.

2. Overall Strategy (1 page) (20%)

Think about "winning" strategies. A "winning" strategy is one which results in a functional, thoroughly tested, and reliable vehicle with a minimum of effort. Separately list essential and "would be great to have" features. A good rule of thumb is that that you would like to be 80% complete with 20% of time budget. Then you have time to solve the remaining hard problems.

Speed is important, but speed without stability and robustness won't get you far. Will your vehicle rely on raw speed, expert navigation, expert breaking, etc? How does your strategy affect the types of sensors and control strategies you will use?

List anticipated sensor needs and how they will be used. (**Estimate number of lines of digital and analog IO you will use**). Tell me whether you think you'll try to go for the NXP cup (this is not a commitment at all, but this may shape your strategy)

3. Hardware Design

3.1 Attachments to Vehicle (one page) (5%)

List every attachment (components) you anticipate adding to your vehicle. (You are not committing to add these components, just helps you to plan for leaving room for them if desired). Some possible things to attach: CPU board, IO board, battery pack, DC-DC converter, user interface, sensors, etc.

3.2 Detailed Mechanical Drawings of Vehicle (2 pages) (20%)

Draw a detailed layout of the vehicle with attachments from Section 2.1. Include dimensions of circuit boards and vehicle. Expected detail is to the level of screw holes for what you need to mount. Show location of flag mounting post, emergency stop switch, and battery pack. Can you change the battery pack without unscrewing anything? Are switches from power/reset/etc. readily accessible? Have you left room for expansion circuitry components if needed?

Include a labeled photo which indicates anticipated locations of your sensors, including speed.

3.3 List of Special Materials (1/2 page) (5%)

Do you need metal or plastic brackets? Metal or plastic plates? Special Switches or connectors? Do you plan to use a 3D printer? We will put together periodic class mail orders to Digikey.

3.4 Motor Drive Circuitry (1 page) (25%)

Show detailed schematic for your motor drive circuitry, including values and pin #s. Draw expected parts layout. Is there room for heatsinks?

4. Software Design (Confidential) (1 page) (20%)

Describe in some detail what you expect a good software strategy to be. How much effort do you expect will be extended on for example, precise steering, precise speed distance/velocity, error recovery? List those things you need to understand more completely before you will be able to design your software. State your assumption about what quality of sensors you are assuming. Make first pass, high-level block diagram of the software system. (A block diagram should show functional modules and their interconnection, **not a flow chart**)