ELEX 7660 : Digital System Design
2017 Winter Term

Project Guidelines

Project Proposal

By February 13 you must submit a multi-page project proposal containing the following:

Introduction explain why you chose your project. Provide links and references to background information and to similar projects.

Objective describe what you will demonstrate at the final demo (see below)

Diagrams use diagrams to describe the hardware and software components of your project. You may want to include scale drawings, schematics, flowcharts and any other graphic that helps describe how your project will be put together.

Parts List a list of parts that you will need to complete your project (see below) and projected total cost.

Schedule a list of of the things you expect to be able to demonstrate in each of the five weeks allocated to the project.

Remember that your proposal will be published. Do not include personal, copyrighted or proprietary information.

Working in Groups

Most engineering projects are done by groups of people. An objective of this project is to give you experience working in a small group.

At the start of the project you will want to:

- document who will be responsible for completing each task and by when
- arrange to communicate on a regular, minimum weekly, basis to review progress against your schedule
- arrange logistics: where will you store and/or work on your project? how will you share files?

You will be marked as a group. Invariably, some group some members will be able to contribute more than others. Don't let this bother you – do your best and take pride in your own work. Be flexible.

Demonstration

During the final lab sessions (April 7 and April 10) you will have 5-10 minutes to demonstrate your project to the instructor and the other students in your set.

While planning your project, decide on the features you will demonstrate and how you will demonstrate them. This could affect the features you decide to include in your project (e.g. battery life, demo track size, etc).

Scheduling and Milestones

You have 5 weeks to complete the project (March 3 to March 31 for Friday labs, March 6 to April 3 for Monday labs). You should be able to devote approximately 4 hours per week to the project.

Work backwards from your deadline to come up with weekly milestones (measurable indications of progress) that you will need to have accomplished each week.

If the schedule seems unrealistic, revise your objectives or look for other way to meet them. Allow time for mistakes. Do not commit to an unrealistic schedule. Extensions are not an option.

Include the delay to receive your parts in your schedule. You may want to think about out how to test your design before parts arrive (e.g. simulations, replace sensors with switches, etc.).

Although you will not be marked on meeting your milestones, it is strongly recommended you communicate or demonstrate to the instructor what you have accomplished each week. Get help if you are falling behind.

Ordering Parts

Use a copy of the spreadsheet on the course web site to list the parts you need to have ordered for your project. These will be ordered as a batch shortly after the due date for the proposal.

For each item you will need to add a row with the following columns:

- project group number,
- supplier name (the name in the Source of Parts document,
- part URL (formatted as a link),
- part description,
- quantity,
- unit cost, and
- extended Cost (as shown, probably in USD).

If at all possible, the part URL should link directly to the specific part so that the person doing the ordering only has to click on the link, enter the appropriate quantity and click on "add to cart."

If this is not possible, make sure the description has enough information that a search will find the part and that the desired part can be selected. Please be specific. The person ordering doesn't know what you need and has to process many orders – if the description is ambiguous the part will not be ordered.

You will not be charged shipping if the order is from one of the major suppliers listed on the course web site and you submit your spreadsheet on time.

If you miss the batch-order deadline you can still order parts but you will be charged shipping and it may result in an additional delay since routine orders are processed weekly.

After the parts are ordered you will be supplied with a tracking number you can use to estimate when the parts will arrive.

You can also purchase parts locally. Details TBD.

Autonomous Operation

If you want to use the FPGA board autonomously (not connected to a PC) you will need to supply it with power and a source of configuration data.

Consult the DE0-Nano manual (on the course web site) for external power supply requirements (3.6 to 5.7 VDC) and connector pin-outs.

You may re-program the on-board EPCS64 configuration memory with your design (the configuration file must be less than about 64 Mbits). See the Appendix (Chapter 9) in the DE0-Nano manual for instructions.

Restrictions (or strong recommendations)

Solderless breadboards are unreliable. Don't bet your project on components staying plugged into your breadboard. They are also not designed for high currents. Your project should use soldered connections and/or appropriately-rated connectors.

The following additional restrictions apply to projects using external power supplies or inductive components (motors, solenoids, relays, etc.) since these increase the risk of damage to the FPGA.

- If using external power supplies your proposal must explain, if applicable, how you will sequence multiple power sources and how you will interface different logic levels.
- If you are driving inductive loads your proposal must explain how you will deal with the back-EMF generated when switching the current off.
- The instructor will help you conduct a design review before ordering parts and will help you test your interfaces before the FPGA is connected.
- Use of optoisolators is a good idea when high voltages/currents are involved.