**Preliminary Design Specification Assignment (500+ new words)**

**Section 1 – Technology Review**
For this section, gather information from all project member Technology review papers and combine into one single document. You would not repeat all text, but instead combine concepts and thoughts into one single version. In section 1.4, you only need to include 25 engineering requirements but please ensure the 25 you choose do not repeat. Make sure all ERs are measurable with numbers! You can use the description from the Tech review assignment to ensure this section is well done. Additionally, every requirement with a number needs a realistic tolerance such as ‘plus or minus 10%’ or ‘at least 5V.’

**Section 3 – Design Possibilities**
List the top three different approaches that could have been taken to implement the project. For each approach, tell why it was or wasn't chosen with reference to the customer requirements. You should list the entire approach, and how any differences would affect the entire system operation. Simply changing one block alone is not a different implementation. The purpose of these design solutions is to stretch the boundaries of the design, so choose ‘vastly’ different implementation approaches to compare. Spend at least 200 words on each design possibility. For the possibility you have selected as the approach you will take be sure you spend at least 400 words on it.

For each of the three options, include a narrative of how the system fits the customer requirements. Explain how the system/project would be used or executed as applicable. Talk about the complexity of the design as a whole and the benefits or costs of each one versus the other.

**Section 4.0 – Block Diagram and Interface Definition** – In this section you need to include 2 images and 2 tables. Both of these images and tables should be shown when clicking the menu link ‘’ on your Google Site. One image should be of the black-box (a single block) representation of your system. Include all interfaces. The second image will be a block diagram containing 9 to 12 blocks showing the internals of your system. Be sure this diagram has an enclosure/case block and one or more ‘code’ blocks as needed by your design. When drawing the blocks for this and other block diagrams, please use black and white drawing with minimal color. Do not use background images. Please use only ‘plain’ arrows; this is not a marketing pitch.

After each image there should be an associated interface definition table. The table should include all interfaces for the image. When filling in an interface definition table, be sure to include the exact name of the signal on the diagram, what type the signal is, and all of the pertinent details. Each interface should have a unique name unless it is the same as another interface. Table 1 gives some examples of details for various signal types.

<table>
<thead>
<tr>
<th>Type</th>
<th>Possible Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Sensor Output</td>
<td>Voltage Range (V), Response Time (Hz), Current Loading (A), Signal Meaning (e.g. 0V is no light and 5V is 1000 Lumens)</td>
</tr>
<tr>
<td>Digital Signal</td>
<td>Signaling Voltage (V), Edge Rate (Sec.), Max Current (A), Active high/low</td>
</tr>
<tr>
<td>DC Power</td>
<td>Voltage (V), Allowable Ripple (Vpp), Max Current (A), Continuous Current (A)</td>
</tr>
<tr>
<td>AC Power</td>
<td>Voltage (VAC), Frequency (Hz), Max Current (A), Continuous Current (A)</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>Signaling Voltage (V), Speed (bps), Protocol (I^2C, SPI Mode 2), Known Commands (Run is 0x00, Stop is 0x01, etc...)</td>
</tr>
<tr>
<td>Motor Output (Mechanical)</td>
<td>Max Torque (ft*lbs.), Speed (RPM), Shaft size (in.), Power (hp)</td>
</tr>
<tr>
<td>Programming (for Code Blocks)</td>
<td>Method (e.g. JTAG), Voltage (V), File type (e.g.</td>
</tr>
</tbody>
</table>
Submission:
To turn in the preliminary assignment, please be sure that it is completed on your Google Site by the deadline. The grading TAs will clone your site and review it as it existed when the assignment was due.
### EVALUATION RUBRIC FOR PRELIMINARY SPECIFICATION

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Sophisticated</th>
<th>Competent</th>
<th>Unsatisfactory</th>
</tr>
</thead>
</table>
| **PROJECT INTRO/ TECHNOLOGY REVIEW** *(40pts)*  
Section 1.1-1.3  
Score: ____ | Project description provides a clearly worded discussion of what the project entails and substantial evidence that the group clearly understand the project. All suggested changes from previous submissions have been addressed. | Most significant requirements are listed—enough to describe basically what is needed from the project. May appear that the group is just rewriting comments obtained from discussions with faculty advisors or sponsor mentors. Little or no discussion of the significance of the project is provided. All suggested changes from previous submissions have not been addressed. | Description is incomplete, significant aspects missing, and what actually needs to be done is not clear. Little evidence that the students actually understand the project is provided. All suggested changes from previous submissions have not been addressed. |
| **ENGINEERING REQUIREMENTS** *(60pts)*  
Section 1.4 | **Customer requirements** and at least 25 associated engineering requirements are included. The list of requirements is comprehensive and complete and fully defines what is needed from the project. Every engineering requirement is abstract, verifiable, unambiguous, and traceable. (Section 3.2 of textbook) | **Customer requirements** and at least 15 associated engineering requirements are included. —enough to describe basically what is needed from the project. Some engineering requirements are not abstract, verifiable, unambiguous, or traceable. (Section 3.2 of textbook) | **Customer requirements** and associated engineering requirements are mostly vague and incomplete or there are less than 15 in total. Requirements do little to actually describe what is needed from the project. Engineering requirements are not abstract, verifiable, unambiguous, or traceable. (Section 3.2 of textbook) |
| **DESIGN SOLUTIONS** *(60pts)*  
Section 3  
Score: ____ | Multiple possible solutions are described fully and completely. Several of the designs are feasible and could potentially solve the design problem. A final solution is present and supported by a short feasibility analysis. | Multiple possible solutions are described, but the reasoning behind selecting or deselecting them is not clear or could use elaboration. An intended solution is evident, but not supported. | No final design solution is suggested, or reason behind decisions is not presented. No other possible solutions are discussed. |
| **BLOCK DIAGRAM** *(100pts)*  
Section 4.*  
Score: ____ | Block diagrams are excellent. Adequate number of blocks exist, all signals (internal and external) and connections are defined (mechanical, electrical, and programming). Signal definitions are in a tabular format and are complete. All signals are fully defined. | Block diagrams include an adequate number of blocks, and at least in includes two of; all external connections are defined, all internal lines with protocols are defined, blocks cover adequate scope for beginning design e.g. no further decomposition is required. | Block diagrams are missing or is unsatisfactory. |
| **ORGANIZATION** *(20pts)*  
SCORE: ____ | Text contains effective sequencing and paragraph breaks, and the writing is easy to follow. A strong introduction draws the reader in, and a strong conclusion provides a sense of closure. Writing includes smooth, effective transitions among sentences, paragraphs, and ideas. | Attempts at sequencing and appropriate paragraph breaks are evident, but the order or relationship among ideas may occasionally be unclear and hard to follow. The introduction and/or conclusion are weak or underdeveloped. Some transitions work well but others are stilted and formulaic. | Without effective sequencing and paragraph breaks, the text lacks coherence and the organization seems haphazard and disjointed. An identifiable introduction and/or conclusion have not been provided. Transitions between sentences, paragraphs, and ideas are largely missing. |
| **CONVENTIONS** *(10pts)*  
SCORE: ____ | Writing demonstrates control of standard writing conventions (punctuation, spelling, capitalization, grammar) and uses them effectively to enhance communication. Errors are so few and minor that the reader can easily skim over them unless specifically searching for them. | Writing demonstrates partial control of standard writing conventions (punctuation, spelling, capitalization, grammar). Significant errors do not occur frequently. Minor errors, while noticeable, do not impede readability. | Writing demonstrates limited control of standard writing conventions (e.g., punctuation, spelling, capitalization, grammar and usage). Errors impede the text’s readability. |
| **CITING SOURCES** *(10pts)*  
SCORE: ____ | All borrowed material has been acknowledged with specific in-text documentation. Each section contains a bibliography that lists all sources cited in section. References and bibliography adhere to IEEE style guidelines. | Cited sources may consist of only web sites, significant claims in the text are not referenced. |