ME213: Introduction to Engineering Design
Spring 2021
Group Assignment #4: Solution Implementation (or PDR) Report
Due: Tuesday, April 6, Beginning of Class

Directions
Generate a preliminary design report. Utilize the work you have been doing on your solution implementation and detailed design and create a formal report. Copy your concepts report (stored it in your “Project” folder) and name the copy “me213-2021s-pdrReport”.

Add “Part 3” to the report with the following sections. Add the appendices after the bibliography; each new appendix should start on a new page. Use the same formatting and general tips as the proposal report. Start Part 3 on a separate page. The bibliography should still be at the end though. I.e. (Title, Part 1, Part 2, Part 3, Bibliography, Appendix A, Appendix B).
Part 3: Engineering Analysis & Preliminary Design

3.1. Engineering Analysis
System Modeling for Key Requirements

**3 pages max, with diagrams and equations.** Create a model to calculate the kinematic motions, forces/torques, power, and etc. required for the key elements of your system. Include the governing equations behind the model. Describe the meaning (including units) of each variable in your system, including any factor of safety. Include all entered numerical quantities and clearly mark your results.

**Note #1:** For the figure, use a computer-generated image and labels (i.e., no hand-drawn portions). Center both the image and caption. Be sure your figure numbering starts after the last figure you had in the last part of the report.

**Note #2:** Step-by-step numerical calculations are not required. Just show complete equation inputs and then results.

**Note #3:** Just as with anywhere else in these report assignments, if you rely on any outside sources for information on your calculations or variables (e.g., equations, variable values), you must cite them properly.

3.2 Preliminary Subsystem Designs

**1 page max, per subsystem.** Create an entry for each subsystem as below:

[Subsystem Title]
Restate the objectives for the subsystem (i.e. remember to do iterative design loops – define, generate, implement, test), and provide a short physical description with all key components (include specific models/manufacturers for purchased products). Include a detailed image/drawing of the subsystem. Make note of any new or updated requirements that you have found based on your preliminary design and analysis with the other subsystems (e.g., mass target, power draw/generation, cost).

**Note #1:** For the figure, use a computer-generated image and labels (i.e., no hand-drawn portions). Center both the image and caption.

3.3 Preliminary Manufacturing, Assembly, and Testing Plans

[Subsystem Title]
Create a step-by-step description of how you will fabricate each part of the subsystem, followed by steps to assemble them together into the complete subsystem. Include images and text to describe the procedures, equipment and tools required, and operational settings (e.g., RPM, feed rate). Your goal is to produce directions clear enough to be interpreted and acted upon by any undergraduate mechanical engineering student (picture yourselves back at the beginning of the semester). Format your figures according to examples presented in lecture (subsequently posted on Laulima for your reference).
Note #1: While you may use CAD models to illustrate the manufacturing process for each part, it may be easier to use 2D line drawings (as in the example presented in class). Photo realism is not required here; it may be more effective to use simpler images to convey what to do.

Note #2: It’s ***highly*** recommended that you create your CAD models for each part and assembly *before* showing the assembly process, since generating your figures for this portion of the report will be much easier.
Appendix A: Initial Bill of Materials (BOM)

No page limit. Create a formal “report quality” version of your buy list. Create a table with your desired items for each vendor, as shown below. After you complete this assignment, you will submit your BOM tables as spreadsheets to the ME department for purchase.

<table>
<thead>
<tr>
<th>Vendor X</th>
<th>Item Name</th>
<th>Vendor Description</th>
<th>URL</th>
<th>Quantity</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxx</td>
<td>xxxx</td>
<td>xxx</td>
<td>xxx</td>
<td>xx</td>
<td>xx</td>
</tr>
</tbody>
</table>

Subtotal: xx

Shipping: xx

Total: xx

Est. Shipping Time: xxx

Note #1: Don’t forget commonly-overlooked items, such as fasteners (nuts, bolts, washers, etc.), mounting brackets, and wire.
Appendix B: Current Work Period Project Management

1-2 paragraphs max. Describe your team’s project management strategy for this portion of the project. Include details about how you decided to divide up your labor, such as whether or not you portioned out work based on subsystem or discipline/specialty. Explain why you chose to organize your work the way you did. Describe any unexpected challenges you encountered that may have required revision to your plan along the way (e.g., new discoveries that caused major design revisions and unexpected work). Finally, describe any changes that you may make in your work distribution in the future (e.g., moving electronics design work from one person to another who may have more time or experience).

1-2 pages max. Create a Gantt chart similar to the one shown below for each teammate, detailing all design work performed for this portion of the project. Be very specific in describing the individual tasks performed by each person, and be honest in how much time you actually spent. Your goal here is to show that effort was distributed both logically and equitably amongst the team.

<table>
<thead>
<tr>
<th>Team Member X</th>
<th>Wed (9/19)</th>
<th>Thurs (9/20)</th>
<th>Fri (9/21)</th>
<th>Sat (9/22)</th>
<th>Sat (9/29)</th>
<th>Sun (9/30)</th>
<th>Mon (10/1)</th>
<th>Tues (10/2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Research</td>
<td>1 hr</td>
<td>1 hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAD Modeling</td>
<td></td>
<td>1 hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report Writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.5 hr</td>
<td>0.5 hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note #1: This is not a competition. A large number of hours does not automatically translate into a better grade here.

Note #2: Review these Gantt charts with your teammates for potential clues about how to distribute work more evenly/logically in the future. Was someone able to complete their chosen assignment, but only after spending an inordinate amount of time on it? Might that person be better allocated to a different area of the project?