EE/CME 495 Interim Project Report

Due: Dec 5, 2019 at 11:59PM
(hand in on course website)

Assignment Description

Overview

This assignment requires you to generate a report summarizing the progress of your design team throughout the first term. It is expected that you have been following the steps in the engineering design process that have been discussed in class. Your interim report should include the outputs from the following early stages of the engineering design process:

- Problem description
- Requirements specification
- System alternatives
- System design
- System test plan
- Project planning

The following sections describe the expectations for each of these items in detail.

Problem Description

A high-level definition of the problem you are attempting to solve should be included in the report. Note that this portion of the report will not be marked and is included for reference purposes, so it is expected that the description generated for the first assignment (with suitable modifications to address any concerns raised by your supervisor) can reused here.

Requirements specification

The requirements specification builds upon the problem description by defining a set of specific detailed technical objectives for your design. As discussed in class, the ideal format for the requirements specification includes two components.

1. **Table of requirements:**

   The table of requirements lists the requirements for the design in a clear, logical, easy-to-read format. As discussed in class, the items in the table should be specific, measurable, realistically achievable, independent, and necessary. Note that by this stage of the design, you should have conducted sufficient analysis to make decisions on any "nice to have" targets for your design. As such, there should be relatively few (if any) targets (as indicated by the word "SHOULD") in your final requirements specification as reported here.

   Each item in the table should have a unique identifier for easy reference throughout the report.

2. **Justification:**

   Requirements are critical to any engineering design and should not be chosen haphazardly. The justification section describes the reasoning and analysis which went into the selection of the above requirements. This may include references to existing products or datasheets, records of discussions with your customer, and the results of any calculations, simulations, or experiments that were conducted in order to help choose your requirements.

System alternatives

The system alternatives section of the report describes the process followed to generate alternative designs, analyze the alternatives, and ultimately select a system level design. The main components of this section of the report are:

1. A brief discussion of the methods used to generate alternatives.

2. Descriptions of the three system level designs that were selected for deeper analysis. This should include rough block diagrams of the three options.

3. Analysis of the three candidate system level designs. This should include consideration of each candidate design from the following perspectives: ability to meet the technical specifications, economic considerations, environmental considerations, safety considerations, project timelines, and project risks.

4. A discussion of which candidate design was chosen and why. No specific method of making the decision is required, but you must be able to justify your selection to a skeptical audience.

System design

The system design section of the report describes in detail the high level design that was chosen in the system alternatives section, including the following:

1. A detailed block diagram showing each of the subsystems in the design and the signals and interfaces between subsystems.
2. A description of the functionality, inputs and outputs, and requirements for each subsystem.

System test plan

The system test plan consists of a series of tests which describe the process that will be followed in order to determine whether the final design has met the system requirements. Note that the system test plan should test the system as a whole, not the individual subsystems. Each system requirement should be covered in the system test plan.

Ideally, each system test should have a clear, reproducible, and unambiguous procedure, a listing of the required equipment, and a description of how the results will be interpreted. For complex tests, a diagram illustrating the connections between the system and any test equipment may be helpful.

Project planning

The project planning section of the report should include the following:

1. A Gantt chart / project schedule listing the milestones and task assignments for the remainder of the project. Now that the system design has been selected, it should be possible to break down the detailed design, system integration, and testing tasks.
2. A rough parts list and parts budget for the design. If your design is to be produced at scale, include cost estimates for both the prototype units and the production units. You may wish to include price quotes for required parts in an appendix.
3. A summary of the number of hours spent on the project thus far and the projected hours for the second term.
4. A breakdown of the overall project development and prototyping costs (assume appropriate wages for engineering staff).

Rubric / Marking scheme

This assignment is worth 20% of your final grade. It will be marked out of 20, with marks assigned to the individual sections of the report as follows:

Problem Description

No marks, section included for reference only.

Requirements specification

Marked out of 5, as follows:

Mark	Description
4-5	Requirements clearly stated in an easy to read fashion; stated requirements cover all key aspects of design; requirements are logical and well justified through analysis;
3	Some requirements missing, unclear, or unrealistic; insufficient justification for how requirements were chosen;
1-2	Significant flaws; many required elements missing or poorly done
0	Requirements specification not present

System alternatives

Marked out of 4. One mark is allocated for health, safety, and environmental consideration of the design alternatives:

Mark	Description
1	Thoughtful and realistic consideration and analysis of health, safety, and environmental implications of design alternatives;
0.5	Limited or inappropriate consideration of health, safety, and environmental implications of design alternatives
0	No consideration of health, safety, and environmental implications

The remaining three marks will be assigned as follows:

Mark	Description
3	Realistic design alternatives generated and considered; design alternatives analyzed thoroughly to assess technical, economic, and project management strengths and weaknesses; solid justification for selection of final design
2	Some unrealistic or infeasible design alternatives analyzed; some analysis incomplete or incorrect; weak justification for selection of final design
1	Significant flaws; many elements missing or poorly done
0	System alternatives section not present

System design

Marked out of 5, as follows:

Mark	Description
4-5	Clear and complete block diagram illustrating system design; logical explanation of overall system operation; reasonable partitioning of design into subsystems; functionality of each subsystem clearly defined; interfaces between subsystems explained in detail
3	Some elements missing from block diagram; explanations of operation of overall system and individual subsystems not sufficiently clear; some interfaces or subsystems missing or not well defined
1-2	Significant flaws; many elements missing or poorly done
0	System design section not present

System test plan

Marked out of 4, as follows:

Mark	Description
3-4	System tests adequately verify requirements are met; clear and unambiguous test procedures are provided; block diagrams and equipment lists provided where appropriate;
2	Requirements not adequately covered by tests; some test descriptions are vague or do not contain sufficient detail; some equipment or facilities required for tests not realistically available
1	Significant flaws; many elements missing or poorly done
0	System test plan not present

Project planning

The project planning section will be marked out of 2, as follows. Note that your supervisor may also take into account the material included in this section when assigning your term 1 grade for project management.

Mark	Description
2	Detailed list of upcoming tasks for remainder of project; reasonably complete parts budget for prototype units and production units, considering scale of production; thorough and realistic budget for overall development
1	Some elements described above missing, incomplete, unrealistic, or poorly done
0	Project planning section not present