INSTRUCTIONS FOR THE PROBLEM STATEMENT

Your project will begin with the *Problem Statement*, which (1) summarizes the team's complete understanding of the engineering design problem at the heart of its project, and (2) presents a detailed and technical list of specifications any solution to that design problem must meet. The best way to think about this document is that it is a *complete* documentation of all the knowledge your team has needed to obtain—by speaking to your Mentor and any corporate sponsor, as well as by conducting other research—in order to understand fully the challenge set before you.

Submission

You will submit the *Problem Statement* in two stages: **a *preliminary* submission** and **a *final* submission** (see the Schedule for due dates). After the preliminary submission, you will receive detailed feedback—but no grade—from your TAs. You will use that feedback as you revise the document for the final, graded submission. This approach allows all teams to receive extensive feedback on their writing from their readers before receiving a grade. *You will not follow this two-stage approach for any other reports in senior design, so use this opportunity wisely.*

Report Format

The *Problem Statement* will follow the memo format. For all formatting requirements, see General Style Guide in the EE 364D/E Course Guide. The body of the report should be 6 to 10 pages of text, with extra space allowed for figures, tables, references, and any appendixes.

Content

The outline below covers the essential topics of the document but does not prompt you for every supporting detail, or even every significant topic—every project creates its own relevant ideas. **The team must determine the supporting content appropriate to cover those topics sufficiently, and the most logical organization of those ideas**. Your job is to create a document that encapsulates those important ideas for your project for a diverse set of readers—some with specific technical background, and some without.

In addition, remember to use your introductory content (the Introduction, introductory paragraphs, and topic sentences) to share important information with the reader: present your content itself in summary form rather than taxing the reader's patience with a vague list of topics to be covered.

INTRODUCTION

Orient the reader to this document by including the following:

- A clear statement of the purpose and context of the document
- A clear, concise, and comprehensive summary version of the document's content (i.e., it's ideas, not simply a list of the topics it covers).

In developing the introduction, keep in mind that an engineer unfamiliar with your project and plans should be able to quickly understand your project from this introductory section.

DESCRIPTION OF THE DESIGN PROBLEM

The goal of this section is to provide a clear, concise, and *complete* explanation of the engineering problem you must tackle. By putting the ideas into your own words, you can demonstrate to your reader (and yourself) that you understand the challenge before you.

You must give readers with and without a strong background in your area of expertise a clear sense of what a design solution must accomplish and why it is important. Remember that the design problem you are addressing is not simply an end product or its function; it is the full set of challenges you face in achieving that product or function. Ask yourselves what the purpose of the eventual product or system is, why it is important, who the target users are, and what you need to know about the client's domain to understand the dimensions of the problem clearly. Doing so means asking many questions of your Faculty Mentor and/or industrial sponsor, as well as conducting background research.

Note: *The length of this material may vary across teams, depending on the project.* ***Teams will likely require subheadings to organize the information.***

At the minimum, this section must contain the following information:

- **Problem Background.** *Any* background information you, or others associated with the project, need to know to fully understand the purpose of the project
- **Stakeholder Needs Analysis.** A non-technical, bulleted list of the key stakeholder needs that will be satisfied by the product or system. Each need should be stated in such a way that you can turn it into a detailed, quantifiable specification later in the document.
- **Design Functionality.** An overview of the function(s) your design will perform, understandable to someone who is not an expert in your technical area. What is the scope of the design? It is often useful to tell what it "is" and also what it "is not" in order to determine the project scope. Be sure the boundaries of your project are clearly defined.
- **Relevant Standards.** Discuss any standards you have researched that may apply to any solution to this design problem.
- **Use Cases.** Describe one or more use cases that show how a user (actor) would interact with the product to have his or her needs fulfilled. For example, a security system user might be a different use case from someone acting in the role of a system administrator.
- **Ethical Considerations.** Discuss the key ethical considerations raised by this specific design problem and what obligations your team bears as a result. Possible topics include but are not limited to the following:
    - Health and safety
    - Environmental impact or sustainability
    - Privacy or data security
    - Intellectual property

Consider that your project area may raise specific issues not mentioned here, so be thoughtful in assessing the potential impact of your design.

- **Project Deliverables.** Describe the end items the team will deliver to the Faculty Mentor and any industry sponsor at the end of EE 464. You should be specific enough that you promise something concrete to your sponsor and/or Mentor but not so specific that you are already proposing a specific design solution.

REQUIREMENTS SPECIFICATION

The requirements section catalogs all of the specific criteria a successful design must meet. It is a translation of the ideas in the previous section into engineering terms, answering the following question: How will you know when the design of your project is satisfactory and the project is finished? Because this information is usually a compilation of specific data, the best sections (and subsections) usually contain a table (or, in some cases, a figure), preceded by a short introductory paragraph.

At the minimum, this section must contain the following:

- **Inputs and Output Specifications.** Introduce and provide an input/output (I/O) diagram, as well as tables listing, describing, and setting values for all relevant specifications for inputs and outputs *to your system*.
- **User Interface Specifications.** For each required user interface, introduce and provide a table listing, describing, and setting values for all relevant specifications.
- **Operating Environment Specifications.** Introduce and provide a table listing, describing, and setting values for all environmental conditions in which any design solution *must* operate. For projects with substantial software components, describe the computational, software, and network environments in which the team must implement the design.
- **Performance Specifications.** Introduce and provide a table listing, describing, and setting values for all testable performance parameters. (You will develop a plan for exactly how to test these specifications in a later document in EE 464.)

TEAM QUALIFICATIONS

Describe your team members' qualifications for solving this design problem. Identify the specific contributions to be made and the work for which each member of the team will be responsible. *In the form of a table*, list each team member by (1) name, (2) planned contributions, (3) areas of expertise, and (4) related course work. Indicate in which semester you will implement this plan in EE 464.

CONCLUSION

Briefly review the contents of this report—for a manager who may read nothing else—by providing a short review of the ideas in this report that you want the reader to remember. Restate the purpose of the report, and summarize the most important information you have covered in terms of how it addresses that purpose. Conclude by stating what this information means for your project as well as a clear indication of what comes next.

REFERENCES

Use of references is REQUIRED in your document, and you must list all references cited in the text. As stated above, this course uses the IEEE reference style.

APPENDIX A: APPLICABLE STANDARDS

Inclusion of this appendix is REQUIRED. All projects are affected in some way by regulations and standards. In this appendix, you need to provide information about government and industry standards will affect your design decisions. Be sure to reference this appendix (or these appendixes, if you determine more than one is needed) at an appropriate point in the main document.

Note that the sequence of page numbers in the body of the report continues through your appendixes. (This numbering system is different for longer reports, such as the final report.) Appendix pages do not count toward meeting the page-total requirement.