[This document describes the final written report required for your Senior Design(ECE/COE 1896) project. Use this template as a format for your report. Delete/Remove sections that do not apply to your project. Do not change the formatting in the template.]

[Editorial comments appear in this style (italic blue font in brackets, hidden font) and will not normally print with your document. You may delete the editorial comments after you understand them.]

ECE/COE 1896

Senior Design

<*Project Name*> Conceptual Design

Team#

Prepared By: (Team Member Name)

(Team Member Name)

(Team Member Name)

(Team Member Name)

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[If necessary, insert a blank page after your Table of Tables to make the front matter end with an even page. You should be able to print your final report double-sided and have the page numbers appear as they would in a book.]

[The following sections must be included in your final report. You may add sections or subsections to suit the needs of your project, but do not omit any of the sections provided here, unless instructed to do so. Follow the instructions and examples in each section to build your report. If you insert material from other sources, make sure the format is consistent with this document’s original format. If you have trouble with the formatting, please consult your course instructor.]

# Introduction

This section should contain a brief overview of your project. In this section you should describe the problem that your design will solve or unmet need that it satisfies. Also include a high-level description of the prototype you will deliver. (~1 page)

# Background

This section should provide background information that will be important for understanding the problem and your proposed solution. For the problem, what areas of knowledge (science, health, economics, engineering, etc.) are important for understanding the problem, and the need for your design? Why is a better solution needed? You should provide background information on these topics, with appropriate references. For example, if your project were intended to make bicycling safer for commuters, you would include a few sentences about how many people commute by bicycle, how many bicyclists are injured each year, and what factors contribute to the safety problem.

You should also include background information that is relevant for your solution to the problem, also with appropriate references. For example, if a critical part of your design involves using ultrasound to measure the distance to something, then you should include some basic information about ultrasound, and how it is used to measure distance. You should also include information about the state of the art for this problem. What other solutions currently exist, and what have others tried (possibly including notable failures)? What is unique about your design? (~2 pages)

# System Requirements

Describe the requirements for your system. Explain how your customer will use your system and the detailed requirements. Be clear in distinguishing between features the customer *requires* and features the customer *desires*. Note that the operative term is “**detailed requirements**”. The report should not only state what the requirements are, but in separate paragraph following the requirement statement describe details of and/or justifications for the requirement.

In this section and the other sections that follow, you may use subsections, sub-subsections, and sub-sub-subsections to organize your work. When you use subsections, make sure you use the proper formatting styles defined with this document. Do not type the section heading and then manually adjust the format to match. You should use the Styles and Formatting window (available under the Format menu) to select and apply the appropriate style to each heading type.

## Example Subsection Heading

The above is an example of a subsection heading. Note the numbering and font size.

## Another Example Subsection Heading

Above is another example subsection heading. The following two sub-subsections and their corresponding sub-sub-subsections are further examples. Note the formatting, and that there are no blank lines inserted for spacing purposes. The formatting will automatically space paragraphs and headings correctly if you apply the appropriate formats.

### Example Sub-subsection Heading

Text for the sub-subsection.

### Another Example Sub-subsection Heading

Text for the sub-subsection.

#### Example Sub-sub-subsection Heading.

Text for the sub-sub-subsection.

#### Another Example Sub-sub-subsection Heading.

Text for the sub-sub-subsection. If you require more than four levels of headings, please consider revising your report to streamline the presentation.

# Design Constraints

A constraint imposes a limitation on some aspect of the system. A design constraint will impose limits on the options that are available to a designer of a solution by imposing immovable boundaries and limits (e.g., the system shall incorporate a legacy or provided system element, or certain data shall be maintained in an online repository). Design constraints can also include physical constraints, cost constraints, and schedule constraints. A physical constraint will impose a limitation on weight, volume, and dimension applicable to the system elements that compose the system. A cost, schedule constraints impose limitations on project cost and schedule. List the design constraints for this project. Also include non-technical constraints. Engineers should be able design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. You must include at least three constraints besides the time and budget constraints imposed on the entire class.

## Constraint

Constraint text.

## Constraint

Constraint text.

## Constraint

Constraint text.

# Conceptual Design

A key idea to focus on for this section is “function begets form”. This philosophy is that the functions the system provides for the customer will influence/determine the form of the solution. By “form”, we mean physical structure. There are two parts to this section – what the system must functionally do for the customer and conceptual design ideas that accomplish the objectives. Here, apart from the requirements, you describe the functions your system must perform (i.e. what your system must do) to satisfy the requirements. Following the functional description, describe your design concepts. You may also need to justify your choices. Use subsections to describe each design aspect. Include plenty of figures and diagrams. This conceptual design should be specified in enough detail that somebody else could take your design plans and implement a prototype. Be specific, list actual parts and components where appropriate. At this stage of the design process you may not know how you will implement a particular subsystem or component in the final prototype, but you should be able to list specific options.

## Design Concept

[You may delete all of the following examples from your final report. You may want to keep the examples in your report until you are done to use as references or templates to cut and paste.]

You will use figures in your report. The following graph, see Figure 1, is an example figure. The figure is centered on the page and has a caption directly following it. Insert captions using the References tab. In the Captions group, select Insert Caption and then click OK. After the dialog box closes, type the figure title after the figure number you just inserted.



Figure 1: Concept Car.

In your written text, you should refer to every figure in your report. To insert a reference to a figure, use the Insert menu, select the Reference option, and then the Cross-reference option. Choose the type of item you want to refer to and the style (typically “Only label and number” for the “Insert reference to” option). Select the appropriate caption and click insert. This approach will automatically correct your cross-references if you later insert additional figures.

# System Test and Verification

Include preliminary test plan. Specify key performance criteria that are measurable and how you will test these criteria (specify at least 3, you can include more if necessary). Saying that the prototype simply ‘works’ or ‘doesn’t work’ won’t be good enough. Your test plan is how you verify all of the requirements. List the expected/desirable test outcomes and materials/equipment that you made need to carry out your plan.

## Software Systems

Analytical, Type-1, and Type-3 tests

## Hardware Systems

Analytical, Type-1, Type-2, and Type-3 tests

# Team

Describe the composition of your team, the skills that each team member brings to the project and the division of labor. Everyone must assume sole responsibility for at least one aspect of the design. Your grade will primarily be a group grade and you are expected to work together and assist one another. However, you at the end of the semester you will receive an individual grade based on your individual roles. Roles are subject to change as the semester move forwards, however, roles cannot be ambiguous or vaguely designed

# Schedule

Insert a schedule for your project. Describe in detail what you will accomplish each week between now and the end of the semester. Your first graded checkoff will occur shortly, after that checkoff you will be evaluated/graded on your progress every other week.

* In addition to a schedule, list the items you plan to aquire for your initial order
* Provide proper justification for your order and explain how it moves the project forward.
* You have a nominal overall project budget of about $400. .
* After the 1st checkoff, you will be given an opportunity to re-evaluate your schedule and be given the opportunity to order more/different parts. You do not have to order all of the items you may need for your prototype now, especially if you wont make use of them over the next two weeks.

## Minimum Standard for Project Completion

In this section propose a minimum standard for project completion. You may be planning on incorporating many features into your design. However, there may be difficulty in successfully demonstrating some of what you proposed. Please propose a minimum standard for completion. We will use this as a basis for an agreement between team and instructor.

Think of this as the ‘worst case scenario’, not the best-case (i.e. What is required in order to assign a passing grade for the project? - Not the minimum demonstration for a good grade, but minimum for a passing grade).

## Final Demonstration

On 12/7 you will participate in the senior design expo. In this section please describe what you will demonstrate at the exposition. This is quite different from the minimum standard for completion, but rather all of the features you expect to be graded and evaluated on.

# References

Provide a list of references used in your final design project.