**Note:** The Proposal Template used for ECE Culminating Design Courses is modeled on commercial business proposals and contains elements of R&D proposals. Real-world examples of engineering proposals are not available because of the proprietary nature of the information disclosed therein. **The Project Proposal should be submitted on CANVAS (Teamname\_Proposal.pdf) as well as to your team’s faculty advisor and external partner (if applicable).**

**Descriptive Title of Project**

Culminating Design Project Proposal Template

Team Name

Project Faculty Advisor

External Partner (if applicable)

Team Members Names, Majors, and Email Addresses

Submitted

Submission Date

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**Executive Summary**

This section should explain the basic idea of your project. The Executive Summary is a brief but specific statement about your project.  It includes a brief project description along with a number of items which will influence the project development. The summary details the need, scope and expected content of your project along with a clear description of what specifically will be designed and prototyped.  The summary addresses novelty, customer needs, general specifications, constraints, evaluation criteria, market, goals, codes / standards, realistic design constraints, hardware-software trade-offs, the computing aspects of your projects, as well as any other specific relevant issue of the project.

The Executive Summary is NOT an introduction. Rather, it’s a stand-alone portion of the document that could be distributed apart from the rest of the document. The Executive summary reads as if the Introduction does not exist, and vice versa. It should be written at a high enough level as to be understood by non-technical people (i.e., management). Think of it as a document that the CEO of a company would read in place of the complete report. Basically, describe motivation, objective, approach, and results. This section should be a maximum of 2 pages in length, single-spaced.

Specifically, consider and address as applicable:

* 1. What is the design problem and Why it should be solved?
  2. What are the technical problems?
  3. What is the overall design/technical/objective(s)?
  4. What tools/methods are used to guide the work?
  5. What is the selected design solution?
  6. How much will it cost?
  7. What are the key performance specifications?
  8. What is the proof of concept? What demonstrates that the solution works?
  9. What are the next steps/future work

**Nomenclature**

1. Provide an alphabetical list of symbols/variables/parameters used and their definition/meaning. Include units used for each symbol or variable, as well.
2. Include acronyms and their meaning.

**Descriptive Title of Project**

The primary purpose of the project proposal is to allow a technical evaluation of your project in order to assess its feasibility and the strengths of the technical approach. A secondary purpose is to evaluate schedule and financial considerations. Later reports (mid-project and final) will build on the project proposal with additional information being added at each stage. ***Note that the entire report should be double spaced.***

**1. Introduction**

The Introduction should begin with 2-3 sentences explicitly stating that team X is requesting Y amount of funding to develop Z. This section contains the project scope, motivation, and background.

The introductory material explains the nature and scope of the design problem and provides necessary context for the remainder of the report. **Cite references.**

* 1. **Motivation**

1. What is the design problem, motivation, and need? Provide a layman’s (simple) description of the design problem/opportunity and provide contextual background information (as appropriate; consider your audience). References should be included, as appropriate.

**1.2. Objective**

1. What is the intended use? Provide a discussion on the intended purpose(s) or use(s) of the product. Include description of product user(s) and operating environment for product.
2. Discuss desired product functions, special features, points of interaction with other products/devices (e.g., hardware/software integration), etc.
3. Value Statement - benefits to user(s) and other stakeholders.
4. Briefly state/summarize potential desired solution(s) if known, alternatives as appropriate, key performance aspects, and your intended means of demonstrating proof of concept.
5. Brief discussion of major technical hurdles, challenges and opportunities. Include any regulatory, code, and standards issues, if applicable.

**1.3 Background**

1. Provide contextual background information (as appropriate; consider your audience). References should be included, as appropriate.
2. Briefly introduce the content/structure of the remainder of the document.

**2. Project Description, Customer Requirements, and Goals**

Give a clear description of what specifically will be designed and prototyped by your team. This section should contain enough detail so that the next sections make sense, but should not include detailed technical information.

In this section, you will define the engineering design specifications for your design based on customer requirements, desired functions, and applicable constraints (see lecture material). Wherever possible, be as quantitative as possible in your specifications and provide measurable targets. For example, instead of “fast” use “speed greater than 10 miles/hour”.

1. Discuss the stakeholders. For example, include a Stakeholder “2x2” Chart.
2. Develop and discuss a list of customer needs for the project in non-technical terms. The needs are such things as what the final product should do, the target price for the product, and the targeted user. Also think about human factors considerations and metrics for customer satisfaction
3. Develop and discuss the functions that the design is supposed to perform and develop associated engineering performance metrics (i.e., how well should it do “it”?)
4. Construct a QFD Chart based on the customer needs and the engineering requirements
5. Develop a list of constraints, for example, does this product have to function with specific other products that impose constraints (like software/hardware), does solution have to utilize specific materials or manufacturing processes, etc. Also, consider constraints that may be imposed by standards.
6. **Technical Specifications**

This section should cover the desired technical specifications of the project or product, not how it will be implemented. Include qualitative and quantitative operational, performance, interface, physical, ranges, limits, tolerances, units and other specifications that the final product will have to meet. Do not add additional specifications which are not required for your design. Note that you may be building a prototype that will clearly not meet some of these specifications. Be as quantitative as possible when defining amounts, ranges, limits, tolerances, units, etc. The specifications should be in **tabular form** and should not include paragraphs of information or explanation. Identify and describe the relative importance of the specifications. Employ appropriate tools such as a Quality Function Deployment, House of Quality, etc., with supporting descriptions. This section is essentially a contract between your team and your project advisor and is the most important section of this document.

1. **Design Approach and Details**

This section should outline the details of the design approach that you are planning, as far as they are known at this time.

* 1. **Design Concept Ideation, Constraints, Alternatives, and Tradeoffs**

In this section, the concept ideas you generated are to be discussed. Feel free to use an appendix to include additional concepts and details.

1. Discuss and list the functions that the design needs to fulfill
2. Identify and describe different concepts for fulfilling each function. Use ideation techniques covered in lecture.
3. Discuss the different concepts/possible solutions for each (sub)function. What are the technical tradeoffs? In particular, include the constraints that are affecting your project decisions.
4. Introduce and discuss the different integrated concepts you derived from the set of possible functional solutions
5. If any student(s) on the team are computer engineering majors, briefly describe the computing aspects of the project and the hardware/software interactions and trade-offs.
   1. **Preliminary Concept Selection and Justification**
6. Discuss the selection process used to identify the promising concept(s) to be designed further. You can use a decision-matrix type approach, evaluation matrices, etc.
7. Perform an initial evaluation of the (selected) concept(s)’ feasibility with respect to the design specifications. Identify the technical “critical path” items and explain how the design process will proceed in order to address these key technical issues early in the process.
8. State any known aspects of the design (for example, if a key component or development platform has already been selected). If you have already prototyped some pieces of your project to evaluate feasibility, describe what you have done. Include any parts of existing products or software or previous projects that will be used. If there is a GUI, show what the proposed screens look like and what information is displayed.
9. Discuss contingency plans if your approach doesn’t work. Discuss potential risks and countermeasures that you foresee at this point . Use block diagrams, schematics, etc. as needed.
10. Clearly indicate design aspects that you don’t yet have figured out.
11. Define and discuss the set of detailed engineering design specifications (extended/derived from the initial set of specifications) for the final design.
    1. **Engineering Analyses and Experiment**

This is a very important section because it includes the methods used to “prove” that your design works from an engineering and physics perspective in a quantitative manner. It should include engineering analysis that are relevant to your design (like power and energy analyses, circuit analysis, etc.) and a discussion of simplifying assumptions in your analyses.

1. How will prototype testing be accomplished during the design process?
2. Describe the design analyses and experiments to be performed to ensure the design meets specifications.
3. Describe the analyses and experiments already performed and results. Use a subsection to describe each specific analysis. Details of each analysis may be in an Appendix.
   1. **Codes and Standards**

What are the most significant codes and standards that apply to your project? How have they affected your design decisions thus far? Consider that many industries have their own standards bodies (e.g., ASHRAE), as do many professional societies (e.g., IEEE, SAE, ASME). ASTM and IEEE standards are directly accessible at <http://libguides.gatech.edu/standards> . **Cite references.**

* 1. **Broader Impacts & Considerations**

1. Explain how considerations of issues related to public health, safety and welfare affect your project design.
2. Explain how the decision-making process incorporated professional and ethical considerations related to trade-offs among global, cultural, social, environmental, and economic factors.
3. If any student(s) on the team are International Program participants, describe the relevant global implications of the project.
4. **Project Demonstration**

How will your project be demonstrated and how will the demonstration validate the project specifications (acceptance testing)?

1. **Schedule, Tasks, and Milestones:**

Show specific tasks (building blocks) of the project and the time line (schedule) for accomplishing these building blocks or milestones. Indicate how these tasks are divided up and who is assigned what tasks. Provide an overall project time line in the form of both a GANTT chart and a PERT chartwith tasks, milestones, and critical paths shown. Estimate the degree of difficulty and the risk involved for each task. What is (are) the critical path(s) for your project? Based on your estimation for tasks and task durations, use your knowledge of project management tools to calculate the probability that your team will complete the project one week before the GT Capstone Expo. Note that most of the information in this section should be organized in the form of the project management charts and should not include long paragraphs of information.

1. **Marketing and Cost Analysis**
   1. **Marketing Analysis**

This section of the report contains information about selling your product and idea to others. A description of any existing similar products and a comparison to the proposed new product should also be included. How will your product be different from the competition? **Cite references**

* 1. **Market Research (For MechE and BME students only)**

1. Describe market research plans such as customer surveys, focus groups, gathering market information from studies, internet, experts, etc. (For BME: include number of potential procedures/uses per year (with references))
2. Describe the results of market research including market size, demographics, target price, go-to-market strategy, number of potential procedures/uses per year (with references, information on current competitive products/procedures, target market sales price; with a brief justification comparing to predicate device(s) or methodologies
3. Discuss impacts, if any, of your market research on the design
4. Discuss/provide any client reviews and user evaluation, if applicable
   1. **Cost Analysis**

Present a cost analysis of estimated prototype engineering and construction. Assume that you are being paid a typical engineer’s starting salary. Clearly show estimated hours to be worked on the project for each person on your team (except for class lectures, include all time spent on the course, i.e., meetings, report preparation, etc.). In terms of parts, be reasonably accurate on the “big ticket” (i.e., expensive) items, and provide estimates for small parts. Don’t forget power supplies, cables, and packaging.

Consider just your project and determine a suggested selling price assuming that you sell a certain number of units over a five year time period and that the total development costs are amortized over all of these units. Include estimated materials and labor to fabricate, assemble, and test each unit. Factor in fringe benefits, overhead, and sales expense. Indicate expected profit (and percent profit) for each unit sold. Give reasonable estimates for parts pricing, not detailed parts costs. You can make appropriate assumptions and educated guesses. Briefly explain how you determined the estimates, and cite references for actual prices you are using.

1. **Current Status**

Summarize the current status of your project based on the task identified, the percentage complete, and sub-tasks completed.

1. **Leadership Roles**

Briefly summarize the leadership roles for EACH person on the team. ALL team members must have at least one leadership role. Many team members will have multiple leadership roles. Leadership roles include those in ECE4871 as well as those anticipated for ECE4872. Those required for ECE4872 are: 1. Webmaster, 2. Expo Coordinator, 3. Documentation Coordinator

1. **Individual Contributions to this report: Project Proposal**

Include a detailed list of the contributions to this report from each member of the team.

1. **References**

Include a list of references for all items cited in this report. Use IEEE style format. You should include references for background information, similar products or projects, items you intend to purchased, cost information, and any other information that you have found and used for your project. You may have additional items not specifically referenced but which you consulted. If you do, put these in a separate section called “REFERENCES” in the form of an unnumbered list.

**Appendix**

Include material that is needed to understand your report but is too lengthy to incorporate into the body of the report. Extremely lengthy information (e.g., software listings) should be posted to your project website.