

Proposal Writing

ECE 2031

Design Proposal Assignment

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Why Do a Design Proposal?

- Open-ended design problems are a key part of your engineering education, and a proposal is “Step 1” of such a problem.
 - And a requirement of this ABET-accredited curriculum.
- You will have to think about an even more open-ended problem for your senior design project.
 - This is an easier “practice run”.
- No matter what career you pursue, you will very likely write or help write proposals.

Audience for a Proposal



- Engineers always have a customer – someone who is paying for the design.
 - Management/marketing of the same company that employs the engineer.
 - The firm who hires them for a single job, if they are independent consultants.
 - Another large company, using the engineer’s company for “outsourcing”.
 - A government agency, including DoD, DoE, DoT (both state and federal), etc.
- Customers (often called sponsors) write Requests for Proposals (RFPs).
- Responders (often called offerors or proposers) write proposals, which are usually evaluated competitively by the customer.

Writing Your Proposal



- Your audience is Dr. Collins and Kevin.
 - We know about the DE2Bot, SCOMP, etc.
- The RFP for this semester's project will be all of the project specification:
 - Project lectures, proposal assignment sheet, etc.
- The proposal you write will address how your team plans to address the given requirements.
- Your proposal will follow the format explained on the proposal assignment sheet.

Think About the Big Picture



- What have we asked you to do for the project?
 - What are the technical requirements?
 - What are the demonstration requirements?
- Why do those matter to us?
 - Your technical work serves a future purpose.
 - Your demonstration is the bulk of what we will actually see of your project.

Proposal Detail



- Each team's proposal will be **DIFFERENT** – focus on **YOUR** unique aspects.
 - Your software and any modified hardware.
 - Application demonstration.
 - What else?
- Proposals may have similar background information.
 - Project summary, DE2 board features, robot hardware, etc.
 - But this should be short and concise.
- Assume the reader has good knowledge of the hardware.
 - Don't waste space writing about how the robot works - how to control the motors, sonar, etc.
 - However, do not immediately jump into your design without **SOME** background for context.
 - The reader does *not* know what your software will look like, what strategy you will use in the demo, your team organization, etc.

Organizing Your Proposal



- All proposals will include the following sections/headings:
 - Executive Summary (ES)
 - Introduction
 - Technical Approach
 - Management Plan
- Additionally, some sections will contain relevant, descriptive subheadings.
 - Subheadings will be determined by each team.
 - Your goal is to make information easy to find.

Executive Summary



- The entire proposal condensed into one paragraph – write it last!
- Allows an “executive” to quickly judge whether or not your proposal is worth consideration.
 - Briefly define the problem being addressed.
 - Briefly discuss the approach that will be used to solve the problem *and* explain the strength of the approach.
 - Include all the spoilers!
- Consider it a separate document.
 - Don't refer to the rest of the document.

What Makes a Good ES



- If it's not in the ES, the reader will assume it's not in the paper.
 - Everything that you think will increase your chances of winning the contract should be in the ES.
- Save intricate technical details for the body.
 - Think “big picture”.
 - If the reader wants more specific information, they know they can find it in the rest of the document.
- Feasibility is just as important as technical merit.
 - Realistic technical goals AND realistic scheduling.

Introduction



- Briefly describe the design problem and the project requirements.
 - Show that you understand what you are asked to do.
- Briefly describe your team's solution to the problem.
 - Enough that the document headings make sense.
- Avoid too much detail that the reader should already know.
 - Not important: how odometry works.
 - Important: what you do with the odometry.

Technical Approach



- This section contains all the “what” and “how” of your design.
 - By far the largest section.
 - **It should be technically detailed!**
- Explain your team’s methods of fulfilling all of the design requirements, and why that’s the best approach.
 - **Do not just state your intentions. How will you achieve them? Why that way? How do you know it’s possible?**
- You should “sell” your idea as being effective, intuitive, robust, or any other desired traits.
- Use descriptive subheadings.

Technical Approach Topics



- Explain the intended design and operation of your software / algorithm / strategy.
 - Again, focusing on what YOU are doing.
 - Include traditional flowcharts or UML activity diagrams to describe program flow.
- Describe how you plan to use the DE2 and robot hardware features.
 - What devices are you going to use, and how will they work? How will you handle real-world concerns?
- If you plan to make any hardware modifications, what are they and how will they help you?

Technical Approach Topics for Demo

- How do you foresee the entire demo process playing out?
 - You will have some flexibility here. Be creative, but don't promise the world if you can't deliver.
- How does your plan maximize the effectiveness of your demo?
 - Trade-offs between difficulty and design time.

Management Plan - Timeline

- A Gantt chart will make up the bulk of this section of the proposal.
 - “Show” the plan for the rest of the semester.
 - Use Visio or any available tool to make a Gantt chart.
- Also need some text in the document to give the chart context.
 - Major tasks.
 - Division of labor.
 - Milestones.

Realistic Timelines



- Do not **force** your plan in to the available time.
- If you run out of time on the Gantt chart, **you will run out of time in the project as well.**
 - In that case, **simplify your proposed design** instead of trying to make your current plan fit.
 - It's better to be realistic than to have to explain why you didn't complete your proposed design.
- Consider how long something will actually take, double it, then add that time to the Gantt chart.

Management Plan – Contingency

- Include your contingency plan, accounting specifically for how you will handle any problems that arise.
- “If X does not work, Y will be used because it is already working and is easy to integrate.”
- Balance your contingency plan between “everything might fail” and “nothing will fail.”

Manage Your Time



- The proposal can only be written once you have a well-defined plan for your project.
- Experiment **before** proposing.
- You have three lab meetings before the proposal is due, and two after.
 - Your proposal should reflect that $\sim 2/3$ of your project is *already complete*.
 - Brainstorm, design, and plan outside of lab so that you can use your time with the robot effectively.
 - Robots will be in high demand during open hours.