Design Elements & Methods

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Errors Observed (so far)

- capitalization
  - LEGO®, LEGO's, Pspice
  - Figure 1, Motor 2
- hyphenation
  - a 9-volt battery
- three clauses – We used LEGO's, and they’re fun, but they’re expensive.
- headers – use them
Formatting Tips

*Bad Example*

Try to use lists, bullets, and headers as much as you can. Text that runs together in long, drawn-out paragraphs can be hard to follow. It is also hard to see the main points. Furthermore, it makes it difficult to scan quickly for specific points of interest.

*Better Example*

- Exploit lists, bullets, and headers
- Paragraph format:
  » can be hard to follow.
  » hard to see the main points.
  » difficult to scan for specific points of interest.
- Don’t overdo lists
  » can be hard to read – too choppy
Writing Style

- Use short sentences.
  - Bad:
    "In lab we found that a bridge rectifier was slightly more efficient than a half-wave rectifier, but taking into consideration the penalty for use of extra parts we feel a half-wave rectifier will work to our advantage."

  - Better:
    "In lab we found that a bridge rectifier was slightly more efficient than a half-wave rectifier. However, a half-wave rectifier was actually better once the penalty for extra parts was considered."
Paragraph Too Long

After being given the opportunity to explore and analyze several types of possible circuits, our group as a whole has come to the decision that we will use the half-wave rectifier. The half-wave rectifier essentially has only one component, the diode. We chose this type of circuit because of its efficiency in energy when compared to its input and its use of a minimal number of parts. This design also has the option of a capacitor being placed in parallel with the motor. The advantage of placing a capacitor in the circuit is a greater top end speed. Without the capacitor, the car is unable to reach this greater speed, but the acceleration is greater. Our decision at this stage in the design process is to not use the capacitor because the car’s acceleration is of greater concern to us than its top end speed. The other circuit option is the full-wave rectifier, which consists of more parts that would place us much farther back in the start of the race. To eliminate any discrepancy on whether we should use the half-wave or full-wave, we used PSpice to determine the results from both circuits. We found that for a theoretical car to go 10 meters with a half-wave, it would take roughly 5.25 seconds. For the same car to go 10 meters with a full-wave, it would take roughly 4.6 seconds. We also decided to test the half-wave with a capacitor on the same theoretical car and we found it would take it 5.4 seconds to go the same 10 meters. The difference in time between the full-wave and the half-wave was nearly half a second different for the entire length of the course. We also kept in mind that the full-wave would again require us to start our car several feet further back than if we used the half-wave. To us, the time difference was negligible and so we decided on the half-wave because of the shorter course length. Included in our report are printouts of our results in deciding between a half-wave rectifier and a full-wave rectifier.

Writing Style

- Short paragraphs
  - Each paragraph should stand alone
  - Each paragraph should ordinarily
    - say what you want to say
    - say it
    - say what you’ve said
  - In other words:
    - introduce your point
    - support your point
    - drive your point home
Professional Tone

• Don’t make vague assertions.

“We decided to use 12 guage wire. The 12 guage wire is efficient for its size. It will conduct enough electricity and not add too much weight to the car. It also offers a low amount of resistance.”

Professional Tone

• Less vague:

“We decided to use 12-gauge wire. It provided the best tradeoff between drag and electrical resistance. (See Table 3 for details.)”
Professional Tone

- Don’t use narrative. A report isn’t a diary.

NO:
“We tried a half-wave rectifier at first, but then we put a capacitor in parallel with the circuit and found that the average speed increased.”

YES:
“A capacitor in parallel with a half-wave rectifier gave the highest average speed. (See Table 2 for a comparison.)”

Professional Tone

- The report should have a consistent, professional-looking format throughout.

The design project is to build a small vehicle from Legos parts powered by the output of a PC sound card. You will select a waveform to play through the sound card, which will then be amplified by an audio amplifier and delivered to the vehicle.

Separate left and right channels will be available so that steering can be accomplished through the balance control on the PC volume control user interface. Circuits will be designed to convert the audio signals to signals that drive the car motors. The goal is to build a vehicle that can complete a race course in the shortest time possible.
Professional Tone

- No handwritten marks anywhere!
- No hand-drawn figures
- Addressed as one professional to another, not student to instructor

**NO:** “We feel that an 18-gauge wire provides the best tradeoff...”

**YES:** “Our simulations showed that an 18-gauge wire provides the best tradeoff...”

Professional Tone

- Support all assertions with hard evidence if it is available, not vague feelings or general reasoning.
Engineering Report Organization

1) title page
2) abstract or executive summary
3) front matter
4) introduction
5) technical sections
6) conclusions
7) appendices

Title Page

- Title (not too long)
- Names
- Name of class/instructor
- Term (Fall 2008)
- Date
- Auburn University
Abstract

- 100-200 words
- summarize main conclusions of report

In a longer engineering report, an abstract or executive summary can be up to one page long but never longer.

Front Matter

- Table of contents
- List of figures
- Nomenclature
  » V - voltage
  » n - motor speed (rpm)
  » etc.
Introduction

- Problem statement
- Background (history, relevant information)
- Summarize approach
- Outline remainder of report

Technical Sections

- Alternatives
  » discuss each category
  » specify options
- Choice of present design
  » discuss each category
  » interpret data
  » draw conclusions
Technical Sections

- Detailed design presentation
- Include descriptive material in relevant location.
  - Long lists or tables should be referred to an appendix.
  - All descriptive material should be referenced or discussed.
  - Specifications/drawings/parts/cost

Technical Sections

- Performance
  - predicted
  - actual
Conclusions

- What was discovered
  - technical information obtained
  - NOT information learned about the class

Appendices

- Use for material that few people would read in its entirety
  - long tables
  - long calculations
  - detailed specifications