

## Instructions for Submitting Lab Optimizations

1. For each lab document type (proof of concepts, omega presentation video, omega exploration map), there will be a new Gradescope assignment with “optimization” in the title.
2. When you submit a lab document for optimization, you should **submit your entire document including changes**. That means if you’ve optimized your proof of concepts, you will submit your entire proof of concepts document again for the optimization. That also goes for your omega presentation video and exploration maps.
3. As with the proof of skills optimizations, **include a screenshot of your rubric from your original graded submission at the top of your document**. This will help us quickly understand which aspects of your documentation needed improvement.
4. **Include a summary of which improvements you’ve made and where they’re located** in your document (think of it as a changes log). This summary could be at the beginning of your lab document or in a separate document attached to your submission.
5. Additionally, you should make the changes in your documentation easily visible. You can do this by **highlighting them, making the font a different color, adding arrows to point to changes, drawing a box around them**, etc. Wherever you’ve made a change in your documentation, make sure it’s easy for us to find it. If it’s something you can’t point out (such as changing the background color from black to white, still note that at the top of your submission).
6. See the example on the next page.

Question 1

Concepts

8 / 10 pts

✓ +1 I can simulate a simple voltage divider circuit using LTSpice  
pt

✓ +1 I can calculate and simulate series and parallel resistances that I combine.  
pt

✓ + I can build and test a simple voltage divider circuit on a protoboard and measure using my instrumentation board.  
1 pt

✓ +1 I can create a circuit schematic using LTSpice for my design exploration.  
pt

✓ +1 I can make appropriate assumptions to simulate values for my design exploration.  
pt

+1 I can discuss and identify areas where I get stuck, I don't quite understand, or require more information.  
pt

+ I can demonstrate "good failure" whenever applicable by providing accurate results in my experience and speculating what went wrong.  
1 pt

+1 I can identify non-idealities or unexpected results and attempt to explain why they may exist.  
pt

+ I can answer for myself "Is this right?" by comparing mathematical calculations to simulation and experimental results.  
1 pt

✓ +1 I can show plots and diagrams that are easy to read, scaled correctly and clearly labeled.  
pt

✓ + I can use consistent variable labels and component values in mathematical calculation, simulation and experimental results for easy comparison.  
1 pt

✓ +1 I can accurately answer conceptual questions found throughout the lab.  
pt

## Summary of Optimization Changes

1. Proof of Concept #1: added a section on how non-idealities were responsible for why our measured voltages were different from what we calculated and simulated.
2. Proof of Concept #5: added discussion on where we failed in building and measuring our circuit and speculation on what exactly went wrong.

## Example in Document of Where Changes were Made

### **Concept #1: KVL, KCL, and Ohm's Law**

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#### *Discussion*

Our results didn't match exactly, but were close enough to the calculations and simulations.

**Our measured values differed from what we calculated in our mathematical analysis and LTSpice simulation by up to 2.5%. This is reasonable, since each of our resistors have a tolerance of 5%, meaning that their values can differ from their nominal values by +/-5%. Since this error is larger than our measurement error, our measurement error seems reasonable for this circuit.**