MEMORANDUM

To:	Charlie Refvem, Professor, Department of Mechanical Engineering, Cal Poly SLO
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From:	Matthew Wimberley
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Date:	June 14, 2023
RE:	**Term Project Deliverable #3: Final Project Reflection**

Our work was split up evenly between me and David. David worked entirely on the electrical components, soldering the PCB, while I worked on the mechanical components, printing the frame and fastening components together. Given both of our mechanical backgrounds, I would give David a slightly larger piece of the metaphorical pie you refer to in the guidelines as integrating the electrical componentry together was a leap of faith. Both of us watched many YouTube videos to get a better grasp of the process, but David was at the wheel. David also worked on the line logic software and establishing a main loop with the ultrasonic sensor to start what would be a refined finite state machine. I worked on the software for the servo motors to get them to respond appropriately would our color sensor have been fully functional. On the flip side, our motor and transmitter/receiver drivers were working flawlessly from Labs 2 & 4, so we were easily able to integrate those with our term project.

As for the course, this was certainly both rewarding and very challenging. I feel as comfortable with Fusion 360 as I do with SolidWorks, and I have a much better grasp of how IDEs communicate to an MCU. Also, I consider myself fluent with the oscilloscope now. Given that, 10 weeks felt way too short given the scope of the project and other obligations to fulfill. I liked the ambition of having a competition at the end of the course, but David and I easily averaged 20+ hours each from weeks 5 – now. I wouldn't say that the entire time was productive, as there were many, many hours of debugging and rebuilding the IOC for what was in the end a corrupted file, notably the .elf debugger. In retrospect I would have managed our time better focusing on further iterations of our mechanical design and solidifying our power supply because we fried our board. This struggle was ultimately helpful as it gave me a better understanding of what I initially thought of as extraneous files associated with the STM32 project files.

For future ME-507 courses I would recommend teams of three like in ME-405 because I do like the current scope and having a successful competition would be very redeeming for the many painstaking hours spent troubleshooting in lab. ME-405 worked a lot better because of the ease of Python, so given the PCB objective in 507, teams of three would be ideal to split up tasks. Also, I think more focus should be on mistakes to avoid for PCB manufacturing early in the quarter, such as the ease of shorting electrical components and picking correct inductor values necessary for a switching regulator to function properly,

for example. I know in lecture we talked briefly about switching regulators, but I feel the theory into how they work and what would make them function incorrectly would be beneficial for students. Because there are so many pieces that need to be correct long before the soldering process begins, this should be the primary focus of a lab, with guided direction and milestones along the way, just like for the motor lab. As a thought, this could be Lab 3 as there was no Lab 3 for this quarter.

For future teams I would lay out the PCB from week 2 in the quarter. It is just so paramount to have a well designed PCB with proper layout, test points, and header pins that the coding lectures almost seem to detract from the PCB making. Not that it's unimportant in any respect, but personally I still felt very lost on what a proper PCB layout looks like until I talked to other classmates and you directly. I absolutely should have put more time at the beginning of the quarter, but given the class is only 4 units, I feel the workload must absolutely be modified to give students a shot of a competition when taking ME-507 in the spring. I had a lot of fun taking this class, and I'm glad I got to experience a side of mechatronics I may pursue later in life.