Executive Summary

Our design is meant to be an inexpensive way to create a robotic drawing arm. There are many kinds of sophisticated robotic arms, but our design is simple enough that anyone would be able to build and operate the arm. At the beginning of the term, we started our development phase by learning as much as we could about SCARA topology and CNC machines. We looked at various ways two-axis arms have been developed and weighed the pros and cons of each method. We then began our development stage. For our initial development stage, our two most important goals were to build the actual arm apparatus and design a circuit to drive the two motors used for the arm's movement. We faced difficulties in sourcing materials for our arm as many components were unavailable for purchase. We resolved these problems by 3D printing parts that we could not purchase.

We spent a lot of our initial development stage designing our circuit to drive the motors' movement. The main difficulty we had with our circuit was the lack of documentation on the stepper motor driver that we were using. This made it difficult to determine whether problems in our circuit were coming from the orientation of the motor driver or from other components in our circuit. Our second development phase consisted of building our PCB and writing the code necessary to control our robotic arm. Before this project, no one on our team had any experience with PCB design, so this was a major learning curve. We also began writing our code. The code was in the form of G Code commands that were sent to an Arduino using a Python script, and processes the G Code using an imported library to send to the motors. Once we had finished our second development phase, we worked on troubleshooting our circuit and arm.

The key lessons we learned as a team were the importance of collaboration and having back up plans. We learned how to collaborate as a team of three, but also the importance of collaborating with other teams working on the same project. This allowed us to see how other teams resolved the same problems we were facing. We also learned the importance of having a backup plan when something goes wrong. Towards the end of our troubleshooting phase, we had an accident where one of our group members' laptop got destroyed, and we lost all of our code. This was a major setback but because we had a backup plan, we were still able to complete our project.

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Course Timeline			
Design			
Week 1			
Week 2	1/20/23	Weekly Progress Report (Team) Week 2	Start block diagram
	1/20/23	Engineering Requirements Submission	
	1/27/23	Weekly Progress Report (Team) Week 3	Finish Initial Draft of Block Diagram
Week 3	1/27/23	Block Diagram Submission	
Build			
	2/3/23	First Block Check	Start integration of blocks
Week 4	2/3/23	Weekly Progress Report (Team) Week 4	Review Block Diagram
			Design review of PCB
Week 5	2/10/23	Weekly Progress Report (Team) Week 5	Order PCB
Week 6	2/17/23	Weekly Progress Report (Team) Week 6	Begin assembly
	2/24/23	Second Block Check Off	
Week 7	2/24/23	Weekly Progress Report (Team) Week 7	
Test			
Week 8	3/3/23	Weekly Progress Report (Team) Week 8	Begin testing
Week 9	3/10/23	Weekly Progress Report (Team) Week 9	Write presentation
Publish			
Week 10	3/17/23	ECE 342: Project Showcase Assignment (Team)	
	3/17/23	End-of-Project Cycle Self-Assessment (Team)	