Project Deliverable E:
Project Schedule and Cost

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Group 10

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Abstract

This report consists of a project schedule and estimation of the costs and components required for the project, which will inform the prototyping test plan.

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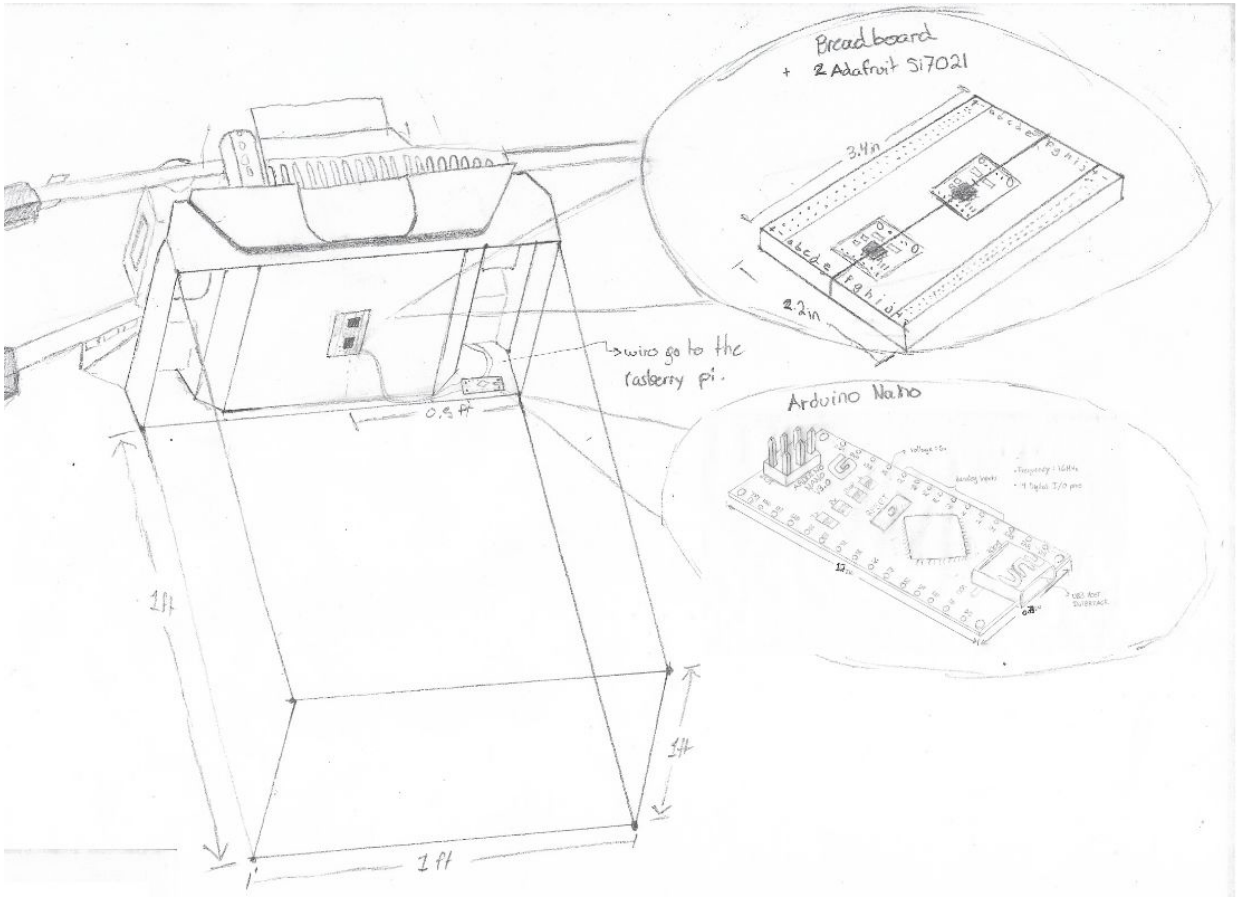
1.0 Introduction

Based on the feedback we received from our client meetup in the last lab, we were able to compile a list of tasks we believe need to be completed in order to satisfy the client's needs. We were also able to come up with a new conceptual design, again based on the feedback we were given by the client to better understand where the sub systems are being placed on the drone.

2.0 Conceptual Design

After our client meeting on February 22 2021 we received feedback on our conceptual design. Our initial conceptual design contained one temperature sensor which was connected to the bottom surface of the drone. The sensor would read temperatures as the package is being lowered. JAMZ suggested multiple sensors be used for accurate readings. They suggested we take the average of the two readings from both sensors. JAMZ also advised us to think about how the arduino is communicating with the raspberry pi. Moreover they also informed us that the power supply on the actual drone is 44V with 44Ah(amp-hours), therefore a step down voltage is required.

Figure 1. Updated global conceptual design after client meeting.

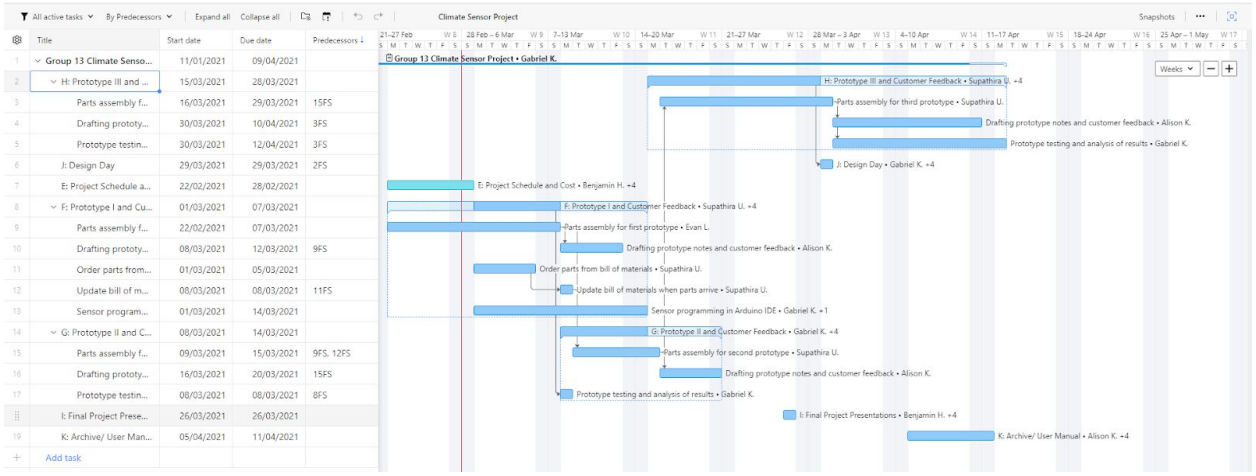


3.0 Project Schedule

3.1 Project Tasks

Project Task	Owner	Date to be completed	Dependencies
Sensor programming in Arduino IDE	Gabriel/Benjamin	March 14, 2021 11:59 PM	
Order parts	Supathira	March 5, 2021 11:59 PM	
Update Bill of Materials when parts arrive	Supathira	March 14, 2021 11:59 PM	- Order Parts
Parts assembly for first prototype	Evan	March 7, 2021 11:59 PM	- Designing the first prototype
Parts assembly for second prototype	Supathira	March 14, 2021 11:59 PM	- Sensor programming in Arduino IDE - Parts assembly for first prototype
Parts assembly for third prototype	Supathira	March 28, 2021 11:59 PM	- Sensor programming in Arduino IDE - Parts assembly for third prototype
Prototype testing and analysis of results	Gabriel	March 14, 2021 11:59 PM	- Sensor programming in Arduino IDE - Parts assembly for first prototype
Drafting Prototype Notes & Customer Feedback	Alison		- Parts assembly for first prototype - Parts assembly for second prototype - Parts assembly for third prototype

Figure 2. Gantt chart of project tasks and dependencies



3.1.1 Task Assignment

- (Evan) - I have been tasked to do the first prototyping as I am familiar with CAD and I might also be able to make a 3D print of our prototype.
- (Benjamin) - I have been assigned to do the programming of the drone with Gabriel. I was assigned this task because I am in computer science and I am familiar with python and java. (java is very similar to C).
- (Gabriel) - I am tasked with the programming of the drone with Benjamin, I have a good basis in programming and am familiar with the communication transfer between microcontrollers.
- (Alison) - I am tasked with drafting the prototype notes based on the customer feedback we will receive as it will help us see what needs to be done for improvements and stay organized.
- (Supathira) - I am tasked with ordering the parts required for the parts assembly of the second and third prototype, while updating the bill of materials when the parts arrive. I am tasked with this due to my prior knowledge in assembling arduinos and sensors from high school courses I have taken.

3.2. Project Risks and Contingency Plans

In the case of one of our items not being approved by a T/A we have chosen an order of which parts we would order as a backup plan. For example if our sensor does not get approved our number to option is to order the DHT11 sensor.

There is a time risk where important parts may not arrive when expected due to shipping delays. To mitigate this risk, the team has identified the pieces of equipment that are critical to the project and will order these parts with high priority/express shipping if available.

Table 2. Project risks and contingency plans for project tasks

Risks	Contingency Plan
Delays in shipping	Critical parts to the project will be identified and will be ordered with high priority/express shipping if available.
Lack of communication, causing lack of clarity and confusion	Two project team meetings per week have been scheduled where misunderstandings can be regularly assessed and resolved.
Team members not being able to complete tasks on time	Team members should communicate in advance of deadlines so that the work can be completed in another way with the assistance of others.
Unplanned work that is not in the project's original scope	Project scheduling will be re-evaluated with the notification of TA/PM
Cost overruns due to estimate errors	The budget will have some room for unforeseen costs

4.0 Cost Estimate

Item	Purpose	Link	Cost	Status	Comments from TA/ Pm
Adafruit Si7021	Temperature/Humidity Sensor	https://www.adafruit.com/product/3251	$11.30	Pending Approval	
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Arduino Nano Board	Microcontroller	KEYESTUDIO Nano Atmega328P CH340 Micro Controller Board + USB Cable for Arduino: Amazon.ca: Electronics	$12.99	Pending Approval	
Wires x 4 (male to male)	Connects the microcontroller to the temperature sensors	https://elmwoodelectronics.ca/products/male-male-jumper-wires?variant=13911790420020&currency=CAD	$1.99	Pending Approval	
Wires x 4 (male to female)	Connects the microcontroller to the raspberry pi (drone)	https://elmwoodelectronics.ca/products/male-female-jumper-wires?pr_prod_strat=copurchase&pr_rec_pid=1524991426612&pr_ref_pid=1524990345268&pr_seq=uniform	$1.99	Pending Approval	

Soldering kit	Seal the connections between the module and the sensors	15Pcs Electric Soldering Iron Kit, Blue Mini Temperature Adjustable Solder Iron Set, 60W Wood Burning Tool, with Large Ventilation Holes and Control Handle(US Plug110v): Amazon.ca: Tools & Home Improvement	$16.79	Pending Approval	
Resistors	Control the electrical flow so our sensors don't jump	ALLDREI 0 Ω to 1 Mega Ohm Resistors Assortment Kit of 1% Tolerance | 1/4W Metal Film Resistor Set/Pack of 550 Pcs and 17 Values/Excellent Fit to Breadboards/ Arduino and Raspberry pi: Amazon.ca: Industrial & Scientific	$11.99	Pending Approval	
Breadboard	BreadBoard for the adafruit sensors	Tiny breadboard - Elmwood Electronics	$5.99	Pending Approval	
Total:			$38.91		

5.0 Conclusions and Recommendations for Future Work

In order to realize our project, several components are needed and their cost was estimated in this deliverable. With a budget of $100, we estimated the total cost of our project to be $74.34 excluding taxes and shipping costs. Each component and/or material has to be approved by a TA before it can be ordered. Research consisted of finding affordable and reliable components that are compatible with the whole system and will be able to function. The most expensive item out of the list is a soldering kit and they vary in prices based on its different features and functions. Our choice for a soldering kit was made based on its low cost and the ability to perform just the soldering we need to join the necessary parts. An additional breadboard is being ordered because the pins of the sensor might not fit into the male to female jumper wires so a breadboard is going to be used instead. It is small enough to fit the two sensors and its designated slot on the module. A CAD drawing is going to be designed for our first prototype showing the main components from our critical subsystems outlined in the previous deliverable.

Future work will consist of ordering and assembling the parts for our second prototype, as well as further testing and analysis. Modifications will then be made according to the feedback received from our customer to produce a final and third functioning prototype for our solution. In order to avoid delays and stay within our budget, we will be ordering from one place for as many components available as possible. This methodology will prevent multiple shipping fees and keeping tracking of multiple orders, helping us stay organized and on track until Design Day.