

SRP EVAP

ME 486C Fall 2025

Samantha Synk – Project Manager
Lilliana Hadik-Barkoczy-Logistics Manager
Garet Bowels-Manufacturing Engineer
Trey Bushling-CAD Engineer
Jorge Cesin-Financial Manager
Brendan Steele-Test Engineer

CAD & Schematics

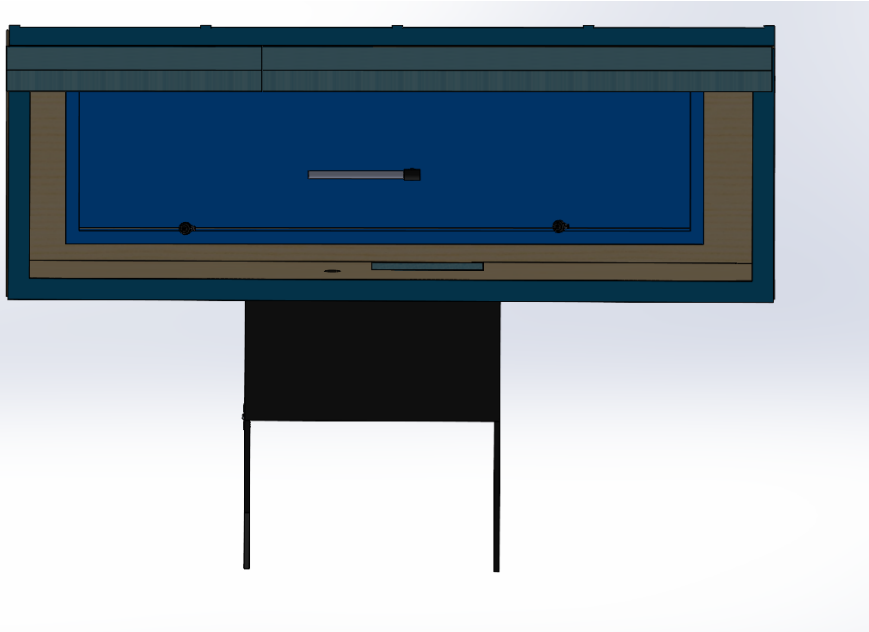


Figure 1: CAD View 1

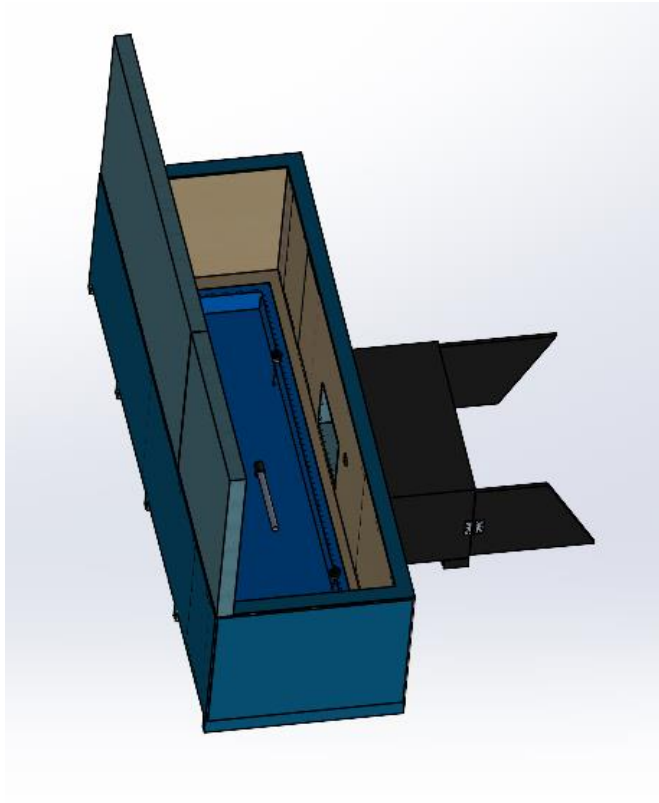


Figure 2: CAD View 2

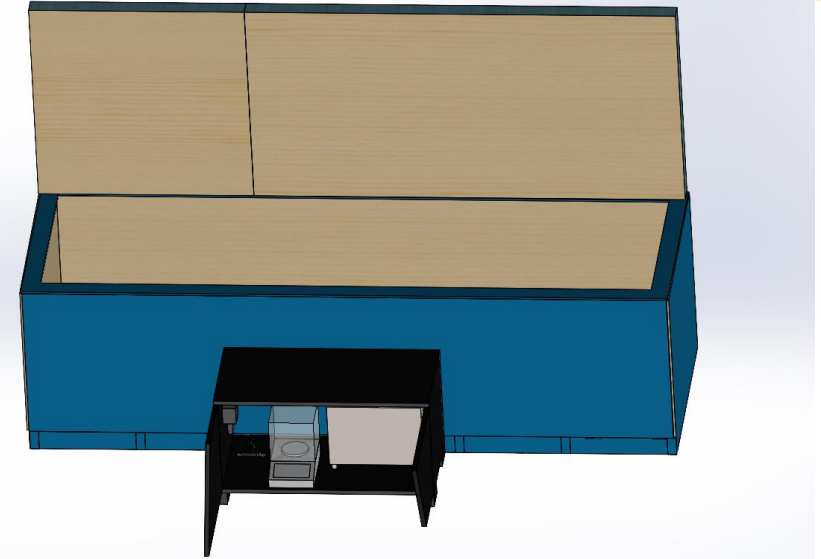


Figure 3: CAD View 3

CAD & Schematics

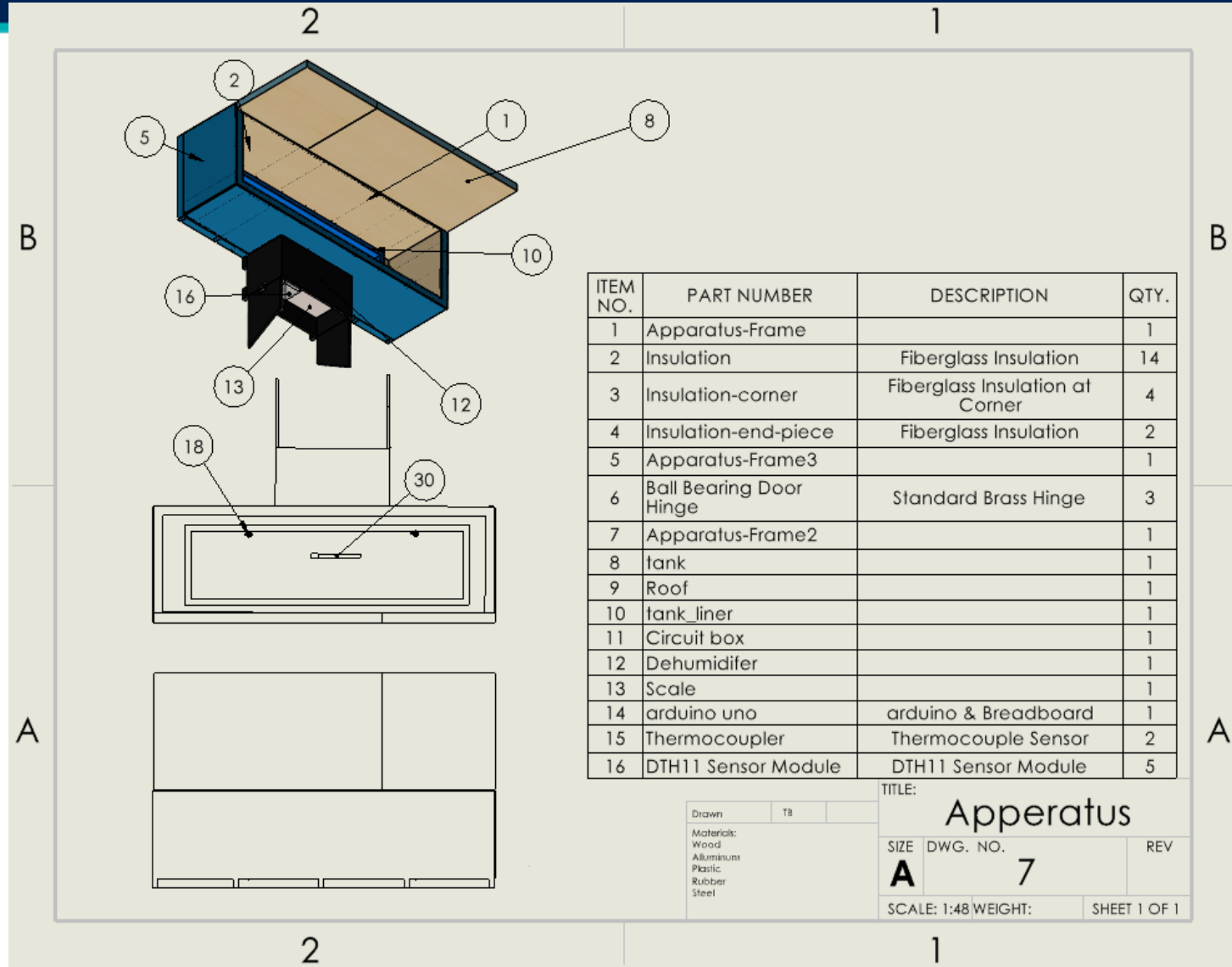


Figure 4: CAD drawing

Updated Design Efforts & Engineering Calculations

Using the Sherwood correlation and Rayleigh number from previous presentation, the theoretical rate of evaporation for the apparatus was calculated:

$$\dot{m}_v = \bar{h}_m \cdot A_s (\rho_{v,s} - \rho_{v,\infty})$$

$$\dot{m}_v = 0.005 \frac{m}{s} \cdot 1.858 m^2 \left(0.0344 \frac{kg}{m^3} - 0.000159 \frac{kg}{m^3} \right) \left(\frac{1000g}{1kg} \right) = 0.318 \frac{g}{s}$$

$$\dot{m}_v = 0.318 \frac{g}{s} = 0.582 \frac{inches}{day}$$

This is about 19 grams per minute of evaporation.



Figure 5: 19 grams of water

Testing Plan Summary

Ambient Open Conditions

- Ambient Air Temp
- Ambient Water Temp
- Ambient Humidity
- **Exposed Ceiling**

Controlled Humidity Conditions

- Ambient Air Temp
- Ambient Water Temp
 - **15% Humidity**
- Enclosed Ceiling

Controlled Water Temperature

- Ambient Air Temp
- **32.22°C Water Temp**
- Ambient Humidity
- Exposed Ceiling

Ambient Closed Conditions

- Ambient Air Temp
- Ambient Water Temp
- Ambient Humidity
- **Enclosed Ceiling**

Controlled Air Temperature

- **7.22°C Air Temp**
- Ambient Water Temp
- Ambient Humidity
- Enclosed Ceiling

“Ideal Scaled” Conditions

- 7.22°C Air Temp
- 32.22°C Temp
- 15% Humidity
- Enclosed Ceiling

Testing Plan Summary Additions

Flow Visualization

- Ambient Air Temp
- Increased Water Temp
- Ambient Humidity
- **Closed Ceiling**

Phoenix Open Conditions

- Ambient Air Temp
- Ambient Water Temp
- Ambient Humidity
- **Exposed Ceiling**

Phoenix Closed Conditions

- Ambient Air Temp
- Ambient Water Temp
- Ambient Humidity
- **Closed Ceiling**

Flow Visualization

Conditions: 90°F Water, 22% RH

Exterior Conditions: 44°F, 3 mph, 101.73 kPa



Figure 6: Flow Visualization 1

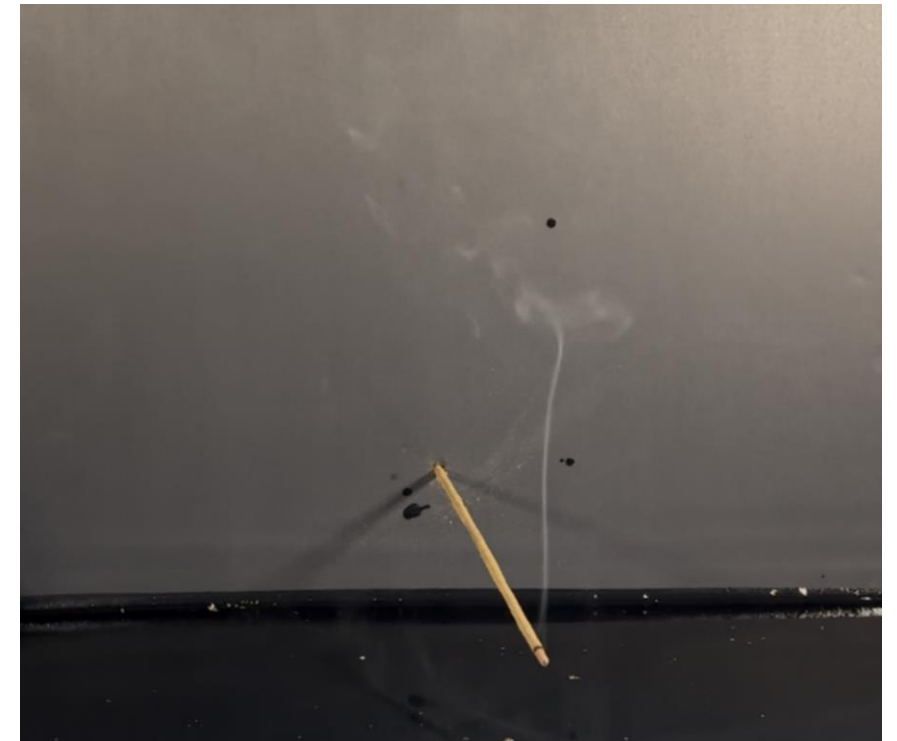


Figure 7: Flow Visualization 2

Bill of Materials

Table 1: BOM

- Link to BOM

Fall BOM.xlsx

2025 Bill Of Materials						
Component:	Quantity:	Description:	Total Price:	Acquisition Method:	Primary Vendor:	Images
Purchased:						
Plywood	10	48in x 96in plywood for the walls	\$ 149.80	Bought	Home Depot	
Wood Beams	20	2in x 3in x 96in wood beams to hold ply wood and to separate insulation	\$ 59.60	Bought	Home Depot	
#8 2in Flat head Philips exterior screws	5 lb pk of 672	2in screws to hold plywood and wood beams together	\$ 33.39	Bought	Home Depot	
2" Corner Brace Zinc 3X20pk	60	Braces for the walls of the apparatus	\$ 44.91	Bought	Home Depot	
#6 3/4in Flat Head Philips metal to wood screws	200	Connecting the braces to the wood	\$ 23.92	Bought	Home Depot	
Waterproof floor putty	1	For waterproofing and sleaing screws	\$ 6.97	Bought	Home Depot	

Purchasing Plan

Part	Quantity Needed	Purchase Quantity	Current Quantity	Unit Price (\$)	Total Price (\$)	Order Placed (Y/N)
Plywood	15	0	15	14.98	224.7	Y
Wood Beams	35	0	35	2.98	104.3	Y
#8 2in Flat head Philips exterior screws (5lb pk of 6720)	1	0	1	33.39	33.39	Y
2" Corner Brace Zinc 20pk	5	0	5	14.97	74.85	Y
#6 3/4in Flat Head Philips metal to wood screws (50 pk)	4	0	4	5.98	23.92	Y
Waterproof floor putty	1	0	1	6.97	6.97	Y
5" x 5" Zinc T-Plate	12	0	12	2.86	34.32	Y
Insulation	2	0	2	20.67	41.34	Y
Reptile Humidity & Thermometer	2	0	2	6.99	13.98	Y
Digital Water Thermometer	2	0	2	11.99	23.98	Y
Plastic Water Container	3	0	3	4	12	Y
Hot Glue Sticks	2	0	2	3	6	Y
1500W Water Heater	1	1	0	104.5	104.5	Y
LED Detachable Tripod Light	3	2	2	24.88	74.64	Y
Wall & Cavity Foam	1	0	1	199.98	199.98	Y
Wide Spray Foam Sealant	4	0	4	39.98	159.92	Y
Arduino	1	0	1	0	0	Y
Vinyl Pool liner	1	0	1	104.97	104.97	Y
Hinges	3	0	3	10.47	31.41	Y
Silicone Caulk	5	0	5	6.89	34.45	Y
Caulk Gun	1	0	1	11.98	11.98	Y
Construction Mask	6	0	6	2	12	Y
4mm Rubber Gloves (200 count)	2	0	2	13	26	Y
GFCI Outlet box	3	0	2	10.48	31.44	
Desiccant	1	0	1	215	215	Y
Glass Siphon Receiving Dish	1	0	0	0	0	Y
Gap Sealent	1	0	1	173.92	173.92	Y
Scientific Balance	1	0	1	157	157	Y

Purchasing Plan Continued

Scientific Balance	1	0	1	157	157	Y
Rubber Siphon Tube	1	0	0	0	0	Y
GFCI Outlet	3	0	3	15.51	46.53	Y
Insulation Spray Foam Adhesive Guru	1	0	1	169.99	169.99	Y
Arduino Sensors	6	0	6	10.93	46.53	Y
Electrical Box For Arduino	1	0	1	12.99	12.99	Y
Flat Brackets	10	0	10	4.72	46.53	Y
Rubber Fridge Liner	1	0	1	19.99	19.99	Y
Heavy Duty Tarp	1	0	1	77.97	77.97	Y
Weather Proof Coating	1	0	1	22.5	22.5	Y
Paint Brush	3	0	3	1.87	5.61	Y
Paint Holder	2	0	2	0.98	1.96	Y
Dehumidifier	1	1	0	393	393	Y
Arduino Loading Cells	4	4	0	15.99	15.99	Y
Weather Proof Paint	2	0	2	0	79.06	Y
PVC Glue	1	0	1	5.85	5.85	Y
PVC Male Adapter	1	0	1	2.7	2.7	Y
PVC Bushing	1	0	1	4.17	4.17	Y
PVC Spigot	1	0	1	10.65	10.65	Y
PVC Sealent Tape	1	0	1	0.98	0.98	Y
Syphon Pump	1	0	1	17.5	17.5	Y
10T Bucket	1	0	1	2.5	2.5	Y
Grommets	1	0	1	4.99	4.99	Y
Rubber Tires	6	0	6	21.95	131.7	Y
Door Stop	1	0	1	5.5	5.5	Y
Door Wedge	1	0	1	6	6	Y
Vinyl Tube	1	0	1	16	16	Y
Clamp	1	0	1	2	2	Y
Syphon Tube (Skinny)	1	0	1	10.93	10.93	Y
Door Hinges(small)	3	0	3	3.64	14.56	Y
Grove Pliers	1	0	1	23.97	23.97	Y
Mixing Buckets	2	0	2	5.15	10.3	Y
				Total Spent (\$):	3254.97	
				Remaining(\$):	1745.03	

Total Spent
No Change from Previous Update
Updated Status
Planned But Not Purchased

Travel Cost

Reason for Traveling to Pheonix: After talking with Dr. Acker, the team decided that it would be beneficial to bring the apparatus down to Pheonix to take more accurate tests.

Travel Cost	
Remaining Budget:	\$1,745.03
Travel Cost:	~\$700
Hotel:	~\$450
Food:	~\$270
Total Cost:	~\$1420

Manufacturing Plan

Table 2: Manufacturing Plan

Part	Time [hours]	Manufacturing Method	Progress Percentage
Apparatus Base, Walls, & Roof	60	Woodworking/Assembly	100%
Data Collection Circuit	15	Electronics/Wiring	100%
Water Pool	6	Woodworking/Lining	100%
Humidity Control System	5	Installation/Mounting	100%
Sensor Mounting and Calibration	5	Calibration	100%
Siphon for Water Level & Balance Calibration	1.5	Tubing/Calibration	100%
Total	92.5		100%

Demonstration Video for Circuit

[SPRcapstone.mp4](#)

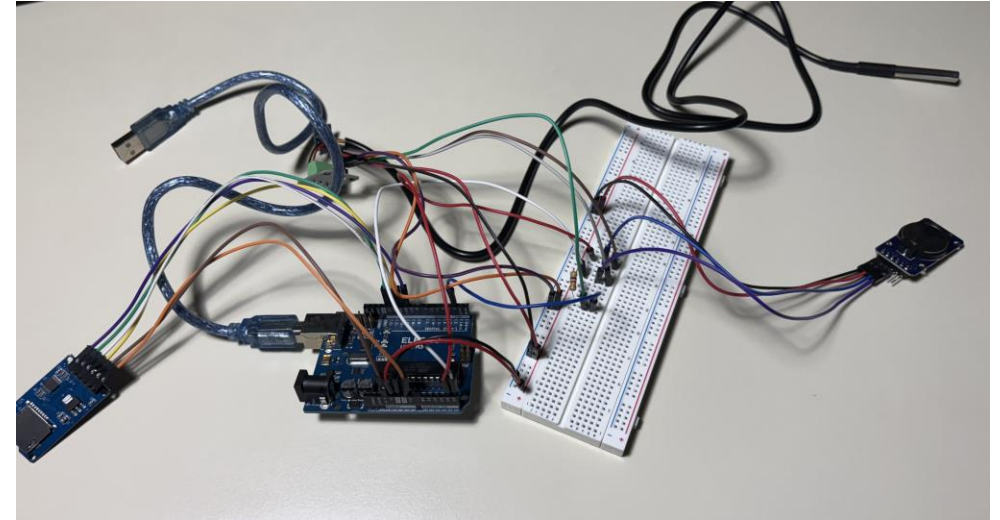


Figure 9: Arduino

Figure 8: Circuit Design

Demonstration Data Collection



Figure 10: Apparatus View 1



Figure 11: Apparatus View 1
Garet Bowels, 11/3/2025, SRP EVAP

Demonstration Data Collection

- **Links to Excel Data Collection Videos:**
 - https://nau0-my.sharepoint.com/:f:/g/personal/trb462_nau_edu/Ekspn2r3WxpBhckE1vlbEzYBNmwkg4VUNld-LEciQZmW6g?tdid=b6fc585d-6ef5-43fc-9845-6dda6e25cc52

Demonstration



Figure 12: Apparatus View 1

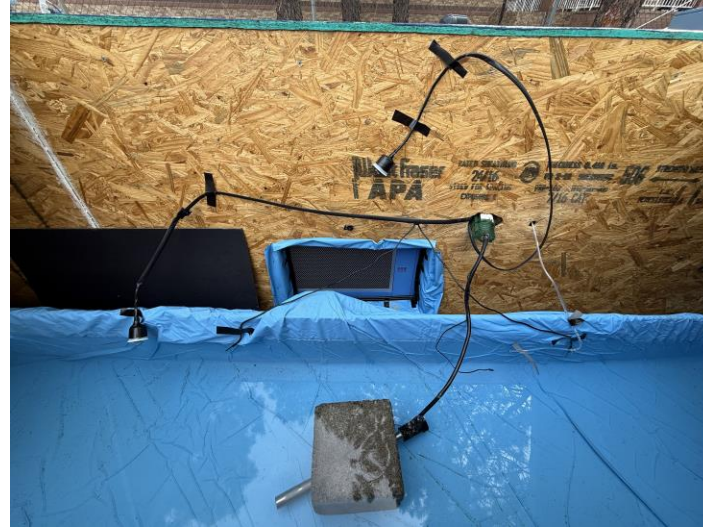


Figure 13: Apparatus View 2



Figure 15: Apparatus View 4



Figure 14: Apparatus View 3

Gantt Chart

- Link to Gantt Chart

[SRP EVAP Gantt Chart ME486C.xlsx](#)

Thank You!