Department of Mechanical and Materials Engineering

Green Automated Aquaponics System

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What is the Aquaponics ?

Aquaponics is a sustainable and innovative farming method that combines aquaculture (the cultivation of fish) with hydroponics (the soilless cultivation of plants). In this closed-loop system, fish waste is used to fertilize plants, while the plants naturally filter and purify the water for the fish. This mutually beneficial relationship creates a self-sustaining ecosystem, resulting in efficient and environmentally friendly food production. Aquaponics offers benefits like reduced water usage, efficient space utilization, reduced environmental impact, and the ability to produce fresh, nutrient-rich produce year-round, making it a promising solution for the future of agriculture.

First steps

Project Planning:

1. Define the scope and objectives of the capstone project.
2. Identify the specific goals and outcomes you want to achieve with the aquaponics system using "**support structures.**

Research and Learning:

1. Study aquaponics principles and techniques.
2. Familiarize with the essential components such as tanks, grow beds, plumbing, and fish.

Design:

1. Create a detailed aquaponics system design, including the layout of tanks, grow beds, and fish.
2. Determine the size and scale of the system based on available space and resources.

Skill Refinement and Specialization:

1. Leverage the existing expertise within the team.
2. Assign specific roles and responsibilities to each individual based on expertise and interests. This specialization within the team will help optimize the use of each team member's skills in the project.

Material Selection:

1. Choose appropriate materials for the construction of tank and grow bed.
2. Consider factors such as durability, cost, and compatibility with aquatic life.

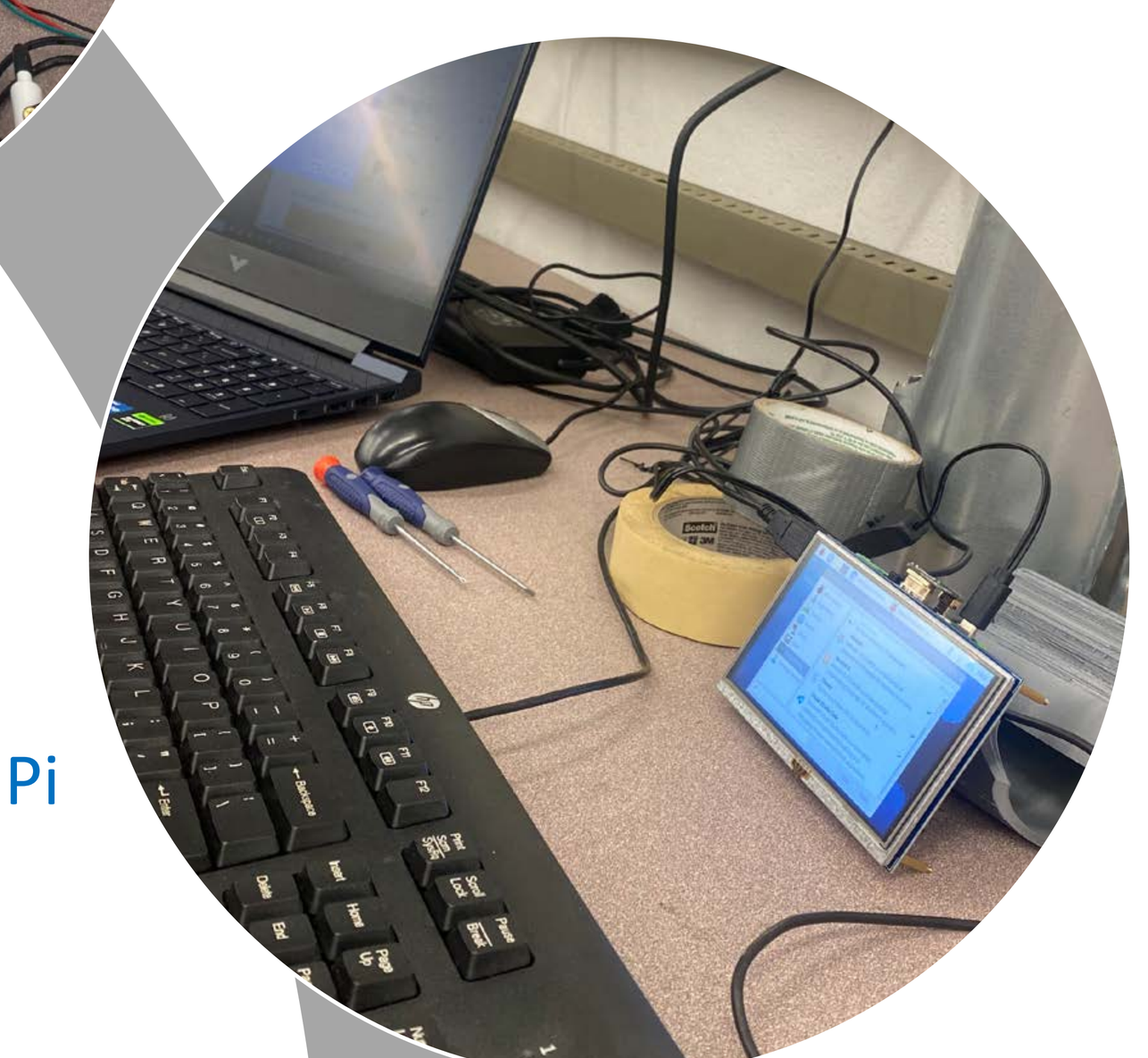
Collaborative Presentation and Report:

1. Work collectively to prepare the content for the presentation and report, utilizing the combined expertise and contributions of all team members.
2. Collaboratively structure the information, data, and findings obtained from your research and initial project steps to create a cohesive and informative presentation and report.
3. Aim to finalize and polish both the presentation and report for a successful presentation on the last day of the first semester.

Fish Feeder

Battery

Solar panel

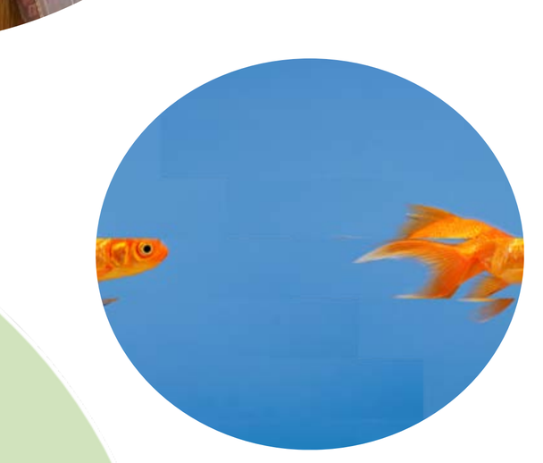


Raspberry Pi

Pump

Backup Battery

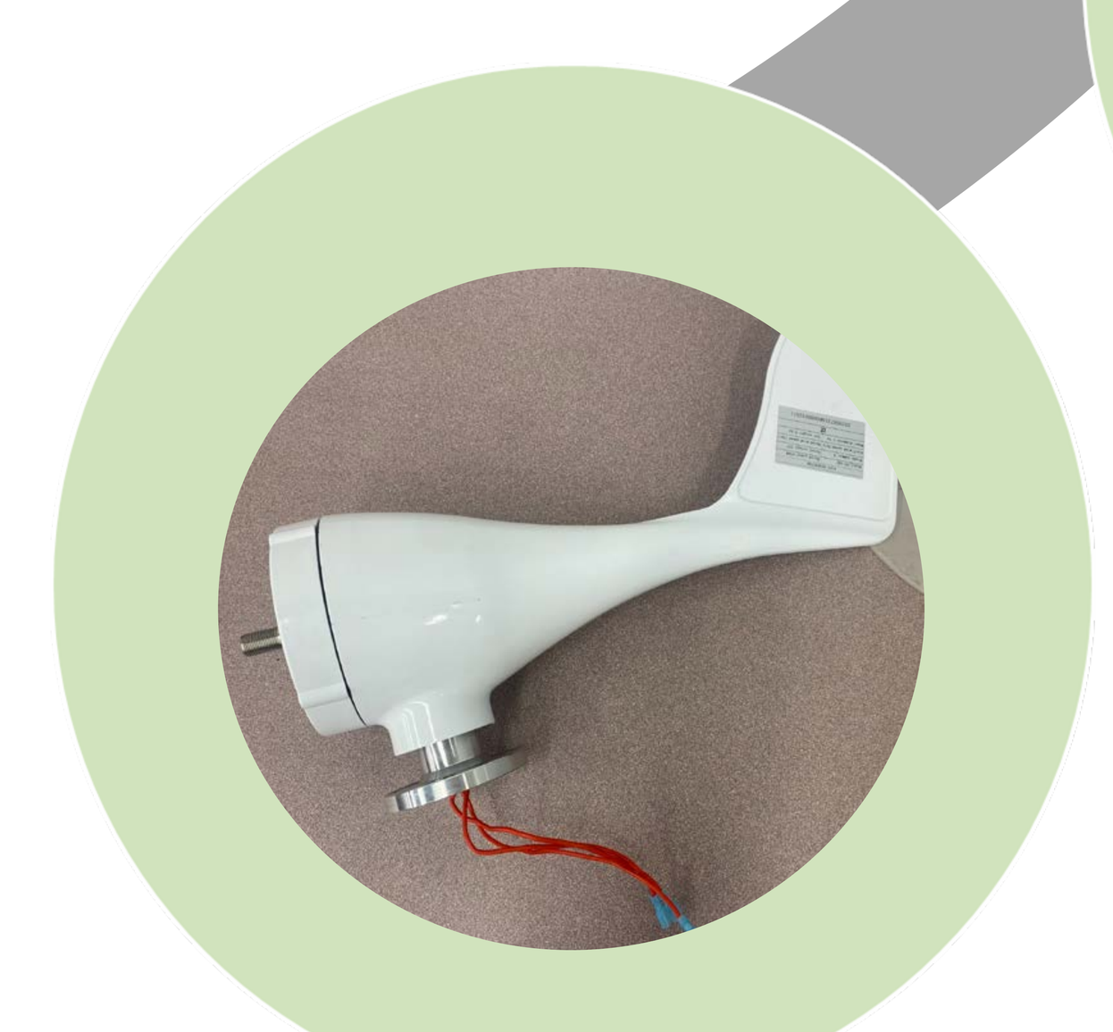
Wiring



Wood wheels and nails for the tank

Temp & pH reader

Wind Blades



Wind turbine Engine

Last steps

Site Preparation and Component Installation:

1. Finalize the location for your aquaponics system, ensuring it aligns with your design.
2. Prepare the site, clearing the area, leveling the ground, and making any necessary infrastructure improvements.
3. Begin the construction phase by assembling fish tanks, grow beds, and plumbing infrastructure according to your design plans.

System Setup and Cycling:

1. Add water to the system and introduce the selected fish species.
2. Monitor water quality, adjust environmental parameters, and initiate the nitrogen cycle to establish a stable ecosystem.

Planting and Crop Care:

1. Plant your selected crops in the grow beds and closely monitor their development.
2. Implement a maintenance plan, including pruning, pest control, and nutrient management to ensure healthy plant growth.

Data Collection and Documentation:

1. Begin collecting data on system performance, water quality, plant growth, and fish health.
2. Maintain comprehensive records, noting any adjustments or issues related to the aquaponics system.

Continued Monitoring and Adjustment:

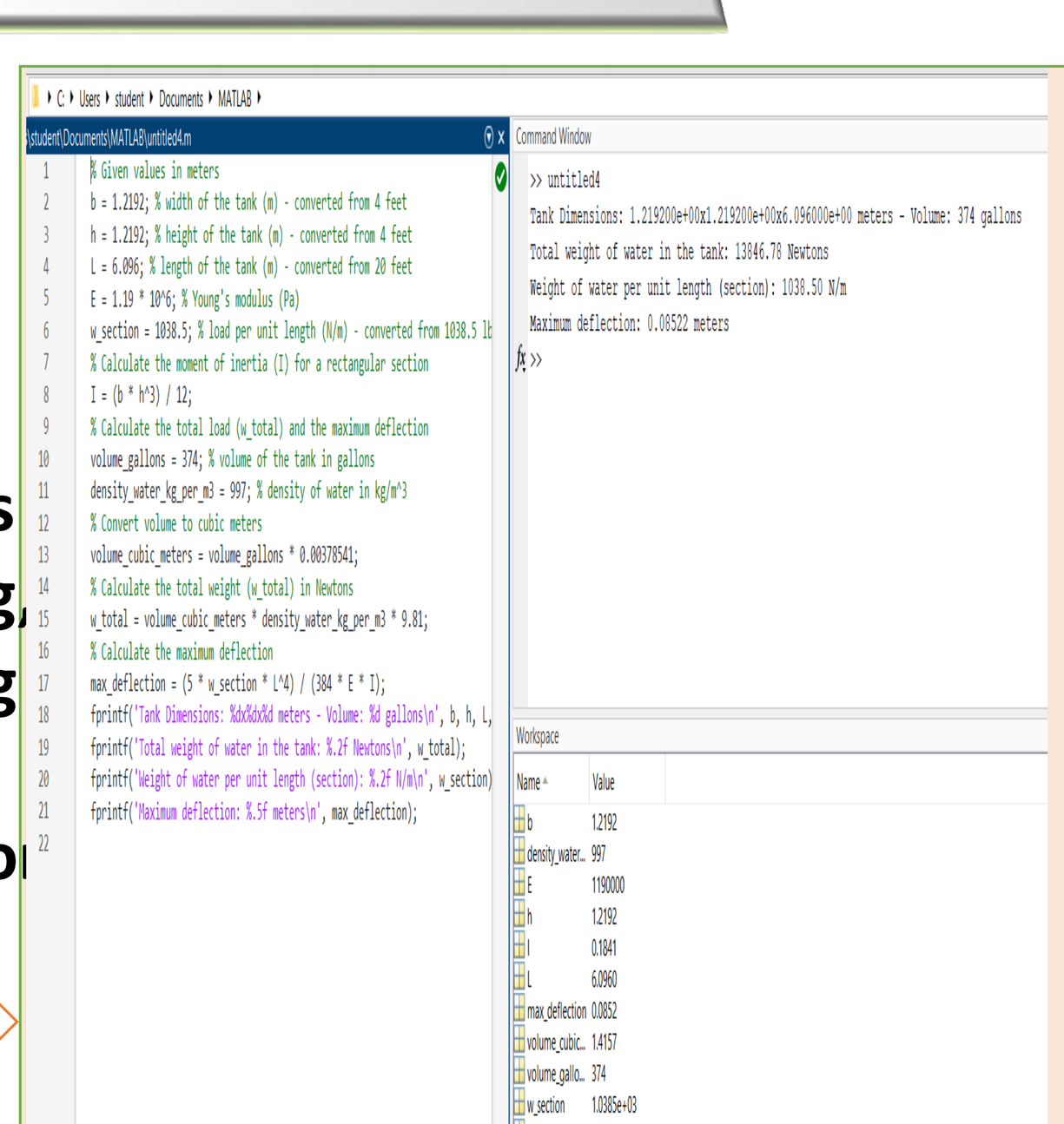
1. Regularly assess and adjust the aquaponics system to maintain optimal conditions for fish and plants.
2. Address any challenges or complications that may arise during the second semester.

Analysis and Presentation Preparation:

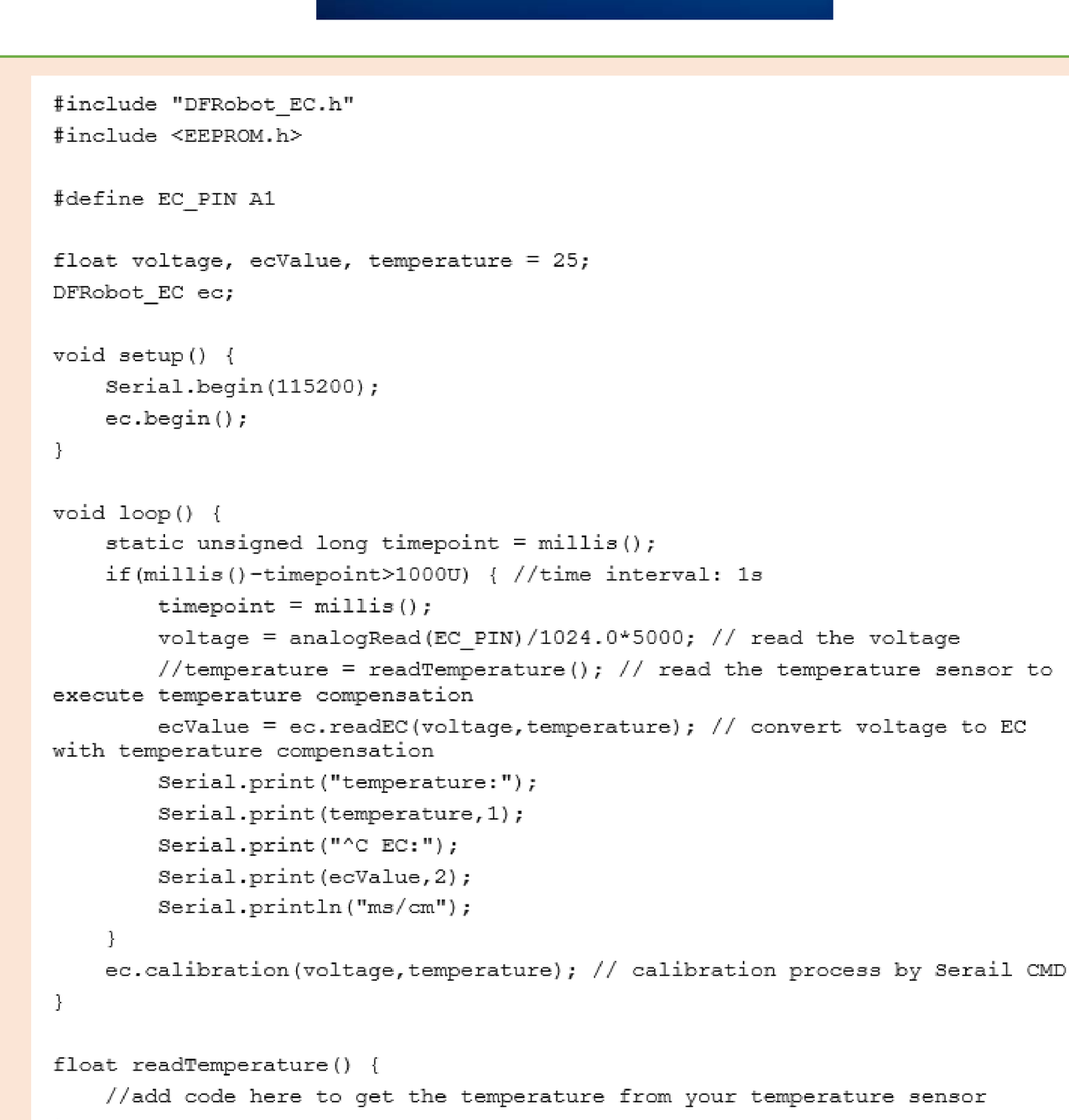
1. Analyze the collected data, drawing conclusions about the system's performance.
2. Prepare for the final presentation by organizing key findings, insights, and the overall success of the aquaponics project.
3. Collaborate on the creation of a compelling presentation summarizing the project's journey and outcomes for the audience.

Building Process

Examples of Coding Modeling & calculation



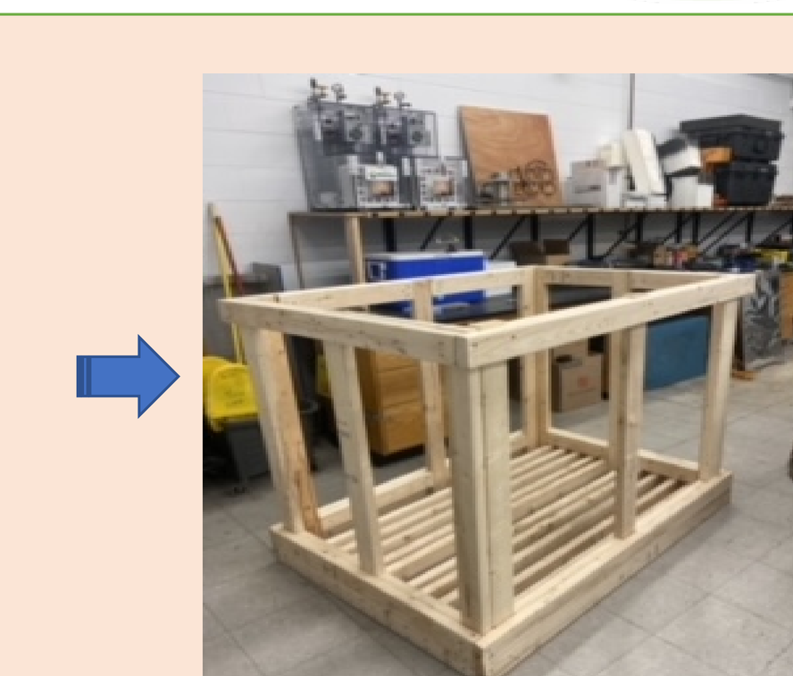
MATLAB code for Tank deflection calculations



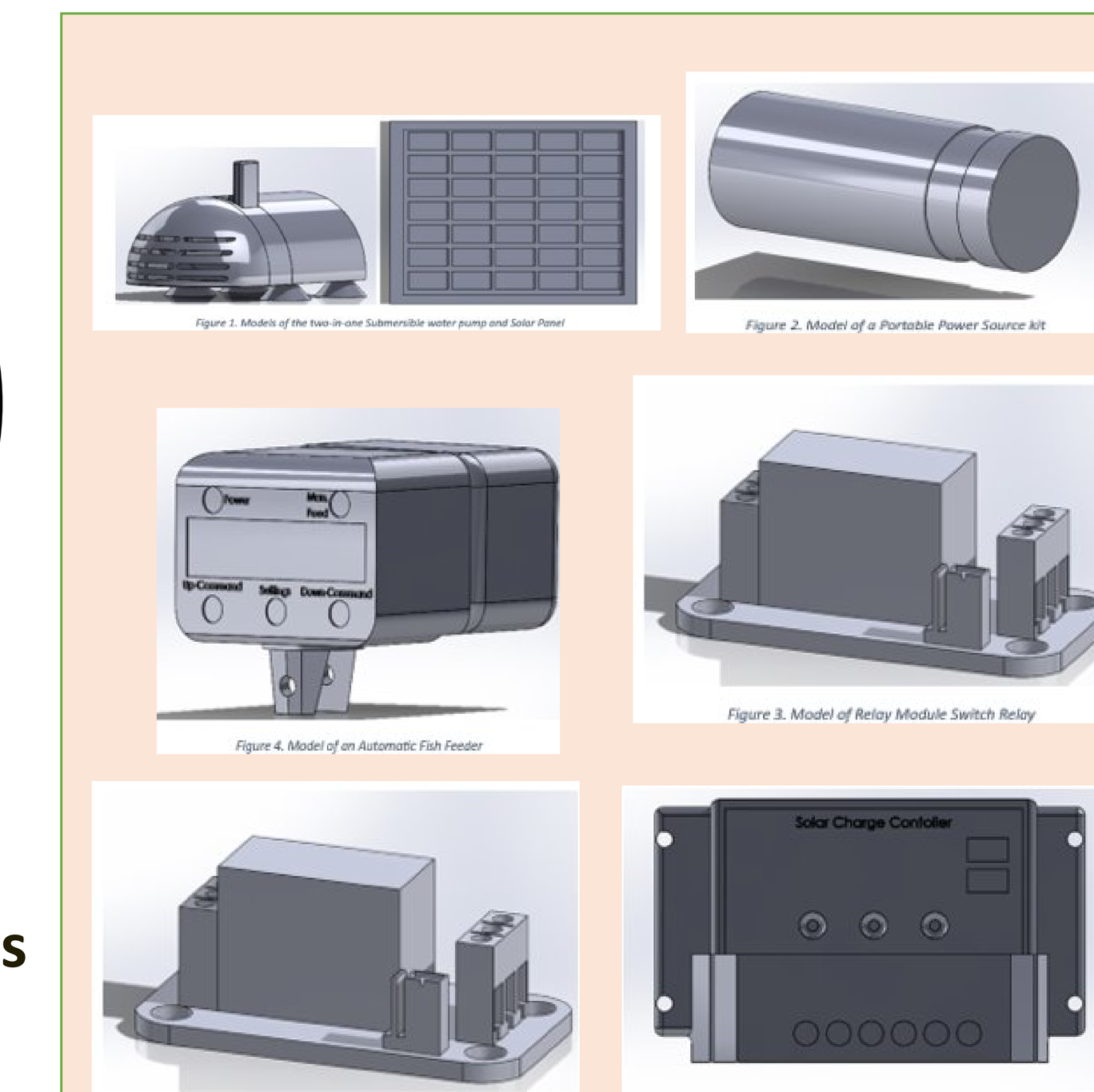
Water Conductivity Sensor Code in Python

Water Total Dissolved Solids Sensor Code in Python

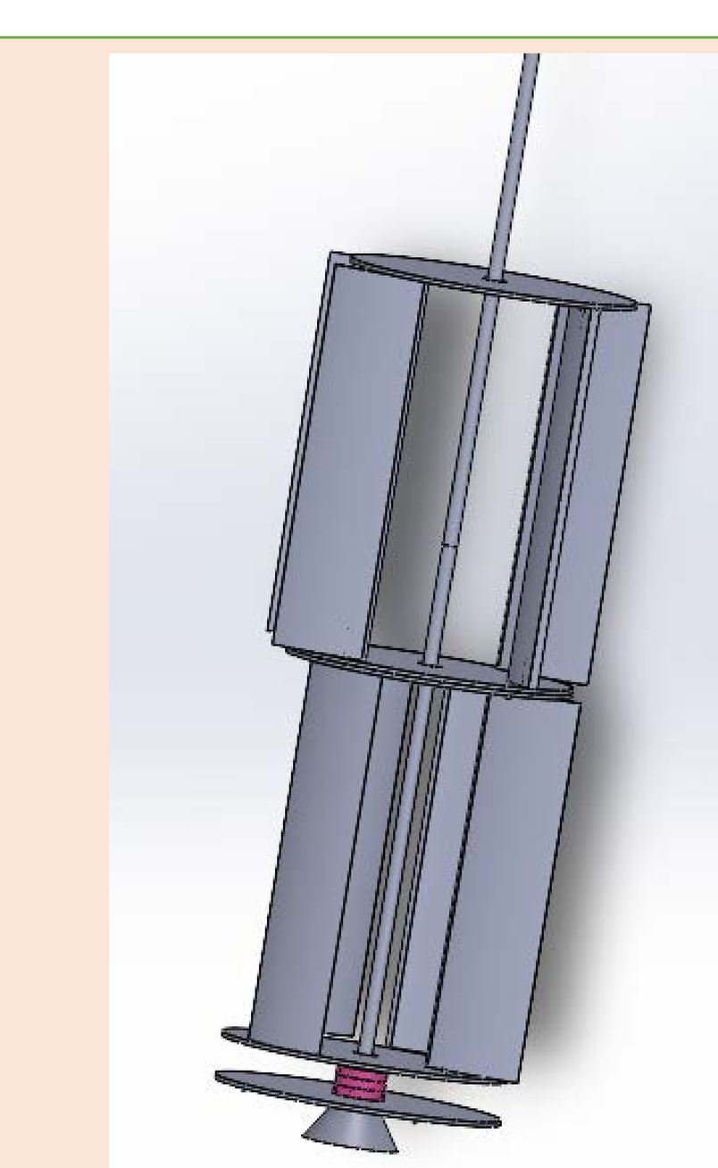
Tank Building steps



SolidWorks modeling parts



Automation's Design



Wind Turbine blade design