We intend to undertake the project Remotely Operated underwater Vehicle as our Capstone Design project for 2019. Our group has met with our faculty advisor on January 25, 2019, to discuss this project.

The design problem to be addressed to explore any kinds of water body to finish some missions, such as taking video, without being in those water bodies. The ROV not only can collect the basic data underwater, such as the depth and its relative position, but also is expandable to put more sensors to collect more different data due to different applications. The data can be used to help users to locate the position of the ROV. Furthermore, users can choose what kind of data they want to collect to meet the specific requirements. Through the extension node of ROV, users can add more block to make the ROV deal with other missions.

This problem has many potential impacts on many potential stakeholders such as science researcher, ocean discover companies and water supply companies. Firstly, the ROV can move in the limited space. By using the extension function of the ROV, those company can use the ROV to find and fix the problems that happened under the water (for example, oil pipe leaking). Additionally, water body research organization also can use it in their water body research programs. The ROV can collect multiple data at the same time by extending its sensitivity and the variety of sensor. As the result, the ROV can be applied to different specific researches.

The design objectives and constraints of this project are:

- To design and implement a prototype ROV as a team.
- Design and build the ROV body using PVC pipes, 3D printing custom designed parts maybe.
- Design and implement a remotely operated control unit using some microprocessor.
- The prototype ROV should be able to maneuver in the water perfectly.
- Test the ROV in the actual field either the swimming pool or the lake.

Those objectives will be achieved through the following tasks:

a) Mechanical structure design: Design the buoyancy body and electronic container of the device. Design the shape of ROV and the connection from the control panel to the ROV
b) Design the actuator of the ROV: Design the actuator to control the movement of the ROV
c) Design the control circuit (hardware) of the ROV: design the electrical circuit with IC to process the signal of all the data that ROV collects. Additionally, design the electrical controller for the movement of the ROV.
d) Design the control unit for ROV (Software): programming the software for ROV control.
e) Design the controller for the operator: Design the control interface for users to manipulate the ROV, which includes remote-control unit, data display system, and the video display system.
f) Building the mechanism actuator: building the ROV based on the design.
g) Implementing the control software: programming and debugging the program of the ROV controller.
h) Experimenting and testing the ROV in the swimming pool.
i) Improving and writing the lab proposal

The structure of the ROV was illustrated by the following picture:

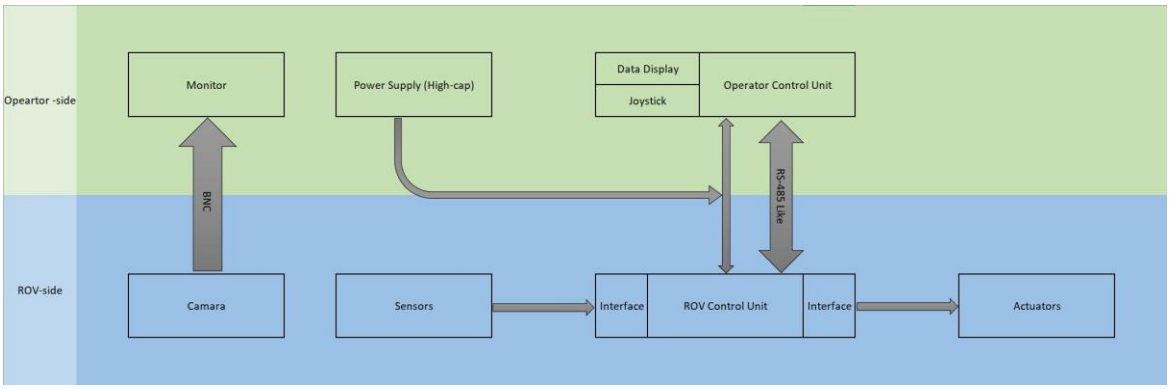

Figure 1 The Block Diagram for ROV

A tentative timeline for completion of these tasks is shown in the following table:

Tasks	Due day

Semester I	
Mechanical structure design	February 1, 2019
Design the actuator of the ROV	February 15, 2019
ROV control circuit design (hardware)	March 1, 2019
ROV control unit design (software abstraction)	March 15, 2019
Operator controller design (hardware and software abstraction)	March 29, 2019
Semester II	
ROV mechanism and actuator implementation	May 10, 2019
ROV controller and operator controller software implementation	May 24, 2019
Experiment and testing the ROV in the swimming pool	July 24, 2019
Improvement and writing the final proposal	August 1, 2019

A tentative budget for the project is as follows:

1. $200 for electrical system (ROV control system, operator console panel, digital camera and monitor)
2. $100 for mechanism system (Pressure vessel, buoyancy body)
3. $150 for mechatronics system (pumps and valves)
4. $70 for long distance cable
5. $80 for back up