

# Field Robotics Group ROB 590 Position

## Waypoint follower for Autonomous Underwater Vehicle (AUV)

### Project Description:

The student will work at the Field Robotics Group (FRoG) under the supervision of Dr. Katie Skinner and a Ph.D. student. This project will be on implementing a waypoint follower for an autonomous underwater vehicle (AUV). The timeframe of this project is to have it complete by the end of the Winter 2025 semester, fully implemented and tested both in simulation and real world environments. The work of this project will be used for field tests in the Summer of 2025.

### Project Requirements:

The project will be composed of 2 major parts, and if time permits, a final part.

1. Implementation of a waypoint follower relative to the initial position and orientation of the robot. Completion of this goal will include:
  - a. Going to a predefined 3D **position** with fixed heading
  - b. Going to a predefined 3D **position** and **orientation (only the yaw angle will change)**

There are no prior requirements on the type of controller and motion planner, and will be open for the 590 student to explore these options.

2. Implementation of a waypoint follower given latitude and longitude of the initial position and final position. During our testing, we will be restricted to the fact that our initial state estimate is dictated by the GPS readings. The goal will be to make the robot go to a predefined latitude and longitude, given the current reading of the GPS. Keep in mind that the GPS can only take measurements while at the surface, so the controller will need to use the internal state estimator to get to the goal latitude and longitude.
3. (If time permits) Object and obstacle avoidance: Given a map that has occupancy information of the 3D scene, implement the controller and motion planner to incorporate obstacle avoidance.

### Information about the robot:

The robot is a [BlueROV Heavy configuration](#) with additional sensors built on top of it. On top of the internal state estimator, we have a developed state estimator running on the robot to provide the full state of the robot over the duration of 5-10 minute long missions underwater.

### Important Qualifications:

1. Highly experienced with control and planning, and implementations on real hardware
2. Experienced with Python, C++ and ROS
3. Proficient with debugging hardware and software issues
4. Has taken ROB 550 and an additional course on controls/dynamics
5. Able to attend in person testing

**Preferred Qualifications:**

1. Prior experience on working with AUVs (has worked with robots similar to that of the BlueROV)

**Application Process:**

- Students interested should email Onur Bagoren ([obagoren@umich.edu](mailto:obagoren@umich.edu)) and Advait Sethuraman ([advaiths@umich.edu](mailto:advaiths@umich.edu)) and CC Dr. Katie Skinner ([kskin@umich.edu](mailto:kskin@umich.edu)) with their CV/Resume along with their transcript (unofficial transcripts are OK).