

Lab 1 – First Swim

You might remember that Ethernet cables ran between your control box and your E79 robot. The cables were cumbersome and limited the range of the robot. In E80, you will build an autonomous robot with an onboard Teensy microcontroller that controls its motors and collects data from its sensors. The purpose of this lab is to get you acquainted with the Teensy and to have you build your first autonomous robot.

Assembling Robot

Your kit should have an undrilled box, one assembled penetrator, two PCBs and components, and PVC for the robot frame. From E79, you should already know how to assemble the robot frame. Go [here](#) to download or view pdfs on how to assemble the rest of the robot. There is a pdf of the steps for assembling the box. There is also a pdf describing what are on the PCBs and how to assemble them.

Open Loop Control

You will use Arduino to program the Teensy. Go [here](#) to download Arduino 1.6.11 (not 1.6.12, the newest version), the Teensy bootloader, and other supporting files. The Teensy bootloader downloads Arduino programs onto the Teensy. Then, go [here](#) for a tutorial on writing Arduino sketches and uploading sketches onto your Teensy. It is advisable to complete at least the RGB LED and PWM tutorials.

After completing the tutorials, go [here](#) to download the Arduino files for this lab. Save the “libraries” files in your Arduino/library working directory. Save the “lab1” folder in your Arduino working directory. The lab1 sketch contains starter code that you will use to send PWM signals to your motors and to log the output on the SD card. Add code to the sketch to control the three motors.

Thrust Calibration

The Teensy will send PWM signals to control the motors. The PWM tutorial introduces such signals ([here](#) is another link to the page). Ideally, the motor will begin spinning when the PWM signal is greater than 0. Realistically, it will have a deadzone and a threshold PWM value needed to spin the motors. Use a thrust stand (pictured below) to generate a plot of steady-state force vs PWM value. Update the motor deadzone values in the Params.h library. Use the calibration to write the PWM sequence in the lab1 sketch to drive your robot along the desired path. This calibration will be very similar to what you did in Practicum 1C.