

# *EENG-340 Open Ended Project: Robot ESP32-S3 Carrier Board*

*April 11, 2024*

DESIGN AND PROTOTYPE A CARRIER BOARD FOR TO ALLOW AN ESP32-S3 TO CONTROL A ZUMO 32U4 ROBOT

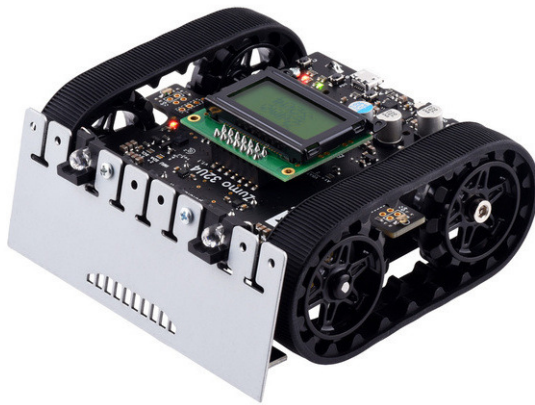
## PRE-LAB PLAN:

- 1 Requirements
- 2 Power
- 3 Communication
- 4 Wireless
- 5 Packaging

## *Requirements*

The goal of this project is to design a carrier board that would enable wireless programming of the robot. This project is focused on the electrical and mechanical connection between the existing robot and the carrier board. At a minimum you need to produce a prototype that can be used to demonstrate the feasibility of this concept by attaching an ESP32-S3 to the robot so that the robot can move freely with no external wires and the ESP32-S3 can control the robot's motion and get information about the robot's movements from the sensors already built-in to the robot. In the next lab we'll continue this work by implementing motion control with feedback.

Figure 1: The Zumo-32u4 Robot



Below is a table of basic requirements for this project. These are just a starting point. You may add more requirements as you develop your design. If you do, please document the requirements, and how you satisfy them in your design.

Note that while wireless programming is the ultimate goal of this effort, it is not expected that you'll implement that feature in this project.

Table 1: basic requirements

	Requirement	
1	Stand Alone	The ESP32 needs to be able to operate as a carrier board mounted on the robot. It must operate without external power or communication while the robot is in motion.
2	Programming	For this project, it's OK if you need to 'pre-program' the ESP32-S3 with a wire and then let the robot run wirelessly. If you can develop a wireless programming option that would be nice, but is not required.
3	Safety	The device needs to be safe at all times.
4	Robust	Since inexperienced users will be using the device, care should be taken that the physical construction is sufficiently robust that the prototype can withstand normal use.

### *Power*

Please get power from the robot. The robot presents 5V and GND at a convenient header that you can find in the documentation posted to Brightspace.

### *Communication*

The robot uses  $i^2c$  to communicate with various peripherals. The ESP32-S3 can control the  $i^2c$  bus and communicate with the robot in that way. You can use the library here <https://github.com/pololu/zumo-32u4-arduino-library> and an example here: <https://github.com/UIndyRobotics/ZumoRobot> to get started.

### *Packaging*

The final prototype needs to be self-contained (aside from the electrical connections to the robot) and fairly robust. The intent is that each student will produce a PCB, but if you are not able to complete that aspect, a working prototype on a perf-board is better than no prototype at all.