Final Design Project: Introduction

Plan: You and your team will be given a set of circuit-build modules that you will complete and combine as needed to design a car with speed control, wheel-direction reversal, and wheel balancing. The solution must incorporate ECE110 topics from lecture and lab and should ***not*** be dependent upon microcontrollers or embedded ICs. The design must allow for forward and backward control, speed modification, and wheel balancing, with additional functionally (like temperature shut-off) as extra credit. A functional block diagram is provided in Figure 1, with a more complete description of functions outlined in Table 1. This is a design experience, and the specifics of your solution will depend on your own choices and implementations.

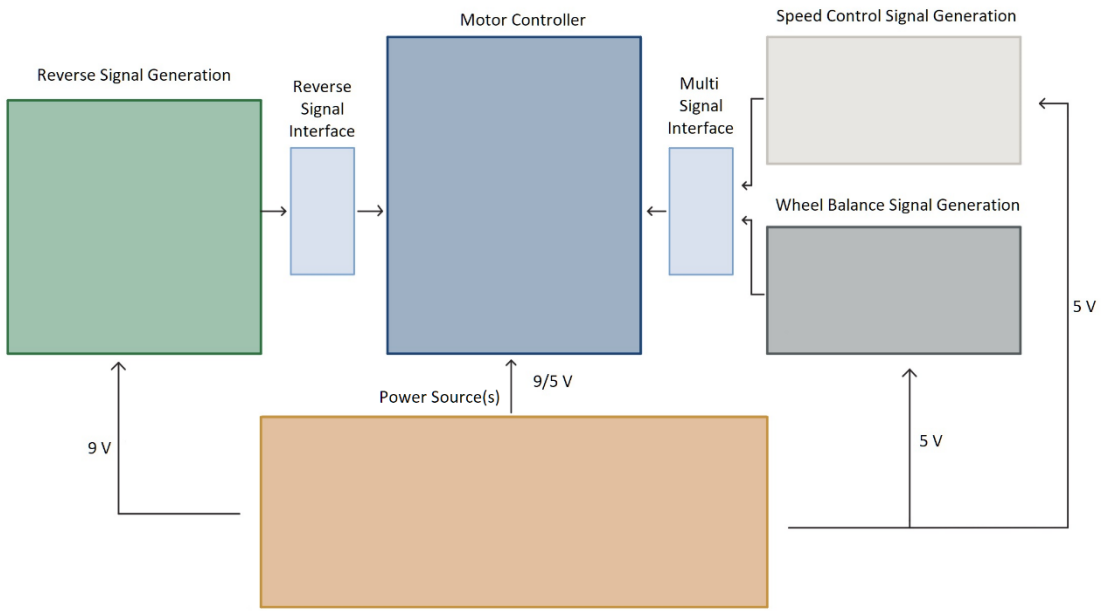

Figure 1: Functional Block Diagram of Final Project

Component	Function(s)
Reverse Motor Sensing	Generate voltage signal when clapping
Reverse Signal Interface	Use detected clap to reverse motor direction
Speed Control	Generate a voltage signal to control motor speed
Motor Balancing	Generate a voltage signal to control the relative speed of the motors (wheel balancing)
Multi-Signal Interface	Use motor balance control and speed control signals to manage individual motor speed
Motor Driver	Use reverse control, and motor balance control, and speed control signals to determine correct motor action
Power Source	Supply power to all systems with the appropriate voltage and capable of providing sufficient current

Table 1: Functional Requirements of Final Project

As teams, think about how you can implement these functions with the tools you have learned from your speed and wheel balanced car in addition to new modules provided. Revisit previous challenge questions and released modules to determine a satisfactory design.

When designing the *interfaces* between the circuits that accomplish each task, think about how you can use MOSFETs and inverters to buffer and condition signals to make them better suited for the next task in the circuit flow.

Notes:

These functional blocks can also be thought of as potential focus areas as future engineers. If you are interested in power, control systems, robotics you should focus on areas related to those things.

Notes:

TIMELINE

Week	Pre-lab	In Lab	After Lab
Week 1	Midterm Written Report	Complete Microphone and pre-amp module and submit as a team	Group submission of Mic & Preamp. Submit Group Progress Report 1.
Week 2	Start work on additional modules. Finish Written Report.	Finish work on 2nd module [individual effort this time] and begin building design.	Individual submission of module. Submit Group Progress report 2
Week 3	Test preliminary design and improve as needed.	Finalize design and implementation. Work on adding functionality from modules as extra credit.	Continue working/improving final design.
Week 4	Refine final design and understanding of what you implemented. Submit E.C modules	IN LAB Q&A	Work on final technical report and video
Week 5 (short week)	Finish video and final technical report	NO IN-LAB INSTRUCTION. Final video and report submission	

Notes:

GRADE DISTRIBUTION

Section	Total Points	Notes
Team Module	**/150**	This will be submitted as a group
Individual Module	**/150**	A module is required to be accomplished as an individual task. There are enough modules for each member of the team to work on a distinct task. Two students of a team are not allowed to submit the same module.
Weekly Progress Reports	**/50 * 3**	One due after each week of lab
Individual Demo plus Q&A	**/200**	Will cover individual contributions to the project
Final Video of Project	**/200**	Shows completed car functionality and covers your implementation (3 -5 minutes)
Final Report	**/300**	Technical report detailing what you have done