**Design Goals**

- Fit through lab doors and hold two people
  - Width = 35” to 36” and height ≤ 24”
- Able to be carried
- Maintain appreciable speed
  - Top speed ≥ 35 MPH
- Stop in a reasonable distance
  - Stop in 30 feet from top speed
- Contain teachable ECE concepts
- Use high # of Arduino, UART, etc.
- Run well documented custom software

**Measurable Objectives**

- Width = 35” to 36” and height ≤ 24”
- Chassis weight ≤ 100 lbs
- Top speed ≥ 35 MPH
- Stop in 30 feet from top speed
- Use high # of Arduino, UART, etc.
- Run all hardware with custom software

**Team Members**

**Electrical Engineering:**
- Ian Johnson
- Patrick Donovan
- Suliman Alturaif

**Computer Engineering:**
- Deagan Malloy

**Mechanical Engineering:**
- Ashley Andringa
- Jake Kolb

**VIP Student:**
- Nikola Durand

**Purpose**

- Design, build, and test a fully functioning electric powered go kart that will serve as an education tool for the ECE Outreach team
- Showcase the skills of each team member by allowing coursework knowledge to be applied
- Acts as a project for future students as they improve upon the initial design

**Future Work**

- Primary goals for future teams include Electromechanical Steering, Electromechanical Braking, Solar Trickle Charging, Autonomous Braking, and Additional Safety Features

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- Special thanks to Olivera Notaros for advocating for the project and assisting our fundraising
- Special thanks to Brad Andringa for providing a work location and tools for the ME Team

**Electronics**

- The Kart is driven by two Brushless DC motors run by two Vedder Electronic Speed Controllers
  - The open source VESC project gives us full insight on the concepts used to drive a BLDC motor as well as communications to a microcontroller
  - The microcontroller in question is the Teensy 4.0.
  - This particular model was chosen for its greater speed and configurable ports. The greater speed allows for the code loop to run in a shorter time and for a higher baud rate to the VESCs
  - We also have a throttle input and braking input to the Teensy via ADC inputs

**Future Work**

- The custom control software is written in the Arduino IDE, interpreted by a program called TeensyQuino, and saved to the Teensy 4.0 microcontroller
- Each loop, one of the critical modules is called
  - These critical modules include throttle control, information display, and other critical functions.
- The VESCs communicate with the microcontroller via UART
  - Each VESC is controlled individually so that in the future, the speed of each wheel can be tuned based on different sensors
- The Code is currently privately on the teams GitHub repository, but will be made public

**Mechanical**

- The goal for this project was to create a functional rolling chassis that the ECE team could integrate their electrical design into.
  - **Frame:**
    - Modeled in SolidWorks to develop a final design
    - FEA testing for simple design validation and software learning
    - Constructed from 1/16” thick, 1” diameter tubing and welded together
  - **Motor Mounts:**
    - Custom fabricated to be a three part system to tension chains
    - Two base plates machined with a CNC from 6061 aluminum stock

- **Braking and Steering:**
  - Single rear hydraulic caliper with 1/8” thick, 6” diameter brake disk.
  - Master cylinder located behind brake pedal.
  - Quick release steering wheel.
  - Rack and pinion style steering system mounted beneath frame.