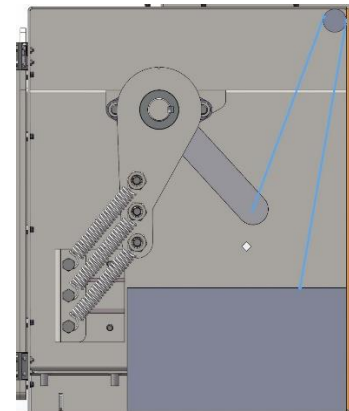
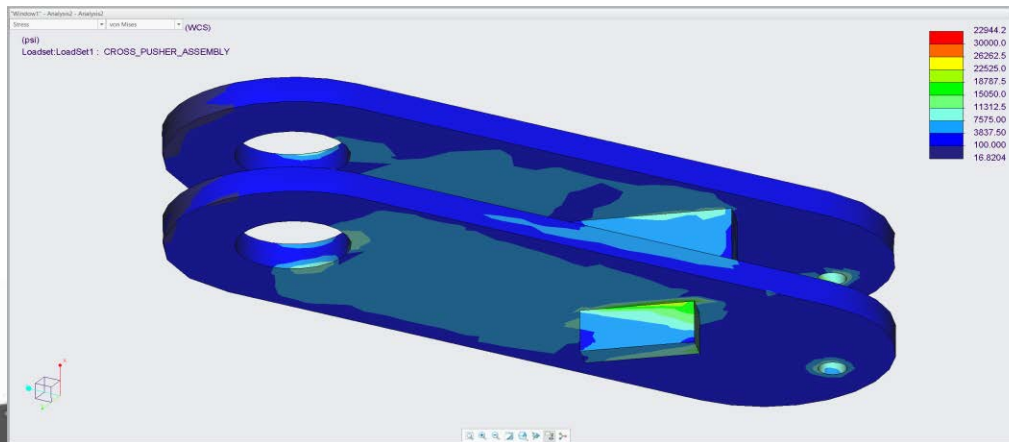


Imperial Abort Gate Redesign (2022)

- The goal of the project was to redesign the High Speed Abort Gate so it is cheaper and easier to produce
- At the conclusion of the project, students were able to:
 - Design and perform analysis in CREO
 - Fabricate and test an improved prototype over the original design that automatically closes when a spark or fire is detected
 - Significantly reduce the price and streamline the assembly
 - Identify areas for improvement for future designs
- This project was sponsored by Imperial Systems



SAE Electric Baja (2022)

- The goal of the project was to design, fabricate, and test a fully electric SAE Baja vehicle
- At the conclusion of the project, students were able to:
 - Design and fabricate a working electric Baja vehicle
 - Test vehicle around campus with excellent results

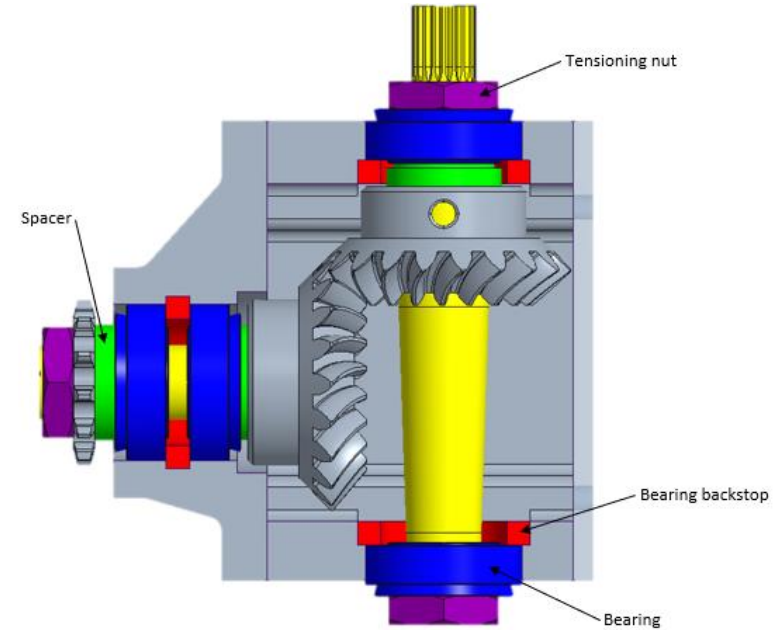
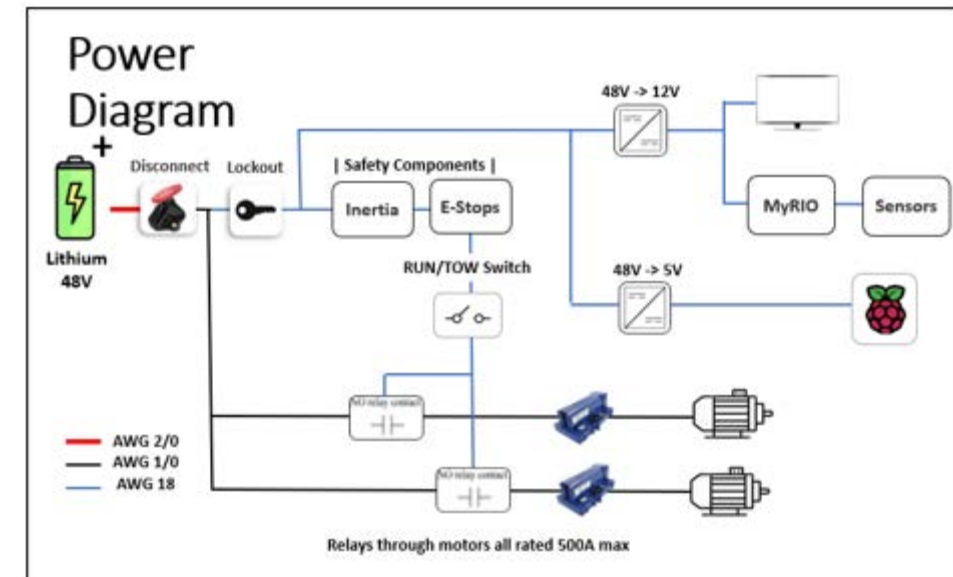


Figure 1. Drawing of gearbox design



Battery Thermal Management (2022)

- The goal of the project was to determine whether the temperature of a battery could be used as a measure of battery health and to predict failure
- At the conclusion of the project, students were able to:
 - Create CFD models to predict suitable locations for measuring temperature
 - Experimentally confirm these CFD models through real-world testing
 - Develop predictive models based on batteries of known health that can be used to predict the health of unknown batteries in the future
- This project was sponsored by Constellation Energy

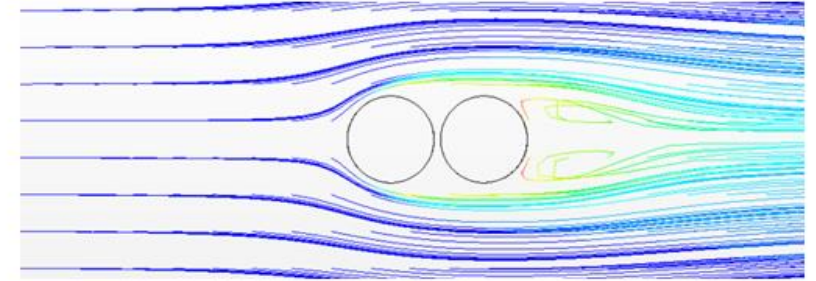


Figure XIII.3 Streamline scenes showing the recirculation zone geometry zone and how it lengthened from single to parallel testing configurations

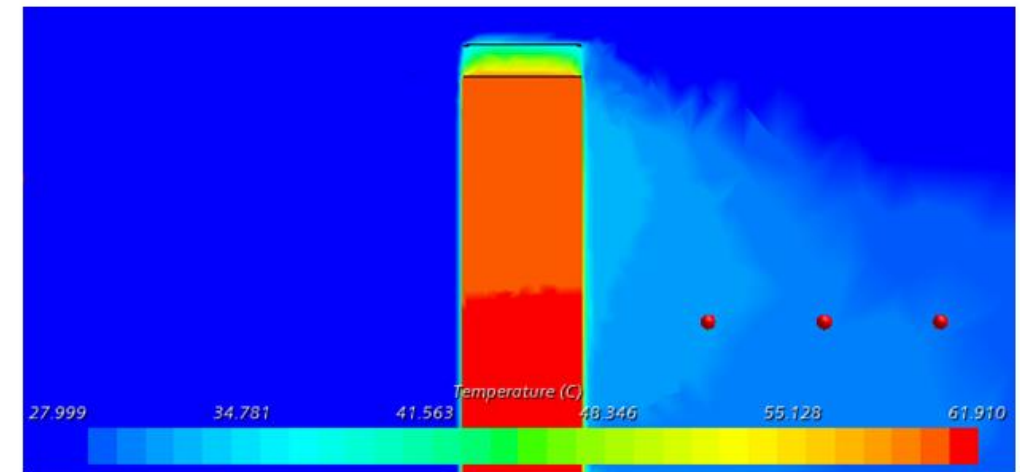
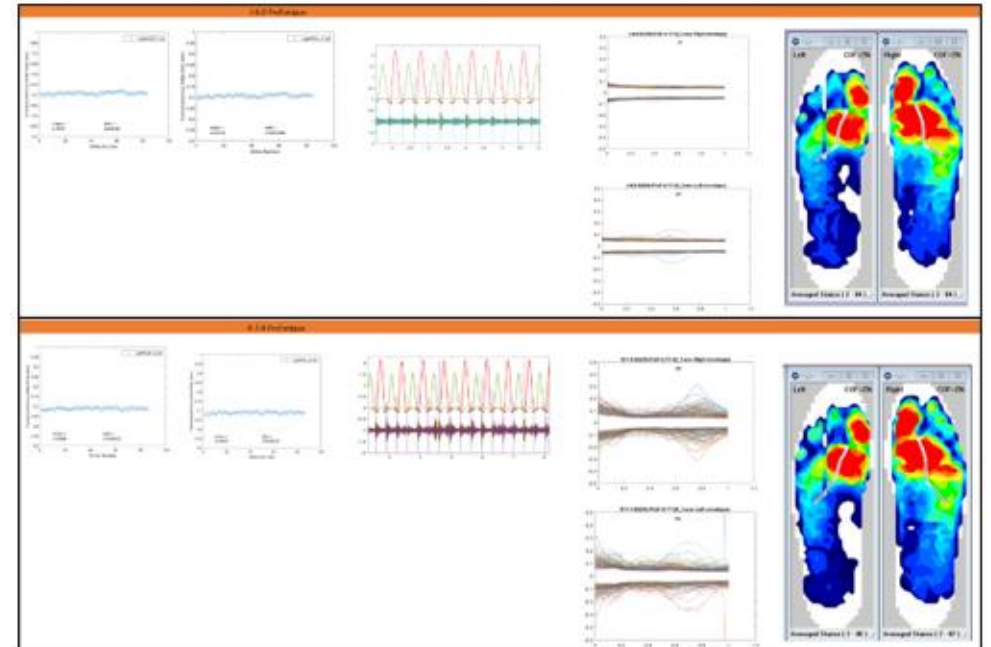


Figure XIII.1 Point probes collecting temperature over a single CFD battery model simulation

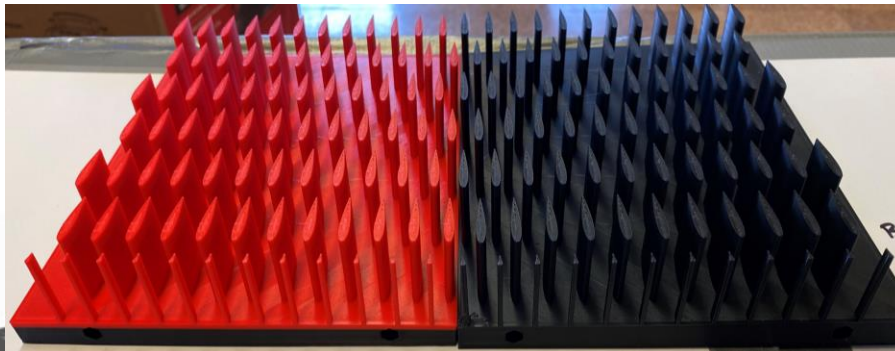
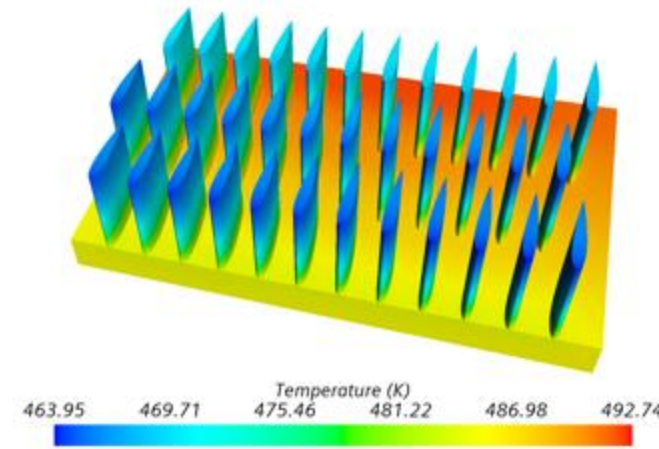


- The goal of the project was to provide and validate clinically useful gait parameters from acoustic measurements with data taken through various methods
- At the conclusion of the project, students were able to:
 - “make new strides in research on the acoustics of a runner’s gait”
 - Partner with the entrepreneurship department to develop a business plan to incorporate some of their findings into a commercial product
- This project was sponsored by Highmark



BPMI Heat Sink Design (2022)

- The goal of the project was to design a heat sink for an unspecified application capable of dissipating over 2 kW of heat, minimizing the pressure drop and overall size
- At the conclusion of the project, students were able to:
 - Design various models using CREO software
 - 3D print prototypes and measure pressure drop in a custom made wind tunnel
 - Extensively model heat transfer and fluid flow using STAR-CCM CFD software
- This project was sponsored by BPMI



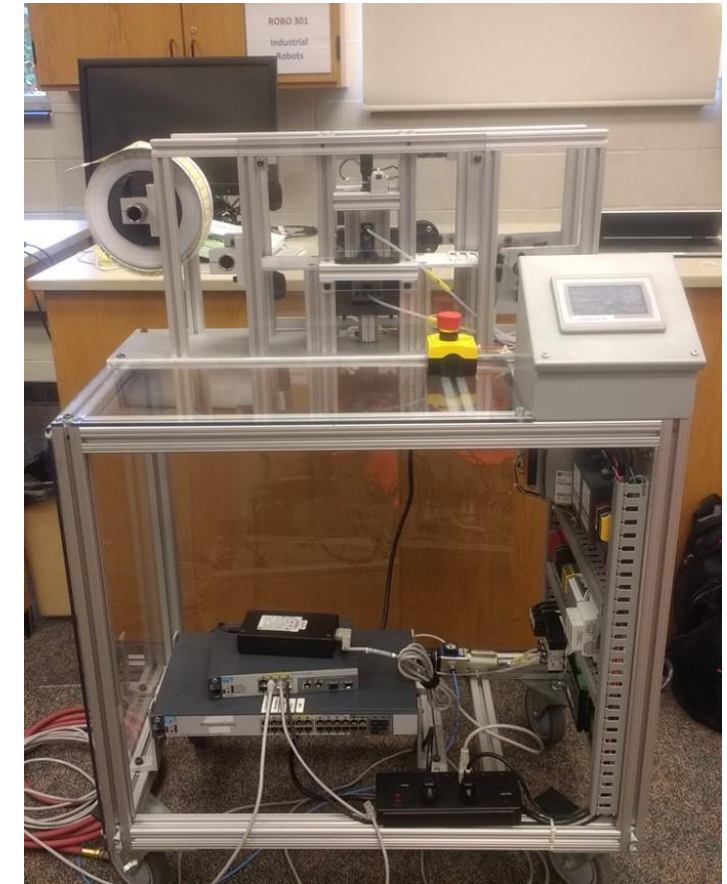
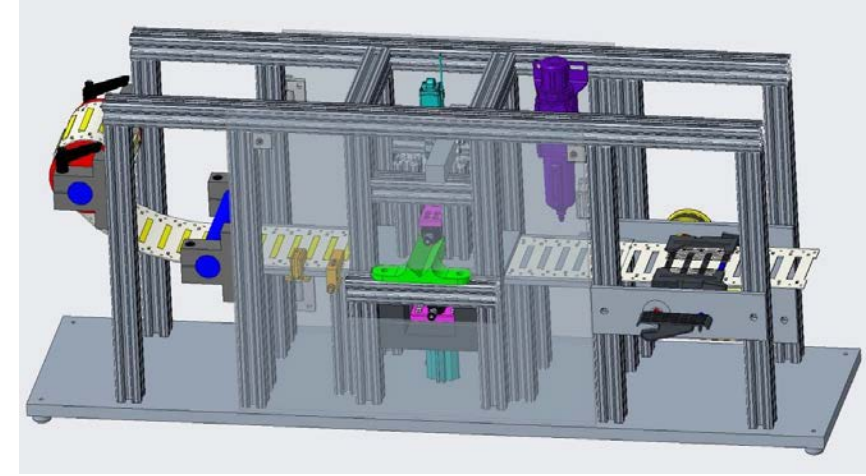
A 3D rendering of a laboratory furnace, likely a muffle furnace. It features a grey metal body with a viewing window on the front door. Inside the furnace, a sample holder with a yellow cone-shaped object is visible. The control panel on the right side includes a digital display, a red emergency stop button, and a power switch. A cylindrical vent pipe is located on top of the furnace.

-

	Manufacturability	Material Holders	Burner	Cost	Smoke Evacuation	Structural Integrity	Totals	Normalized Criteria Totals
Manufacturability	x	0	0	0	0	0	0	0.000
Material Holders	1	x	1	0	1	1	4	0.267
Burner	1	0	x	0	1	0	2	0.133
Cost	1	1	1	x	1	1	5	0.333
Smoke Evacuation	1	0	1	0	x	0	2	0.133
Structural Integrity	1	0	0	0	1	x	2	0.133
							15	

Liberty Electronics Sleeve Label Applicator (2022)

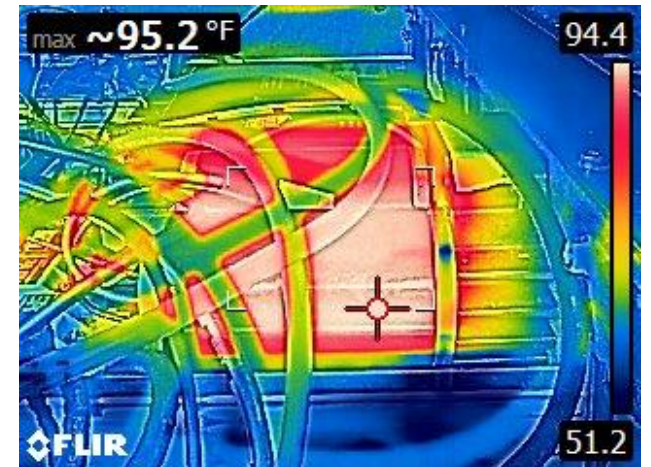
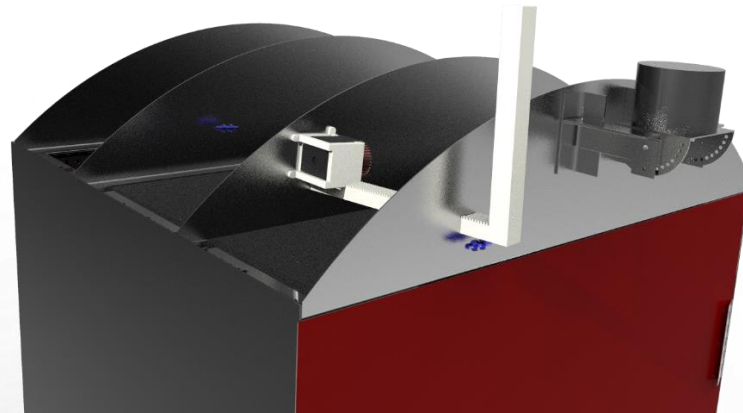
- The goal of the project was to design, fabricate, and test a new prototype improving on the 2021 team's design
- At the conclusion of the project, students were able to:
 - Create and analyze various designs in CREO
 - Fabricate an updated prototype using in-house resources and equipment
 - Achieve greatly increased reliability for the 3/16" labels
 - Identify future needs for the next phase of the project
- This project was sponsored by Liberty Electronics



Mail Delivery Robot (2022)

Interdisciplinary ME and EE project

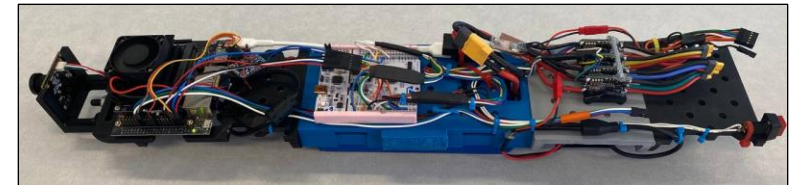
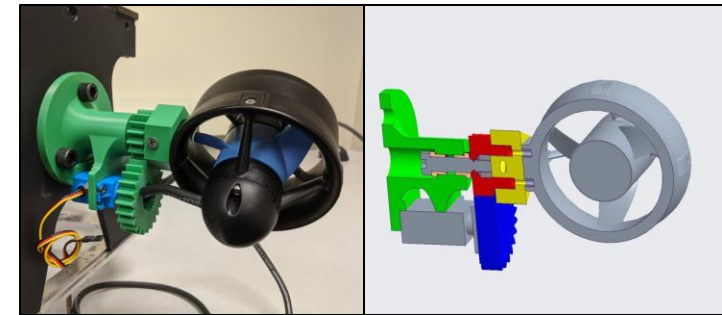
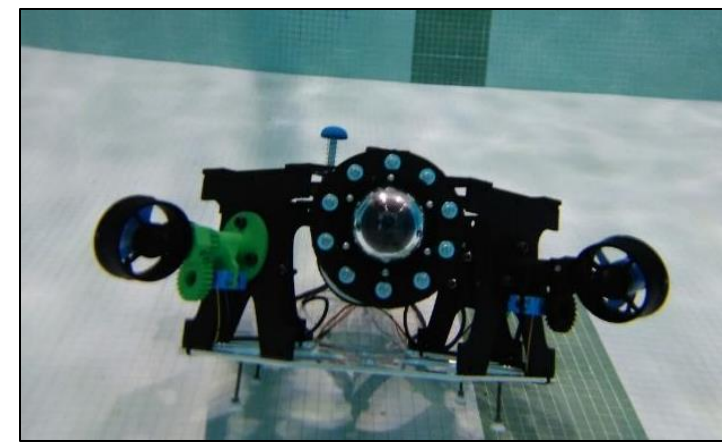
- The goal of the project was to improve the design and functionality of a robot designed to deliver packages on campus. A prior team had developed the basic propulsion system and control.
- At the conclusion of the project, students were able to:
 - Develop CREO models of all mechanical assemblies
 - Analyze thermal loads and verify cooling system design
 - Perform vibration analysis at key sensor locations on the robot
 - Design and implement sensor mounts, door actuator, and charging station
 - Collaborate with ECE students



Robo Sub (2022)

Interdisciplinary ME and EE project

- The goal of the project was to design and build an underwater vehicle capable of navigating in 6 degrees of freedom and recording video
- At the conclusion of the project, students were able to:
 - Design and build a navigation system consisting of four brushless DC thrusters mounted on four servo motors using a custom gear set
 - Design and build a waterproof electronics system including motor controllers, a camera, a pressure sensor, and a navigation computer
 - Program the navigation computer to maintain depth and attitude using the 4 thrusters, and to drive forward
 - Stream, annotate, and record video from the camera onto an SD card
- This design was originally intended to compete in the international RoboSub competition. However, interest from the PA Fish and Boat Commission in local lake exploration motivated us to redirect development towards that goal



pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

