

SECS Senior Design Available Projects – Summer 2022

Electric Scooter Projects

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A suite of technology features designed to improve the overall micro-mobility experience

Comprehensive Alerting Technology for Scooters (CATS) – Razor USA



CATS Team 1: Active safety- Detect riding hazards utilizing range-finding sensors. Mitigate accidents through improved situational awareness.

- Front hazard detection and collision avoidance - Both long range and medium range solutions are developed
- Blind Spot hazard detection and alerts - Alert when a vehicle is approaching from behind

<u>Discipline</u>	<u>Qty desired</u>
ME	1
EE	2
CE	6

CATS Team 2: Compliance with usage rules- Detect and mitigate improper usage through alarms, IOT notifications, and countermeasures

- Sidewalk riding - Utilize on-board accelerometer to classify the road surface
- Reckless riding - Track vehicle dynamics and classify riding behavior
- Fall/accident detection
- Downed scooter detection (sidewalk clutter)
- Theft detection
- Tamper detection
- Develop a “chassis dyno” for stationary test capability

<u>Discipline</u>	<u>Qty desired</u>
ME	1
EE	2
CE	6

CATS Team 3: Visibility and audio - Improved lighting and rider alerts

- Smart running lights with PWM brightness control
- Turn indication
- Multi-use audio system
- Execute alert requests from monitored systems

<u>Discipline</u>	<u>Qty desired</u>
ME	1
EE	5
CE	3

CATS Team 4: Electronic cable lock - integrated anti-theft system tethers the scooter to a bike rack when not in use

- Extensive testing of production “Lock-to”
- Diagnostics detect tamper or system failure
- Retail version utilizing RFID
- Retail version utilizing NFC
- Include a backup disconnect method in case of battery failure

<u>Discipline</u>	<u>Qty desired</u>
ME	1
EE	3
CE	3

CATS Team 5: Pedestrian Detection - Utilize mmWave Radar technology to classify nearby hazards

- Build mmWave Radar system
- Develop “proof of concept” solution for detecting pedestrians in the scooter’s path

<u>Discipline</u>	<u>Qty desired</u>
EE	2
CE	4

NOTE: Confidentiality and assignment agreements are required before students can begin work on any of the CATS projects.

Next Generation Controller (NGC) - Oakland University

NGC Team: An open source control system for light electric vehicles

Motor control - Three-phase, brushless, hub motor control module

- 3-phase induction control with hall sensor feedback
- Control algorithm
- System calibration

Vehicle control - Manage functional subsystems (listed in priority order)

- Throttle, audio, lights, and brake interactions
- BMS communications
- Instrumentation panel: Speed & SOC
- IOT interaction
- Configuration/calibration system: application specific
- Module communications (CAN)

Enclosure(s)

- Modularity
- Heat rejection

Discipline Qty desired

ME	1
EE	2
CE	6

Gutter Guard Forming Machine

Company - Midwest Gutter Cleaning

Blake German — Phone: 248-520-1575 — Email: blake@midwestguttercleaning.com

Kim Messenger — Phone: 248-880-9570 — Email: kbigos17@gmail.com

Project Summary

Our company has designed and produced a prototype gutter guard that fits 5" gutters. We are looking to have a machine built to form the product to our specific profile. This machine, or machines, would need to perforate the sheet or rolled aluminum, form the shape of the gutter guard and then be sheared to the correct length. The ideal length would be at least 8ft of gutter guard or longer. Our current material is .019 by 24" by 50' black trim coil.

Resources that students will have access to includes a Fusion 360 file of the design, the designer of the gutter guard (Kim Messenger), and an expert for the installation of gutter guards, (Blake German). Additionally, a drawing of the design is included at the end of the proposal.

Functional Requirements/ Deliverables

The goal is to have a functional machine to create the gutter guards. For a typical house you need 200ft-300ft of gutter guard. This machine would need to be able to create the same profile consistently. We are not looking for a 500,000 industrial machine, but rather a smaller scale machine that we can use to start a gutter guard business.

Estimated Design Team Composition/Skills

Sheet metal knowledge, CAD knowledge, roll forming, or stamp pressing knowledge.

Design Challenges

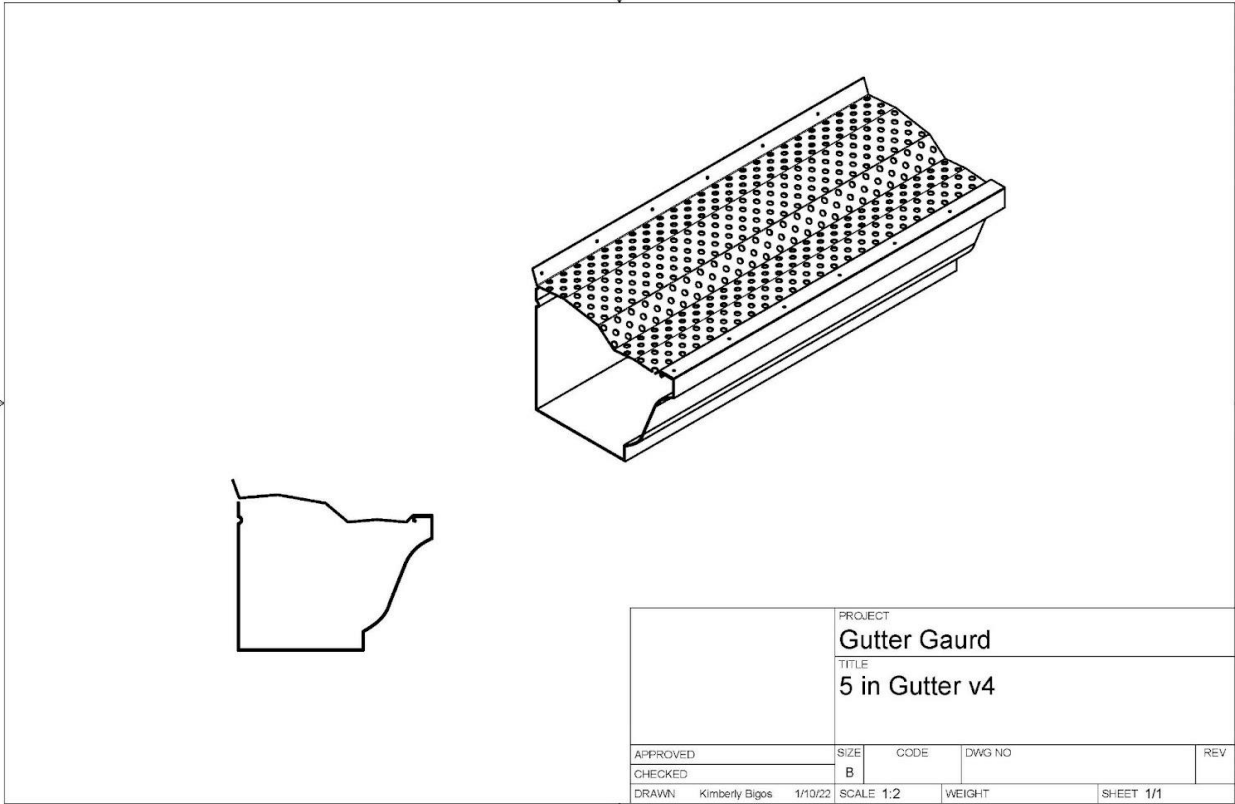
Our company has never created our own product, only installed other company's products. We have not been able to find a machine to fit our needs and are hoping it is possible to build a machine for our specific design.

A design challenge is the width of the material. The product needs about 5 3/4" of material, but currently we are unable to find the material we want to use with that specific width. Therefore, we will need to find a way to use wider material and cut it to a size we can use.

NOTE: Confidentiality and assignment agreements are required before students can begin work on this project.

Estimated Material and Production Costs

The top two most costly items for this project would be the parts for the machine and the aluminum material needed for the product to be produced. We ask that all purchases be approved by our team.



PROJECT		Gutter Gaurd			
TITLE		5 in Gutter v4			
APPROVED	SIZE	CODE	DWG NO	REV	
CHECKED	B				
DRAWN	Kimberly Bigos	1/10/22	SCALE 1:2	WEIGHT	SHEET 1/1

Retinal biometric Estimation-Based System for Hands-Free Communication

Project contact: Abed Shaout ashaout@oakland.edu

Project Summary

In March of 2021, [a project that was published](#) that aimed to serve the disabled community in painting a canvas. The objective is to take the same basic idea and create a system that can allow a disabled person to communicate with simple characters or images.

Functional Requirements/ Deliverables

This system needs to be portable and easy to use. It must deliver a minimum of 15 understandable statements, such as going to the bathroom, eating, sleeping, etc.

Estimated Design Team Composition/Skills

Embedded systems, Programming, CAD knowledge, DSP, Image processing, CNC

Design Challenges

There are many similar products and ideas in the market. The idea is compact portability at a low cost.

Estimated Material and Production Costs

The challenge is making this product very affordable. Initial cost will need to be discussed prior to proposal.