


# Mechanical and Aerospace Engineering
# 2026 Design and Manufacturing Expo
# April 22, 2026

RUTGERS–NEW BRUNSWICK
School of Engineering
Department of Mechanical and Aerospace Engineering

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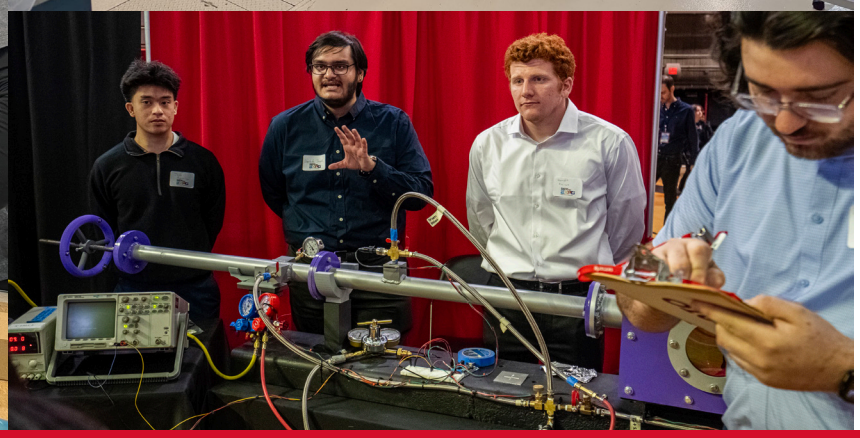
|---|---|
| Course Coordinators | Prof. Edward DeMauro<br>Prof. Assimina A. Pelegri |
| Teaching Assistants | Mr. George Gianoukakis<br>Ms. Wenyi Liu<br>Mr. M. Abrar Muhit |
| Design Specialists | Dr. Basily Basily<br>Mr. Ioan-Mihai Gradina<br>Mr. Milan Simonovic |
| Seminar Speakers | Robert DeSimone *Marotta*<br>Merrill Edmounds *Siemens*<br>Stephen Tse *Rutgers MAE*<br>George Papadopoulos *GE Aerospace*<br>Sean Bradshawn *Pratt & Whittney* |



# NOTE FROM THE CHAIR

We are delighted to welcome you as we celebrate the creativity, technical excellence, innovation, and teamwork showcased in our 2026 Design & Manufacturing and Aerospace Engineering Senior Design Projects. Guided by our faculty mentors, these 52 projects span a broad range of topics across the discipline, reflecting both the diverse expertise within our department and the wide-ranging interests and talents of our students.

The Department of Mechanical and Aerospace Engineering is a dynamic and vibrant academic community offering undergraduate degrees in Mechanical Engineering, Aerospace Engineering, and Applied Sciences (with a concentration in Packaging Engineering), as well as graduate programs leading to the M.S., M.Eng., and Ph.D. degrees.

With 40 full-time faculty members, our department serves more than 1,000 undergraduate students and 180 graduate students. Together with our students, alumni, and industry collaborators, we foster a thriving environment dedicated to excellence in education, research, and innovation.

Our faculty are deeply committed to preparing students to become creative problem-solvers, innovators, and future leaders in engineering. Through a rigorous curriculum grounded in the core principles of mechanical and aerospace engineering, combined with opportunities for undergraduate research and hands-on design experiences, students gain exposure to real-world challenges and practical applications comparable to those encountered in industry and advanced research settings.

Our faculty are recognized leaders in their fields, with many holding distinction as Fellows of major professional societies, including ASME, AIAA, APS, ASA, and AAM. The department's multidisciplinary research enterprise spans a wide spectrum of cutting-edge areas, including nanostructured materials, hypersonics, autonomous robotics, electrohydrodynamics, fluid-structure interactions, energy systems, and advanced materials, among many others.

We extend our sincere gratitude to the faculty advisors for their leadership, mentorship, and dedication in guiding students throughout the Senior Project experience. We also thank our outstanding staff—especially Dr. Basily Basily, Mr. Milan Simonovic, and Mr. Ioan-Mihai Gradina—for their invaluable technical expertise and support in reviewing designs and manufacturing project components.

And most importantly, to our students: we are immensely proud of your accomplishments, perseverance, and hard work. This milestone reflects your talent, commitment, and ingenuity. We wish you every success in the exciting careers ahead and hope you will remain connected to the MAE community for years to come.

Cheers!

Assimina A. Pelegri, Ph.D.
Professor and Chair
Department of Mechanical and Aerospace Engineering

# NOTE FROM THE COORDINATORS

Dear students, family members, and friends,

We would like to extend a warm welcome to the Department of Mechanical and Aerospace Engineering at Rutgers University. This brochure represents the culmination of our yearlong capstone senior design program, showcasing our students' projects across AY 2025 – 2026. We could not be happier with the perseverance and dedication of our students as they worked through challenging engineering problems utilizing the skills they acquired across their academic careers. Through these projects, spanning a range of topics within mechanical and aerospace engineering, our students demonstrated ingenuity in tackling open-ended problems, working directly with their faculty advisors, industry representatives, and fellow students. We encourage you to take time to appreciate the breadth of projects, along with the novelty in our students' approaches to problem solving and join us in congratulating them on a job well-done and a mission accomplished.

To our seniors, we would like to congratulate you on having reached the finish line. This year saw a dramatic evolution of our senior design program as we took part in the first School of Engineering Capstone Senior Design Expo, along with a growth in the total number of groups participating across both Design & Manufacturing and Aerospace Engineering Design. As you prepare for what comes next, whether securing a job or beginning graduate studies, know that we are immensely proud of your accomplishments and are proud to genuinely welcome you into the engineering profession. Congratulations on a successful conclusion to the academic year and the start of a bright new future.

In closing, we also extend deep gratitude to the hard work of our teaching assistants, George Gianoukakis, Abrar Muhit, and Wenyi Liu, who put forth exemplary effort in helping to make this all possible. A special thanks to Jesse Hubler for tirelessly helping our students reach the finish line.

Once again, congratulations to the Class of 2026!

Edward DeMauro, Ph.D.
Associate Professor
Dept. of Mechanical & Aerospace Engineering

Assimina A. Pelegri, Ph.D.
Professor and Chair
Dept. of Mechanical & Aerospace Engineering

# DESIGN AND MANUFACTURING PROJECTS

## MECHANICAL BIRD

AEROSPACE DESIGN PROJECT

Faculty Advisor
Prof. Prosenjit Bagchi

Group Members
Aastha Gobind
Arvin Ramsaran
Edward Rada
Emily Valarezo
Eric Liu
Jesse Nwadiozor

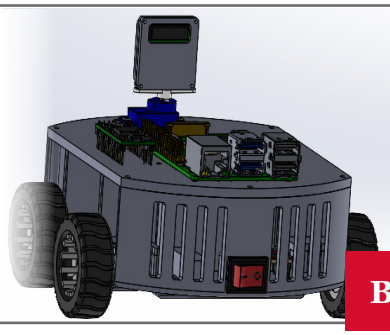
**BA**

This senior design project concentrates on the design and development of a mechanical bird capable of flight through flapping and morphing wings. Unlike conventional unmanned aerial vehicles, a bird-inspired system offers the potential for quieter operation and improved safety.

## MULTI-COORDINATED ROBOTS FOR TARGET IMAGING

Faculty Advisor
Prof. Xaioli Bai

Group Members
Jacob Falkenstein
Alejandro Marote
Nat Onofre
Stephano Rivera

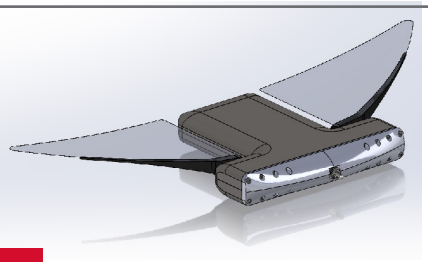


AEROSPACE DESIGN PROJECT

**B3**

For this design project, two identical autonomous robotic cars have been constructed for the purpose of demonstrating multi-coordinated movement and imaging of an arbitrary object of interest.

## BIO-INSPIRED MANTA RAY ROBOT



Faculty Advisor
Prof. Prosenjit Bagchi

Group Members
Frank Puchalski
Salvin Ikedife
Avi Stern
Ellie Vreeland
Nick Cyganik

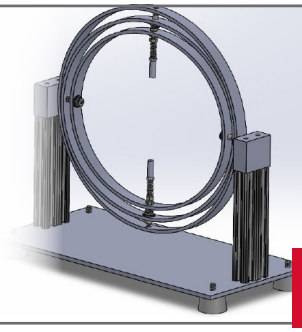
**B4**

This project addresses the limitations of conventional underwater drones, which predominantly rely on propeller-based propulsion systems. Offering a quieter, safer, and energy-efficient alternative to traditional drones, MantaBot could enable closer observation of marine life with minimal disturbance.

## ROTATIONAL STABILITY DEMONSTRATOR

Faculty Advisor
Prof. Haim Baruh

Group Members
Ailli Iranmanesh
Gisselle Rodriguez
Fatema Agami
Saif Ellithy
Emir Kilic
Ese Itietie



**BH**

This project addresses the need for a hands-on device that allows users to directly observe how mass distribution influences rotational stability. To address this challenge, a low-cost, fully mechanical three-ring gimbal system was developed to enable controlled three-dimensional rotation.

## TESTBED FOR AUTONOMOUS SPACE PROXIMITY AND RENDEZVOUS OPERATIONS (TASPRO)

AEROSPACE DESIGN PROJECT

Faculty Advisor
Prof. Xiaoli Bai

Group Members
Kevin Li
Meahan Azmi
Flora Jeng
Logan Kotch
Nathan Stewart
Richard James Hummel

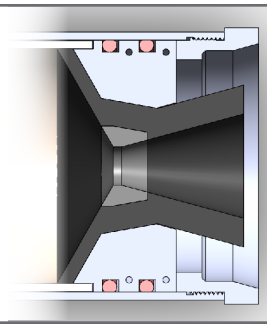
**B2**

TASPRO integrates a mobile robotic platform with a UR5e industrial robotic arm to simulate spacecraft chaser-target interactions and validate control algorithms in a controlled laboratory environment.

## CARBON-FIBER WRAPPED ROCKET NOZZLE

Faculty Advisor
Prof. Haim Baruh

Group Members
Ian Rosenheim
Kael Jespersen
Dario Gosevski
Alex Furman
James Lavery
Shane Huebscher



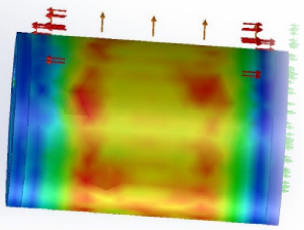
**B5**

Combining carbon fiber's high strength-to-weight ratio with the thermal resilience of graphite, the design achieves durability under high-stress conditions while reducing overall mass. The design is intended for a student research and designed solid rocket motor, with the nozzle constrained for seamless integration in existing propulsion.

# DESIGN AND MANUFACTURING PROJECTS

## ACCESSING A LUNAR LAVA TUBE THROUGH A MOTORIZED AIRLOCK SYSTEM

AEROSPACE DESIGN PROJECT



Faculty Advisor
Prof. Haym Benaroya

Group Members
Abhijith Ajit
Alexis DeMello
Erin Collins
Lincoln Sorenson
Frank Somma
Hana Malabag

**B7**

As humanity plans for sustained lunar habitation, a critical engineering challenge is to enable safe, repeated transitions between a pressurized habitat and the vacuum of the lunar surface. To do this, an airlock system is required to maintain the integrity of the habitat, resist contamination against regloith, and operate reliably.

## PROJECT GHOST: LIQUID ROCKET ENGINE SYSTEM

AEROSPACE DESIGN PROJECT

Faculty Advisors
Prof. Steven Berg
Prof. Sasan Haghani

Group Members
Sathya Balachander
Ravi Patel
Aditya Sharma
Samuel Mulvey
Thomas Tocci
Saahil Joshi
Ayaan Charaniya

**BE**

Design, construction, and testing of a complete liquid bi-propellant rocket engine system capable of producing 750 lbf of continuous thrust. Developed a professional and robust electrical control and data acquisition system to enable safe, repeatable, and high-fidelity testing of a regeneratively cooled liquid rocket engine

## LAVAR: LUNAR AUTONOMOUS VOID ACCESS ROVER

AEROSPACE DESIGN PROJECT

Faculty Advisor
Prof. Haym Benaroya

Group Members
Jesse Felder-Pfaff
Sujoy Gupta
Kevin Rios-Ramirez
Alex Calle
Gerson Diaz
Carlos Bustamante

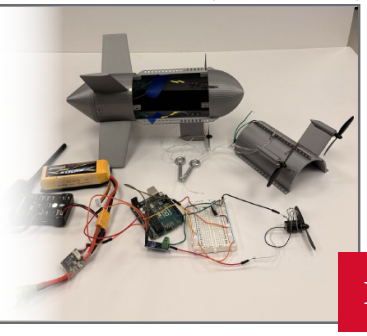
**B1**

Designed a rover to explore underground lunar lava tubes. The system features a pulley-based descent mechanism with a motorized 3D printed assembly and electromagnetic release, along with an independently driven front-wheel system enabling basic autonomous navigation and steering.

## WIND ENERGY AND WATER POWER SYNERGY (WET CENTER)

Faculty Advisor
Prof. Onur Bilgen

Group Members
Aditya Shahani
Gursharn Singh
Julius Bourodimos
Joshua Ryu

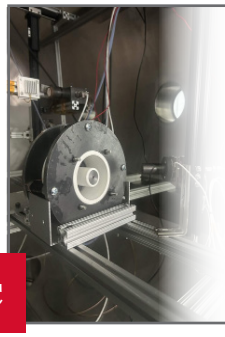


**B8**

A hydrokinetic turbine (HKT) prototype used for performance testing inside a subsonic wind tunnel. Major emphasis placed on creating modular components that allow for easy, repeatable experimentation inside of the wind tunnel.

## DESIGN AND TESTING OF A 200W HALL EFFECT THRUSTER

AEROSPACE DESIGN PROJECT



Faculty Advisor
Prof. Steven Berg

Group Members
Michael Scannicchio
Rebecca Fabian
Andrew Huth
Travis Knipping
Matt Teo
Michael Bettencourt

**BC**

Hall Effect Thrusters are a prominent form of in-space propulsion devices that operate by ionizing an inert gas propellant to create thrust. This project designed, manufactured, and tested a low-powered, 200 Watt Hall Thruster capable of producing thrust with argon propellant.

## RAPID HYDROKINETIC TURBINE MODELING AND TESTING

Faculty Advisor
Prof. Onur Bilgen

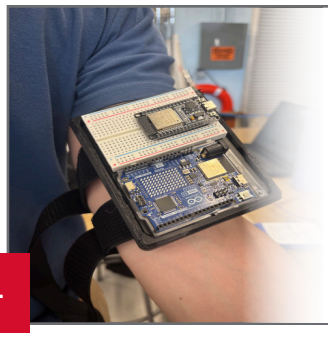
Group Members
Robert Delghiaccio
Semra Tracy
William Bleier
Selvana Mansour
Nicholas Carranza

**B6**

Hydrokinetic turbines provide a renewable source of energy that is less environmentally impacting than dams. This project addresses the critical need for rapid and cost-effective testing methodologies in the field of hydrokinetic energy development.

# DESIGN AND MANUFACTURING PROJECTS

## VITALSYNC ARM SLEEVE



Faculty Advisor
Prof. Joseph Cohen

Group Members
Anthony Profaci
Maxwell Joyce
Aiden Pokhis
Neil Mandar
Rohan Parikh
Nikita Shamota

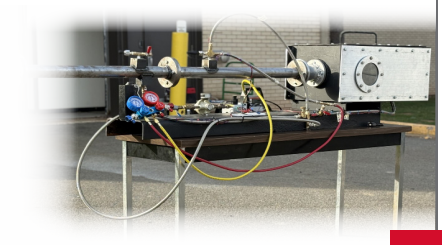
C4

Developed a smart wearable arm sleeve capable of monitoring multiple physiological signals and analyzing them in real time. Addresses the need for a more advanced, yet practical, wearable system that not only collects physiological data but also interprets it into meaningful feedback using machine learning techniques.

## TABLETOP HYPERSONIC SHOCK TUNNEL ENHANCEMENT

Faculty Advisor
Prof. Edward DeMauro

Group Members
Henry Rich
Matt Leighton
Garret Ricciardi
Jacob Aguaviva
Saarim Syed
Vardata Jaura

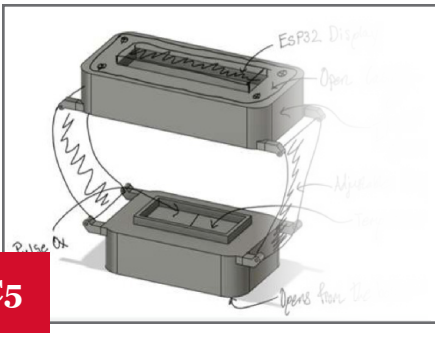


AEROSPACE DESIGN PROJECT

D1

Took on the challenge of enhancing last year's shock tunnel. While there showed promise of results during the previous iteration, there was a lack of accuracy, consistent results, and safety factors. The goal of this project was to achieve consistent ruptures within its diaphragms, controlled debris propagation, and better containment of a vacuum throughout its test section.

## SMARTWEAR II: HEALTH MONITORING WRISTBAND



Faculty Advisor
Prof. Joseph Cohen

Group Members
Mickey Eltvedt
Isabella Vazquez
Josh Hsu
Kunjan Patel
Aditya Ningaiah
Vansh Patel

C5

SmartWear is a low-cost health monitoring wristband designed to help users detect physiological changes before they develop into more serious medical problems. The engineering approach combines wearable sensing, electronics, mechanical design, and machine learning.

## THE FOWL GRYM REAPER

Faculty Advisor
Prof. Edward DeMauro

Group Members
Jennifer Andrews Pilla
Elior Lerman
Rivka Malek
Federico Martinelli
Emily Wong

AEROSPACE DESIGN PROJECT

D5

The Fowl Geese Reduction Yield Management (GRYM) Reaper aims to be the solution to deterring geese. GRYM is a fixed-wing RC aircraft with a built-in spinning-disk mechanism that launches pellets through a barrel beneath the fuselage. The final prototype is lightweight, cost-effective, and easy to use.

## CANEMATE: OBSTACLE DETECTION AND FEEDBACK SYSTEM

Faculty Advisor
Prof. Kimberly Cook-Chennault

Group Members
Madeleyn Andrade Cajamarca
Akhil Abraham
Christina Kornegay
Kevin Pena
Tyler Jones
Sebastian Lima
Ryan Zhang

T2

This project aimed to enhance the functionality of the traditional white cane by designing an affordable, lightweight, and attachable electronic module that improves obstacle detection and user safety while maintaining the cane's simplicity and ease of use.

## STRIKE DEPLOYABLE DRONE

Faculty Advisor
Prof. Edward DeMauro

Group Members
Isha Patel
Diya Joshi
Sreevatsan Sidharthan
Joel Arun
Ohm Patel
Aakarsh Prasad

AEROSPACE DESIGN PROJECT

D2

This project addresses the need for a low-cost, rapidly deployable solution capable of delivering emergency supplies to stranded individuals in hard-to-reach areas. STRIKE (Supply Transport for Relief In Key Emergencies) is a radio-controlled UAV designed to transport and deploy essential food supplies during disaster response scenarios.

# DESIGN AND MANUFACTURING PROJECTS

## BIO-INSPIRED FLAPPING WING ENERGY HARVESTER - GROUP 2

**D6**

Faculty Advisor
Prof. Mitsunori (Mitch) Denda

Group Members
Olivia O'Donnell
Connor Shutter
Bastian Farias
Boris Monchy
Nick Velicky

Traditional turbines are hindered by high mechanical complexity and a reliance on high wind speeds. To solve this, our project introduces a Bio-Inspired Flapping Wing Energy Harvester. By applying the principles of flapping-wing aerodynamics, we have created a system that maximizes lift and drag transitions at low Reynolds numbers.

## SKYGUARD UAS BALLOON-DRONE

AEROSPACE DESIGN PROJECT

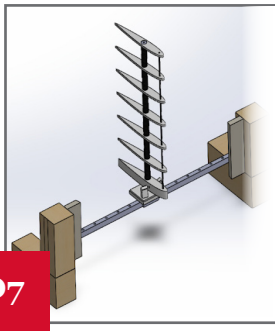
Faculty Advisor
Prof. F. Javier Diez-Garias

Group Members
Abu Bhuiyan
Alex Ly
Jackson Skarbek
Kyle Motta
Manuel Mekhaeil
Alex Pellicane

**D3**

SkyGuard is a balloon-based counter-uncrewed aerial system (counter-UAS) concept designed to provide persistent, low-cost monitoring and response capability at a fixed location. Our engineering approach combines passive aerodynamic stabilization with an actively controlled aerial component.

## BIO-INSPIRED FLAPPING WING ENERGY HARVESTER - GROUP 1



**D7**

Faculty Advisor
Prof. Mitsunori (Mitch) Denda

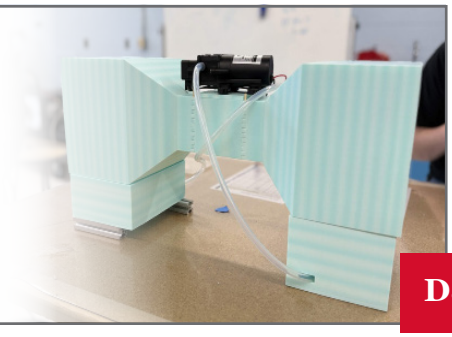
Group Members
Ian Joy
Aito Sterle
Danny Mariano
Joshua Mueller
Michael O'Connell
Thomas O'Connor

This project developed a bio-inspired flapping wing energy harvester that converts wind-induced oscillatory motion into electrical power. By mimicking the unsteady aerodynamic mechanisms observed in birds and fish, this system seeks to provide a compact, low-noise, and potentially wildlife-friendly alternative for small-scale renewable energy generation.

## LIQUID BASED PORTABLE AIR FILTRATION DEVICE

Faculty Advisor
Prof. German Drazer

Group Members
Philip Le
Tulsi Bulsara
Darry Chu
Andres Evelyn
Juan Cordozo
Milo Pangulayan

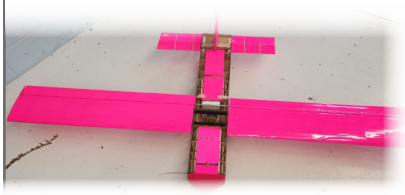


**D8**

The goal of this project was to create a water-based air filtration system that can filter at least 80% of particulate matter in a 150-square-foot room within 1 hour while maintaining a noise level of under 80 dB and operating with an internal battery.

## DESIGN, BUILD, AND FLIGHT OF A FIXED-WING RC AIRCRAFT

AEROSPACE DESIGN PROJECT



**DZ**

Faculty Advisor
Prof. F. Javier Diez-Garias

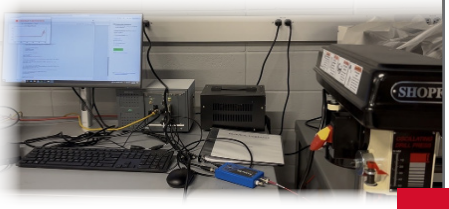
Group Members
Samuel George
Julie Vu
Nicholas Castracane
Melanie Renjifo Saa
Jose Nopo
James Ho
Logan Hood

A custom RC aircraft was built and tested to safely transport live passengers (three rubber ducks, used to simulate live ones for ethical and safety reasons) and additional cargo (a standard hockey puck), while completing a controlled takeoff, sustaining flight, and performing a safe landing.

## AI AUTONOMOUS MONITORING OF MILLING MACHINE TOOL

Faculty Advisor
Prof. Yuebin Guo

Group Members
Dev Rana
Brian Engel
Sid Mehta
Rishi Parekh
Shey Adeyemo
Muhammad Tashif



**G1**

The goal of this project is to retrofit a manual drill press with an autonomous sensing system to detect contact between the tool and workpiece in real time. The system uses an Acoustic Emission sensor, a Raspberry Pi, and a stepper motor assembly to replace the traditional operator's judgment with a neural network-based system.

# DESIGN AND MANUFACTURING PROJECTS

## SOLAR-POWERED HYDROPONIC IRRIGATION SYSTEM

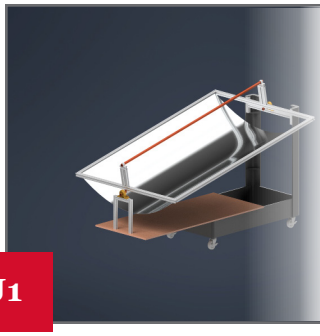
Faculty Advisor
Prof. Zhixiong (James) Guo

Group Members
Alex Seiden
Evan Bickel
Adyan Khondker
Brent Joseph
Jack Cardoso
Leon Charsley

**G4**

The primary objective of this project was to design and prototype a mobile, solar-powered hydroponic greenhouse capable of self-sufficiency from external electrical infrastructure while maintaining ideal growing conditions.

## CONCENTRATED SOLAR ENERGY COLLECTOR - GROUP 1



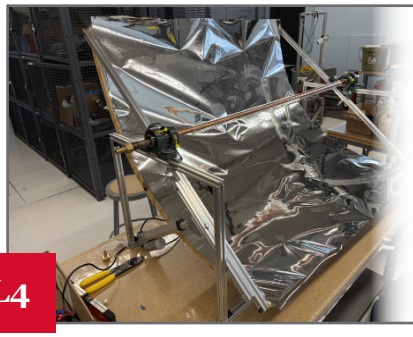
Faculty Advisor
Prof. Yogesh Jaluria

Group Members
Sean Gardina
Marc Oliu
Ty Von Seidelmann
Matthew Sleeper
Andrew Ginart

**J1**

This project addresses the problem of hot water insecurity by creating a self-sufficient device using solar energy to heat water. Up to five gallons of water are heated from room temperature to boiling point using exclusively heat flux from the sun.

## CONCENTRATED SOLAR ENERGY COLLECTOR - GROUP 2



Faculty Advisor
Prof. Yogesh Jaluria

Group Members
Kevin Arruda
John Borkowski
Alex Puhak
Franklin Linares
Andrew Sirabian
Prem Yaragarla

**L4**

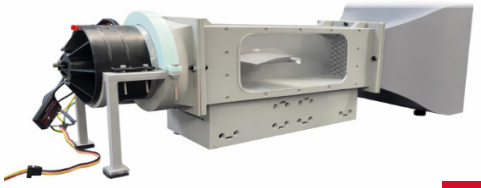
This project presents the design of a concentrated solar thermal system capable of heating and storing hot water using renewable solar energy. The system is intended to heat approximately 10 liters of water from 20-25 degrees C to 90 degrees C during a 10-hour solar heating period and maintain usable heat for up to 8 hours overnight.

## DESIGN OF MINIATURE WIND TUNNEL FOR MEASURING PITCHING MOMENT ON AN AIRFOIL - GROUP 1

AEROSPACE DESIGN PROJECT

Faculty Advisor
Prof. Doyle Knight

Group Members
Maksym Yanchyk
Nick Perone
Jack Erickson
Marco Davila
Ali Ozek
Induwara Dalawella



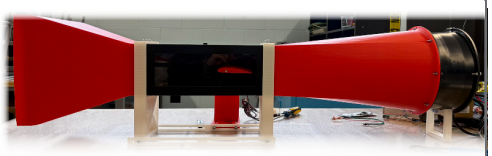
**K1**

This project presents the design and development of a compact, fully 3D-printed wind tunnel for measuring the aerodynamic pitching moment of airfoils. The system is intended to provide an affordable and accessible platform for aerodynamic experimentation while maintaining sufficient accuracy for educational and small-scale research applications.

## DESIGN OF MINIATURE WIND TUNNEL FOR MEASURING PITCHING MOMENT ON AN AIRFOIL - GROUP 2

Faculty Advisor
Prof. Doyle Knight

Group Members
Ryan Freeman
Matt Minunni
David Brown
Joe Ortu



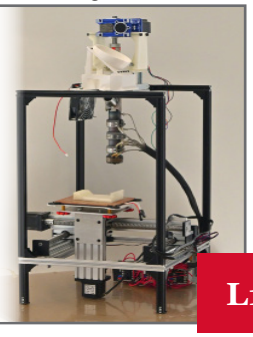
**K2**

This project utilizes 3D printing to design and manufacture a compact subsonic wind tunnel capable of measuring the aerodynamic pitching moment about the quarter-chord of a 2D airfoil. The system integrates airflow visualization through a transparent test section and smoke injection system, while incorporating sensors to measure velocity, angle of attack, and aerodynamic moment.

## CONSTRUCTION AND TUNING OF A PELLET-FED 3D PRINTER

Faculty Advisor
Prof. Jennifer Lynch-Branzoi

Group Members
Dustin Fraser
Spenser Butrym
Areeba Zameer
Ryan Thomas
Ethan Suh
Fizza Zehra
Tyler Kobylinski

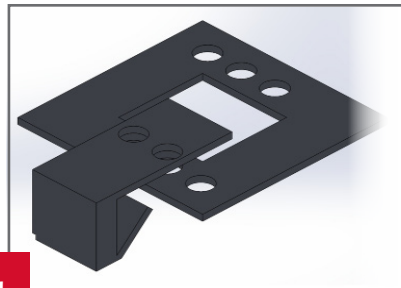


**L1**

This project focuses on the design, analysis, and development of a pellet-fed 3D printer intended for advanced research applications in additive manufacturing. The printer should be capable of processing both low-temperature polymers (~185 °C) and eventually high-performance materials such as PEEK (~400 °C).

# DESIGN AND MANUFACTURING PROJECTS

## HYBRID ADDITIVE MANUFACTURING



Faculty Advisor
Prof. Rajiv Malhotra

Group Members
Isaac Louisma
Conor Udovich
Hamza Alam

**M1**

Issues such as layer misalignment, inconsistent material flow, and extrusion errors often occur during a 3D print but go unnoticed until the process fails completely. This project aimed to create a system that can detect these defects as they happen, enabling immediate intervention and laying the groundwork for smarter, more reliable printing.

## MACHINES FOR TESTING THE MECHANICAL STRENGTH OF ADDITIVE MANUFACTURED PARTS

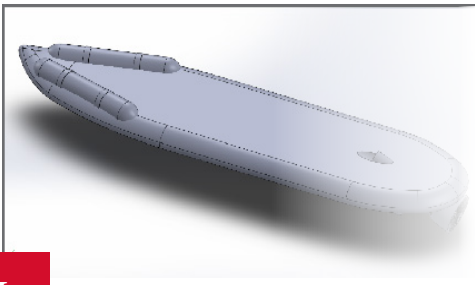
Faculty Advisor
Prof. Andrew Norris

Group Members
Olivier Hyppolite
Brandon Melgar
Prit Patel
Jaime Orihuela
Julian Saucedo
Orlando Castillo

**M6**

Developed a low-cost, reliable testing machine specifically designed to characterize the flexural properties of additive manufactured polymer parts. The design utilizes a two-column aluminum V-slot frame featuring an inverted architecture to lower the center of gravity and improve access to electrical subsystems.

## SURFBOARD PROPULSION SYSTEM



Faculty Advisor
Prof. Aaron Mazzeo

Group Members
Corey Pushko
Jonathan Padewski
Ricky Strange
Luis Roman
Sharif Mustafa

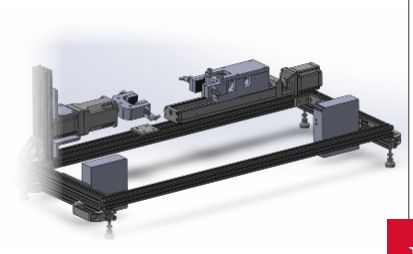
**M2**

Beginner surfers tend to have difficulties picking up the sport, which can then lead to them quitting the sport out of frustration and potentially causing safety hazards in crowded waters. This project proposes a solution to this problem. A surfboard equipped with a pneumatic propulsion system that provides a short, controlled burst of thrust will help beginners match a wave's speed during takeoff.

## ADDITIVE MANUFACTURING MATERIALS TESTER

Faculty Advisor
Prof. Andrew Norris

Group Members
Frank Pagano
Gabriel Ivan Izeppi
Mason Thaochuetoua
Sidney Vasquez

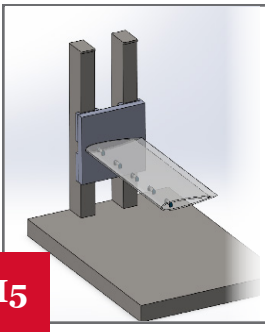


**M3**

The goal of this project was to investigate the mechanical properties of components created through additive manufacturing (3D printing). Concentrated solely on reliably and accurately measuring the stress and strain of 3D-printed parts.

AEROSPACE DESIGN PROJECT

## PASSIVE ELASTOMER-BASED TUNED MASS DAMPER SYSTEM FOR AEROELASTIC FLUTTER MITIGATION



Faculty Advisor
Prof. Aaron Mazzeo

Group Members
Mike-Lee Thezard
Jongwoo Park
Armaan Patel
Kevin Chen
Adrian Dizon

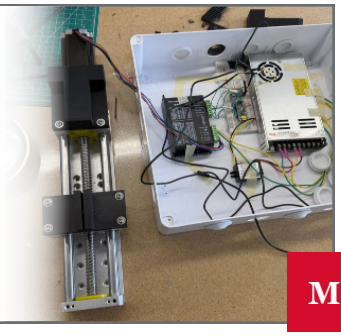
**M5**

This project consisted of a rectangular wing mounted on a test stand integrated with a Passive Elastomer-Based Mass Isolation System to reduce aeroelastic flutter and vibration response, enabling improved structural stability and performance under dynamic aerodynamic loading.

## DESIGN AND DEVELOPMENT OF A TENSILE TESTING SYSTEM FOR ADDITIVE MANUFACTURED PARTS

Faculty Advisor
Prof. Andrew Norris

Group Members
Rodi Adar
Bridget Williams
Yona Lavi
Elijah Hoarle
Camari Bartley



**M4**

Developed a tensile testing system that costs under $500 while maintaining the accuracy needed for meaningful materials characterization of additively manufactured specimens. Designed the system around three core subsystems: mechanical actuation, force measurement, and data acquisition.

# DESIGN AND MANUFACTURING PROJECTS

## MANUFACTURING NEGATIVE POISSON'S RATIO STRUCTURES

Faculty Advisor
Prof. Andrew Norris

Group Members
Gabriel Cocchiola
Donald Reslock
Kurt Seidel
Timothy McCutcheon

**N1**

Materials exhibiting a negative Poisson's ratio, or "auxetic" materials, offer desirable properties in energy-absorption applications. This project evaluates three manufacturing methods for their feasibility in producing auxetic structures at scale.

## UPGRADED NUTRITION BAR EXTRUDER FOR AUTOMATED CUTTING AND INCREASED PRODUCTION SPEED

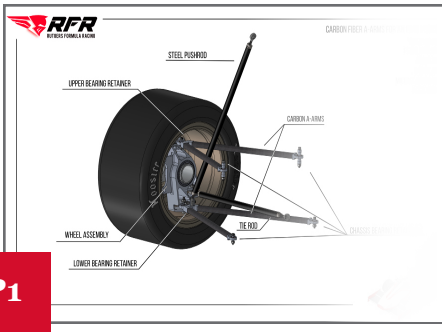
Faculty Advisor
Prof. Todd Rossi

Group Members
Meridian Carsky-Wilson
Amanda Lau
Shubhika Sethi
Isabella Guarracino
Izabella Komperda
Justin Schechter

**S1**

The goal of this project is to improve on the first-generation extrusion design from a prior senior design group that produced a slow extrusion rate of about 4 bars per minute. This updated design addresses many of the prior's limitations, creating edible bars for a more efficient, food-safe system that will achieve an extrusion rate of at least 10 bars per minute.

## CARBON FIBER A-ARMS FOR AN FSAE VEHICLE




Faculty Advisor
Prof. Assimina Pelegri

Group Members
Sheza Bajwa
Peter Gomulka
Arush Jain
Rachit Jain
Michael Yaghdjian
Alex Yanar

**P1**

In Formula SAE, performance is heavily influenced by weight—particularly unsprung mass, which directly impacts handling, acceleration, and responsiveness. This project tackles that challenge by redesigning suspension A-arms (control arms) using advanced carbon fiber composites to significantly reduce weight while maintaining structural integrity.

## SMART FARM

Faculty Advisor
Prof. Todd Rossi

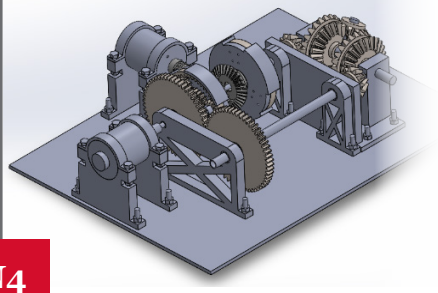
Group Members
Adrian Anderson
Ismail Dar
Roberto Sanchez
Joshua Kaus
Daniel Jedrzejczyk

**S2**

The goal of this project is to reduce manual labor while improving consistency and repeatability in the tree-tying process. Our approach uses a rotating indexed platform that moves the tree to specific angular positions during operation.

AEROSPACE DESIGN PROJECT

## ELECTRONIC CONTINUOUSLY VARIABLE TRANSMISSION FOR WIND TURBINES AND PROPULSION SYSTEMS



Faculty Advisor
Prof. Amin Reihani

Group Members
Shrey Aggarwal
Will Lydon
Ryan Hargy
Jason Guo
Ethan Caudle
Aryaman Kapoor
Zach Pyszczymuka

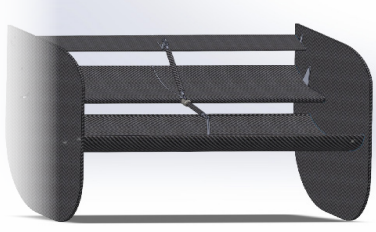
**N4**

This project focuses on the design of a gear-based electronic CVT (eCVT) for propulsion systems and small- to mid-scale wind turbines. Unlike conventional belt-driven CVTs, which suffer from slippage, limited torque capacity, and durability issues, this design replaces belts with planetary gear sets and electronically controlled inputs to improve robustness and efficiency.

## ACTIVE AERODYNAMICS SYSTEM FOR RUTGERS FORMULA RACING FSAE EV RACE CAR

Faculty Advisors
Prof. Jerry Shan
Prof. Sasan Haghani

Group Members
Paul Nasr
Aly Kamel
Michael Stuart
Janine Adams
Anthony Ristovski

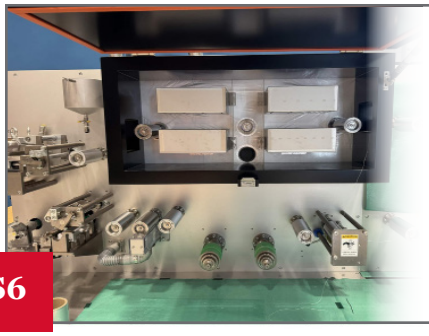


**S5**

Rutgers Formula Racing is manufacturing an electronically adjustable, three-element rear wing for its 2026 Formula SAE EV race car, also known as an "active aero" (also referred to as "drag reduction system", or DRS) rear wing. This wing can switch between two states: a high downforce and low drag configuration.

# DESIGN AND MANUFACTURING PROJECTS

## FUNCTIONALIZING FIBERS USING ELECTROSPRAY DESPOSITION



Faculty Advisor
Prof. Jonathan P. Singer

Group Members
Isha Shah
Hannah Mow
Kenneth Farhan
Matthew Westrich

**S6**

Roll-to-roll dip-coating is a continuous manufacturing method used to apply functional coatings to flexible substrates, but the process generates significant material waste. This project addresses the waste problem by integrating electrospray deposition into an existing machine, replacing the traditional chemical bath with a precision nanoscale coating process.

## AI SMART HVAC SYSTEM

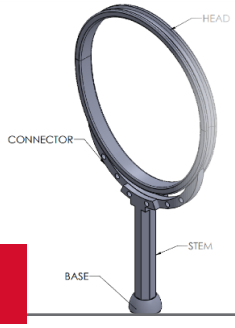
Faculty Advisor
Prof. Nikolaos Vlassis

Group Members
Kenyatta Mills
Chetanya Dogra
James Thompson
Edward Ivanov


**L3**

This project presents the design and development of an Artificial Intelligence-enabled Smart HVAC system that integrates LiDAR sensing with real-time data processing to automate indoor climate control.

## 3D PRINTED TENNIS RACKET




Faculty Advisor
Prof. Stephen Tse

Group Members
Nafees Shaheed
Efrain Olmos-Chavez
Samantha Ross
Abishek Subadheran
Nasir Aziz
Lucas Betances

**T1**

This project addresses the prevalence of repetitive strain injuries and the lack of customization in modern tennis by developing a modular, 3D-printed carbon fiber racquet with a novel adjustable head-angle mechanism.

## DESIGN OF A CYLINDRICAL PRESSURE VESSEL

Faculty Advisor
Prof. George J. Weng

Group Members
Nadira Benjamin
Emily Tan
Divya Patel
Maniyah Dixon
Kylah Durell
Louis Garzon

**M8**

A cylindrical pressure vessel with a capacity of up to 2 liters was designed and fabricated to investigate the influence of geometry on structural performance. The vessel was constructed using a hybrid approach that combines additive manufacturing and composite reinforcement.

## AI-ASSISTED REAL-TIME PARKING AVAILABILITY

Faculty Advisor
Prof. Nikolaos Vlassis

Group Members
Trish Gannoju
Dean Hussein
Erik Armstrong
Sean Duthaler
Zachary Daisey
Barrett Garcia

**W1**

This model parking lot demonstrates an AI-powered smart parking system designed to monitor and manage space availability in real time. Using a camera mounted above the lot, the system identifies whether each parking space is occupied by detecting objects within predefined regions.

## DESIGN OF A SPHERICAL PRESSURE VESSEL

Faculty Advisor
Prof. George J. Weng

Group Members
Katelyn Kazantzis
Jayson Illescas
Daniel Manson
Zeb Hinker
Sarthak Gandotra
Param Savalia
Dipen Patel

**W2**

AEROSPACE DESIGN PROJECT

This project focuses on a spherical pressure vessel made from a rigid 3D-printed PLA liner and a carbon fiber–epoxy outer shell. The liner consists of two mating hemispheres with a notched equator for alignment and assembly. The outer layer uses 3K 2x2 twill weave carbon fiber combined with marine-grade epoxy.

# DESIGN AND MANUFACTURING PROJECTS

## MECHATRONIC SYSTEMS FOR A 6 DOF SHAKING PLATFORM

Faculty Advisor
Prof. Jingang Yi

Group Members
Alex He
Simran Jakate
Alina Zahra
Brian Jin

**Z4**

The TORO platform is a low-cost 6-DOF motion simulator designed to provide professional-grade immersion and training for under $3,800. Using a hexapod system powered by six 750W servo motors, it integrates motion cueing algorithms, game telemetry, and VR technology to deliver real-time feedback across all six axes.

## AUTONOMOUS DELIVERY VEHICLE FOR INDOOR HOSPITAL USE

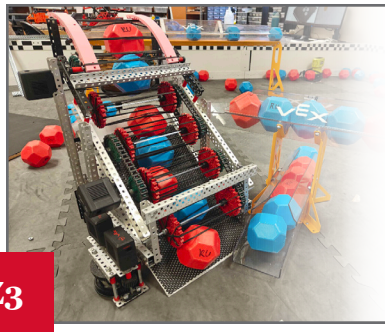
Faculty Advisor
Prof. Jingang Yi

Group Members
Adriel John Pagulayan
Jeremy McQuellen
Brennan Wyckoff
Jacob Young
Jason Huang
Joseph Wlodarczyk
Zachary Merold

**Y1**

The Autonomous Hospital Delivery Vehicle alleviates workload by delivering patient medications or lab samples. This project seeks to provide an affordable and effective option through the designed infrastructure, navigation, and construction.

## NOVEL DIFFERENTIAL SERVO DRIVE FOR AUTONOMOUS ROBOT TRACKING AND MANEUVER



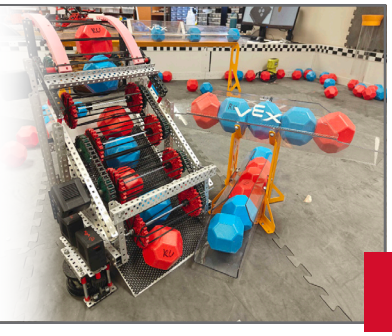
Faculty Advisor
Prof. Qingze Zou

Group Members
Mahdhav Rawal
Aarya Chaudhari
Anirudh Padhy
Shrimed Sangani

**Z3**

This project aimed to design, manufacture and assemble an omnidirectional differential swerve drive featuring four individual swerve modules to be integrated into a scoring system to complete the tasks set by the collegiate VEX Push Back competition.

## OBJECT RETRIEVAL AND SCORING SYSTEM FOR THE VEX PUSHBACK COMPETITION

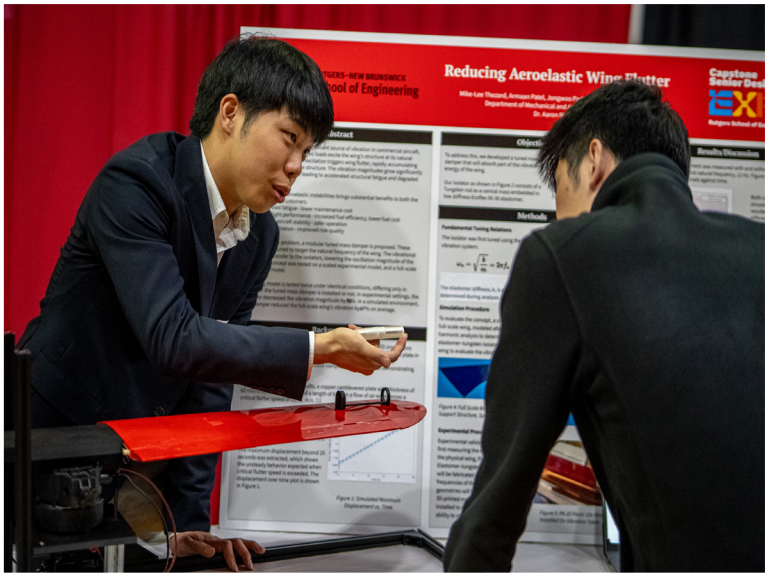


Faculty Advisor
Prof. Qingze Zou

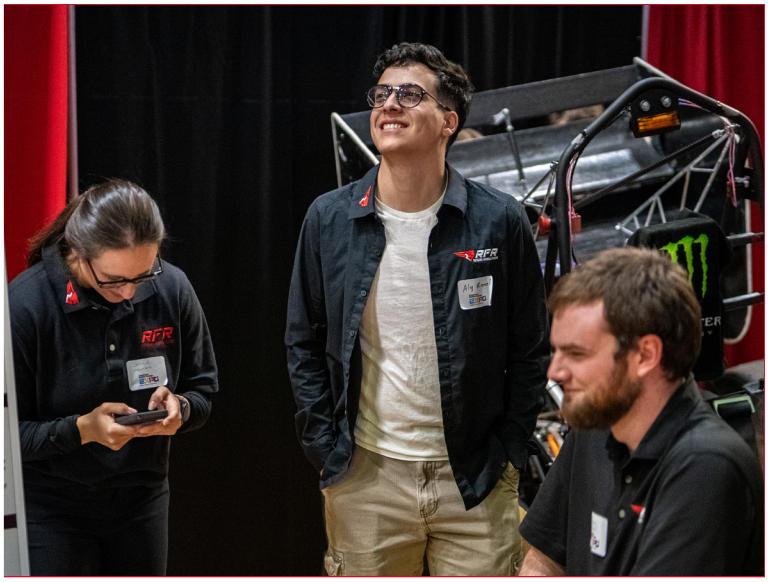
Group Members
Chinmay Mosur
Adam Modzelewski
Kavya Manduva
Nyle Rahman-Vyas

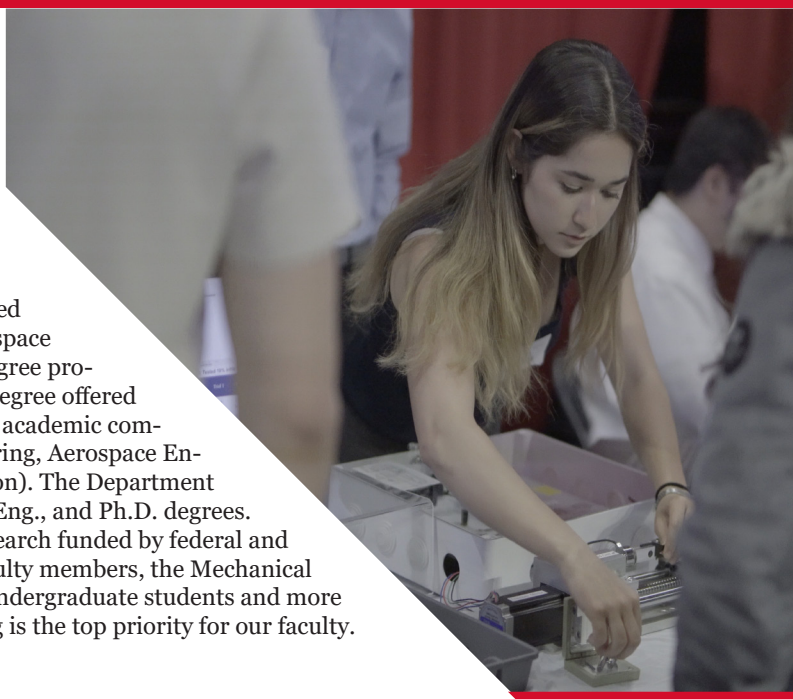
**S7**

The VEX Pushback competition challenges teams to design robots capable of collecting and scoring irregular octagonal objects, called “octoballs,” at three different height levels. A roller intake with a double-output system was designed for its ability to score at multiple heights without repositioning the robot, reducing cycle time.


Reducing Aeroelastic Wing Flutter
Capstone Senior Design
Abstract
Objectives
Methods
Results/Discussion


Capstone Senior Design
Robotic Arm
Frame
Software
Acknowledgments





## Mechanical & Aerospace Engineering at Rutgers

The Department of Mechanical Engineering at Rutgers was founded in 1908 with a focus on driving the country's industrial growth. Aerospace Engineering was added in 1965 as a certificate program with a full degree program established in 2015. It is now the only Aerospace Engineering degree offered among New Jersey's public universities. The Department is a vibrant academic community offering three undergraduate degrees in Mechanical Engineering, Aerospace Engineering, and Applied Sciences (Packaging Engineering concentration). The Department has state of the art laboratories used for research leading to M.S., M.Eng., and Ph.D. degrees. Undergraduate and graduate students participate in cutting edge research funded by federal and state agencies, and industrial partners. With close to 40 full-time faculty members, the Mechanical and Aerospace Engineering Department educates more than 1,000 undergraduate students and more than 180 graduate students. Excellence in both research and teaching is the top priority for our faculty.

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