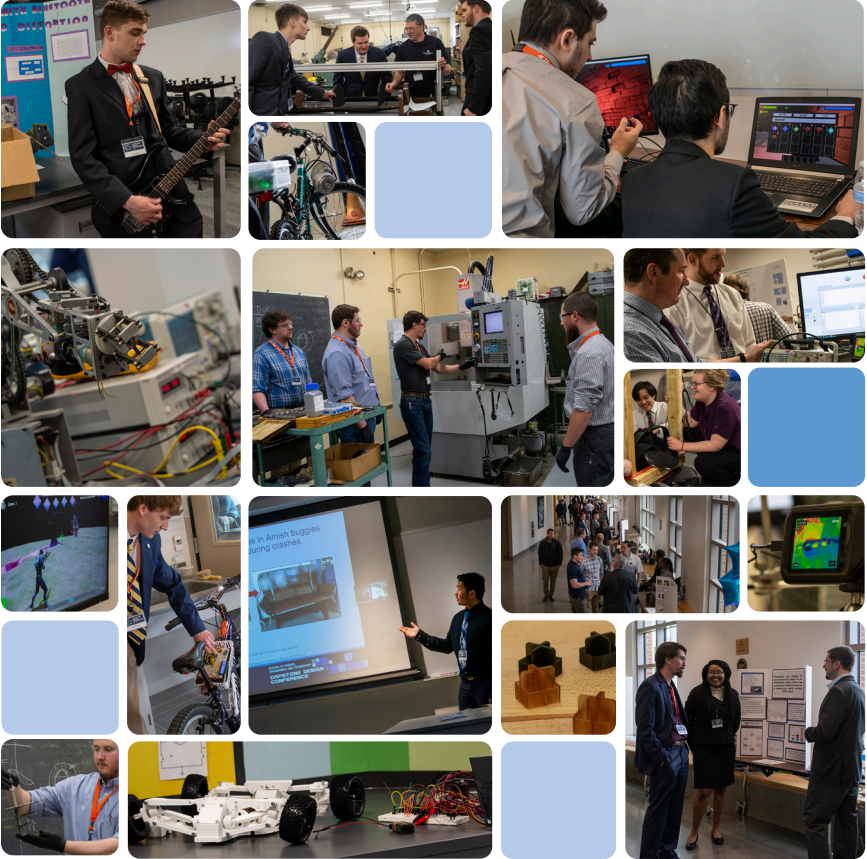


SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

# CAPSTONE DESIGN CONFERENCE



**PennState**  
Harrisburg

**SATURDAY, APRIL 22, 2023**

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

# CAPSTONE DESIGN CONFERENCE SPEAKER



## **Scott Kupper**

*Founder and President, Kupper Engineering, LLC*

With more than 28 years of experience, founder and president of Kupper Engineering, Scott Kupper, specializes in renewable energy and distributed generation projects, including solar, cogeneration/CHP, and landfill gas generation sites up to 200MW. He started Kupper Engineering in 2004 as a Commercial & Industrial (C&I) consulting engineering firm, but has grown the business to include renewable energy and systems integration/controls divisions. In 2020, Kupper Engineering became a member of the Asplundh Infrastructure Group, a leading national alliance of infrastructure services and solutions for utilities, power producers, and energy-intensive customers. Since the acquisition, the company's team has grown to over 60 employees, with Kupper continuing to serve as president. Kupper Engineering has been a part of engineering over 2 gigawatts of renewable energy.

Kupper earned a master of engineering science degree and a bachelor of science degree in electrical engineering technology from Penn State University. Additionally, he earned his technical leadership certificate from the University of Wisconsin-Madison in 2019.

Kupper holds professional engineering licenses in 34 U.S. states and is a member of the Association of Energy Engineers (AEE), National Fire Protection Association (NFPA), Institute of Electronics and Electrical Engineers (IEEE), National Council of Examiners for Engineering and Surveying (NCEES), and the National Society of Professional Engineers (NSPE). Also, he was named the Institute of Electrical and Electronic Engineers – IEEE Philadelphia Chapter – “Delaware Valley Electrical Engineer of the Year” in 2017.

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

# CAPSTONE DESIGN CONFERENCE

**SCHEDULE OF EVENTS - SATURDAY, APRIL 22, 2023**

- 8:00 a.m.      **Registration and Breakfast** (Atrium, Olmsted Building)
- 8:30 a.m.      **Student Presentations and Moderators** (Olmsted Building)
- Civil, Construction, and Environmental Engineering*  
Dr. Shashi Marikunte – C213 Olmsted Building  
Dr. Grady Mathews IV – C211 Olmsted Building
- Computer Science and Mathematics*  
Dr. Hyuntae Na – C212 Olmsted Building  
Dr. Truong Tran – E209 Olmsted Building  
Dr. Hien Nguyen – E212 Olmsted Building
- Electrical Engineering*  
Dr. Kiana Karami – E218 Olmsted Building  
Dr. Xinwei Niu – E219 Olmsted Building  
Dr. Md Habib Ullah – E240 Olmsted Building
- Mechanical Engineering*  
Dr. Rick Ciocci – E243 Olmsted Building  
Dr. Brian Maicke – E244 Olmsted Building  
Dr. Armit Banerjee – E254 Olmsted Building  
Dr. Zhezhen Fu – E257 Olmsted Building
- 11:15 a.m.    **Welcome** (210-Events Room, Capital Union Building)  
Dr. Vahid Motevalli, Director, School of Science, Engineering, and Technology
- Keynote Speaker**  
Scott Kupper, P.E., R.E.P. President, Kupper Engineering, LLC
- [psu.zoom.us/j/99503953505?pwd=ekt0cHI0NTRuWW5qT3hTMmpjWGREUT09](https://psu.zoom.us/j/99503953505?pwd=ekt0cHI0NTRuWW5qT3hTMmpjWGREUT09)  
**Webinar ID: 995 0395 3505 • Passcode: 100524**
- Noon            **Lunch** (210-Events Room, Capital Union Building)
- 1:00 p.m.     **Student Project Exhibition and Demonstrations** (Educational Activities Building - EAB and Engineering Technology Lab)
- 4:00 p.m.     **Awards Ceremony** (210-Events Room, Capital Union Building)  
Dr. Shashi Marikunte
- [psu.zoom.us/j/99846988920?pwd=anzNGZnMIRUaE81dm53SnZhTkxtZz09](https://psu.zoom.us/j/99846988920?pwd=anzNGZnMIRUaE81dm53SnZhTkxtZz09)  
**Webinar ID: 998 4698 8920 • Passcode: 092648**
- 4:30 p.m.     **Order of the Engineer Ring Ceremony** (210-Events Room, Capital Union Building)

# Capstone Design Conference 2022 Winners

## **James A. Andrews Memorial Award for Excellence in Capstone and Design**

### **First Place Award, Mechanical Engineering and Mechanical Engineering Technology**

Team: 412

Project: Design and Development of In Vitro Medical Induction Heating  
Experimental Setup

Team Members: Julian Low, Mark Pollock, Robert Yasalonis

Sponsor: Penn State College of Medicine – Center for Medical Innovation

Adviser: Dr. Anilchandra Attaluri

### **First Place Award, Civil Engineering and Structural Design and Construction Engineering Technology**

Team: 103

Project: Members 1st Federal Credit Union – Structural Expansion and  
Quality Improvement

Team Members: Jacob Bertha, Prabin Bhattarai, Christopher Cruz, Megan Hall,  
Alain Izabayo and Madisan Zechman

Advisers: Dr. Shashi Marikunte, Dr. Sofia Vidalis and Dr. Saravanan Gurupackiam

### **First Place Award, Computer Science**

Team: 204

Project: Dark Night Hero

Team Members: Collin Barletta, Cristopher Herrera, Justin Ostopick and  
Micah Wenger

Adviser: Dr. Hyuntae Na

### **First Place Award, Electrical Engineering and Electrical Engineering Technology**

Team: 313

Project: 'Farrad' – Regenerative Bicycle Assist

Team Members: Aidan Carrigan, Christian Knade

Project Team Adviser: Dr. Seth Wolpert

# Civil, Construction, and Environmental Engineering

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## **C213, Auditorium, Olmsted Building**

Moderator: Dr. Shashi Marikunte

Project: PSU College of Engineering Research & Teaching Space 2 (West 2)

Supported: Payette Associates, Inc. and The Whiting-Turner Contracting Company

Advisers: Dr. Shashi Marikunte, Dr. Sofia Vidalis, and Dr. Saravanan Gurupackiam

### **Zoom Presentation Webinar Link for TEAMS 101-104:**

[psu.zoom.us/j/98740866531?pwd=VUdXbzhUZ21YVDISRHRzbEQzbzFRQT09](https://psu.zoom.us/j/98740866531?pwd=VUdXbzhUZ21YVDISRHRzbEQzbzFRQT09)

**Webinar ID: 987 4086 6531 • Passcode: 854877**

The assigned project is a new mixed-use academic building located at the University Park campus of Penn State in State College, Pennsylvania. The building, referred to as West 2, is four stories above grade, with a below-grade basement. The maximum floor area of the building is approximately 24,000 sq. ft. with an aggregate area of approximately 102,000 sq. ft. The building contains offices, classrooms, study areas, shops and build spaces, and a high bay testing area. An outdoor research/testing space is located on Level 4. Students in the Civil Engineering Capstone Design class worked on this project in small groups to incorporate changes through value engineering, sustainability, energy efficiency, and other modern tools to improve the functionality, or other aspects of this project. Four teams diligently worked on this project in true competition style. They will disclose their approach to make this building project a “State-of-the-Art” construction project, from their perspective.

**8:30-9:00 a.m.**

### **Team 101**

**Project Name: Sustainability Enhancement for PSU COE West 2 Building**

**Team Members: Chayse Campbell, Nathanael McCollum, Hunter Merritt, Deanna Ray, Adam Thomas**

The College of Engineering Research & Teaching Space (West 2) building project is focused on providing improved workflow and energy efficiency practices in harmony with existing infrastructure on the Penn State University Park campus. The design will integrate additional building entrances and multiuse spaces in coordination with the adjacent parking garage. Energy efficiency will be accomplished using stormwater collection and grey water management techniques to reduce demands on campus utilities while providing solutions to non-permeable runoff. Proposal will incorporate LEED engineering certifications and further structural redesign.

**9:00-9:30 a.m.**

### **Team 102**

**Project: Additional Food Court for PSU COE West 2 Building**

**Team Members: Nicholas Betancourt, Michael DeTemple, Robert Skinner, Jesse Troutman**

The group’s goal is to assess the current state of the Penn State University COE West 2 Building, identify areas for improvement, and develop solutions to enhance its overall performance. This may include adding new systems, upgrading existing systems, reinforcing the structure, and ensuring compliance with building codes and safety regulations. The goal of the improvements is to increase the efficiency, safety, and comfort of the building for its occupants and add an additional “food court”

or “cafe” in the middle of the courtyard, outside the building, connected by a new pedestrian sidewalk. Also, in the area of increasing efficiency, solar panels will be added to the roof of the existing West 2 Building.

**9:30-10:00 a.m.**

**Team 103**

**Project: Environmental and Traffic improvements for PSU COE West 2 Building**

**Team Members: Andrew Patterson, Kerriann Riddle, Braden Stehr**

The team has developed two categorical improvements for the planned construction of West 2, environmental and traffic. It would be beneficial to utilize a geothermal heating system, not only for the building, but for the walkways as well. This would decrease the energy cost for heating the building and would reduce, if not eliminate, the need for rock salt on the walkways. Secondly, the team would like to add solar panels to the roof of West 2. This would help offset the cost of the heat pump and the energy needed to run it. Currently, there is only one entrance to the campus area and no connecting roads to the dorms. The plan has been updated to add an entrance to the south side of the campus and pave the dirt road that connects the dorms to the campus.

**10:00-10:30 a.m.**

**Team 104**

**Project: Fifth Floor Addition Plus Green Roof with Patio for PSU COE West 2 Building**

**Team Members: Aly Gheith, Dylan Gullick, Zachariah Harman, Krysten Moore, Nicholas Shimp**

The anticipated scope of the proposed project includes an addition to West Building 2, State College. The addition will include elements such as a partial fifth floor vertical addition, green roof, and a patio space. Structural elements of this project may include column design and load calculations and foundation considerations with the additional loads. Transportation will factor into the project when considering maximum capacity of people in the building with the proposed addition, and traffic flow calculations will need to be considered when increasing the occupancy space. Construction engineering will provide material calculations for the proposed project.

**C211, Olmsted Building**

**Moderator: Dr. Grady Mathews IV**

**Zoom Presentation Webinar Link for TEAM 105-108:**

**[psu.zoom.us/j/99275434476?pwd=OHl0YmpaRTVDTDA2RkVZMjl1NDJYZz09](https://psu.zoom.us/j/99275434476?pwd=OHl0YmpaRTVDTDA2RkVZMjl1NDJYZz09)**

**Webinar ID: 992 7543 4476 • Passcode: 865340**

**8:30-9:00 a.m.**

**Team 105**

**Project: Process Optimization of an Intermittent Cycle Extended Aeration System (ICEAS) Sequencing Batch Reactor (SBR) Wastewater Treatment Plant for Nitrogen Reduction**

**Team Members: Sandy Mai, Tam Nguyen, Elizabeth Raifsnider**

**Adviser: Dr. Yen-Chih Chen**

A wastewater treatment plant with an Intermittent Cycle Extended Aeration System (ICEAS) Sequencing Batch Reactor (SBR) is reaching its permit capacity for total nitrogen. The team has been

tasked with identifying the issues and proposing adjustments or upgrades to the treatment plant to resolve the issues. BioWin will be used to simulate the current operations of the treatment plant and predict the proposed modification outcomes. The goal is to propose a process that meets current regulatory limits without the need for plant expansion.

**9:00-9:30 a.m.**

**Team 106**

**Project: Total Nitrogen Reduction through Process Optimization in Wastewater Treatment**

**Team Members: Jonathan Fischer, Noah Jenkins, John Karinch, Marci Poli**

**Adviser: Dr. Yen-Chih Chen**

The purpose of this project is to evaluate and improve total nitrogen removal capabilities of an existing intermittent cycle extended aeration system (ICEAS) wastewater treatment plant in an effort to meet stringent nutrient discharge limitations and increased loading. Through modeling and calculations of factors such as sludge retention time and sequencing of aerated and anoxic phases, operations will be analyzed for their impact on total nitrogen removal.

**9:30-10:00 a.m.**

**Team: 107**

**Project: Penn State Erie Hall Viewing Area Addition**

**Team Members: Lucas Bradley, Matthew Leblanc, Duy Nguyen, Steven Painter,**

**Gumer Quintana, Cole Schlenker, Tavian Sumlin, Austin Yoder**

**Advisers: Dr. Joseph Cecere and Dr. Grady Mathews IV**

Teams will design a two-story addition to Penn State Erie's Athletic Building. The proposed 5950 sq. ft. building will allow for a viewing area of the courts in the athletic building. Each design-build company is composed of a structural firm and a construction company. Each firm will produce a structural design and layout, exterior shell, construction schedule, and cost estimate for the new addition. An emphasis is being placed on an energy efficient and sustainable design.

**10:00-10:30 a.m.**

**Team: 108**

**Project: Penn State Erie Hall Viewing Area Addition**

**Team Members: Tanner Blair, Joshua Carlson, Dawson Dormer, Nicholas Fitzgerald,**

**Dylan Heckendorn, Thomas Hovanic, Douglas Rubin, Owen Storm, Samantha Weber**

**Advisers: Dr. Joseph Cecere and Dr. Grady Mathews IV**

Teams will design a two-story addition to Penn State Erie's Athletic Building. The proposed 5950 sq. ft. building will allow for a viewing area to the courts in the athletic building. Each design-build company is composed of a structural firm and a construction company. Each firm will produce a structural design and layout, exterior shell, construction schedule, and cost estimate for the new addition. An emphasis is being placed on an energy efficient and sustainable design.

# Computer Science and Mathematics

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## C212, Olmsted Building

Moderator: Dr. Hyuntae Na

### Zoom Presentation Webinar Link for TEAMS 201-205:

[psu.zoom.us/j/92384085379?pwd=MWxOQUZmZFJaVS9lZlJ4OWc0bnAyUT09](https://psu.zoom.us/j/92384085379?pwd=MWxOQUZmZFJaVS9lZlJ4OWc0bnAyUT09)

**Webinar ID: 923 8408 5379 • Passcode: 633522**

**8:30-9:00 a.m.**

### Team: 201

Project: CANNabinoid Drug Interaction Review (CANN-DIR™)

Team Members: Ayden Omealy, Dhruv Patel, Luke Hershey

Advisers: Dr. Paul Kocis, Dr. Kent Vrana, Dr. Hyuntae Na

Sponsor: Center for Medical Innovation, Penn State College of Medicine

With the increasing popularity of the PA Medical Marijuana program, more people are likely to be affected by unintended interactions between THC/CBD and other medications. CANN-DIR™ is a web application that allows users to choose different medications and cannabinoids and see if any of these drug-drug interactions exist. Its interface is designed to be used by both patients/caregivers and medical professionals. The major goal of this project is to upgrade its old version by adding several new features, such as the third-party database integration and an admin page, as well as updating the front-end and the back-end.

**9:00-9:30 a.m.**

### Team: 202

Project: Lactation Lounge App

Team Members: Ilaaksh Mishra, Justin Schaffner, Nathaniel Emmert, Ryan Guillen  
Advisers: Dr. Nicole Hackman, Dr. Adrian Zurca, Dr. Christiana Oji-Mmuo, Dr. Hyuntae Na

Sponsor: Center for Medical Innovation, Penn State College of Medicine

Lactation Lounge App is a phone and web application that helps users locate available mother's lounges around Penn State Health. Employees who are lactating often have to walk around to multiple lounges to locate one that is available. Using the app, employees will be able to check which lounges are available and which lounges are taken. By scanning a QR code at the lounge, other users will be able to see that the lounge is occupied.

**9:30-10:00 a.m.**

### Team: 203

Project: Gratitude Notes

Team Members: Allison Moyer, Brady Waughen, Dinesh Umasankar

Adviser: Dr. Hyuntae Na

Journaling has been shown to improve one's mental health, and this project seeks to modernize this approach. Gratitude Notes is a cross-platform application aimed at improving mental health and mindfulness by allowing users to document their positive events throughout the day. The project aims



to improve user consistency toward documenting their notes and provide a personalized overview of their mood correlated to the activities which they documented. With this application, the team hopes to motivate users to self-explore and become more mindful.

**10:00-10:30 a.m.**

**Team: 204**

**Project: MyBuilding**

**Team Members: Afreen Ahmad, Joe Yeung, Vladyslav Yatsuta**

**Adviser: Dr. Hyuntae Na**

MyBuilding is an application that connects tenants and landlords seamlessly, providing an all-in-one platform for both parties to communicate, manage and organize their property-related affairs. MyBuilding also provides a platform for tenants to upload important documents, make rent payments, and communicate with other tenants in the building. For landlords, MyBuilding offers a centralized location to manage all their properties, keeping track of occupancy status, rental payments, and maintenance requests.

**10:30-11:00 a.m.**

**Team: 205**

**Project: Employee Nexus**

**Team Members: Ethan Stoner, John Fletcher, Kevin Reyes-Chagolla, Zhaokai Xie**

**Adviser: Dr. Hyuntae Na**

Employee Nexus is a cutting-edge complementary web application designed to enhance communication between employees and employers. The app provides advanced features, including a streamlined employee scheduler, a user-friendly request time off functionality, a multi-optional clock-in feature, a training video regimen, and much more. Employee Nexus seeks to provide employees with convenient access to their workplace information. Additionally, this app empowers managers to efficiently manage schedules and other relevant employee information.

## **E209, Olmsted Building**

**Moderator: Dr. Truong Tran**

**Zoom Presentation Webinar Link for TEAMS 206-213:**

**[psu.zoom.us/j/92900195961?pwd=aFkweDFiY2hESXlhMzYrNmtLSGthQT09](https://psu.zoom.us/j/92900195961?pwd=aFkweDFiY2hESXlhMzYrNmtLSGthQT09)**

**Webinar ID: 929 0019 5961 • Passcode: 690980**

**8:30-9:00 a.m.**

**Team: 206**

**Project: Upward Mobility - A GUI-based Browser Game with Cloud-Native Infrastructure**

**Team Members: Aaron Cole, Brodie Baxter, Jacob Naholnik, Justin Neigh, Rocco Zeno**

**Adviser: Professor Michael Melusky**

The project is to develop a browser-based digital board game to be played with 3-6 players. Set in a cyberpunk-themed capitalist dystopia, players must compete to climb the corporate ladder and become rich and powerful while sabotaging each other along the way. The game is written in JavaScript using the boardgame.io framework and utilizes serverless AWS infrastructure written in Terraform for its cloud infrastructure. React is also used to build and manage the html code for web pages.

**9:00-9:30 a.m.**

**Team: 207**

**Project: Tanks 3D**

**Team Members: David Atkins, Nicolas Furfari, Patrick McCleerey**

**Adviser: Dr. Hyuntae Na**

Tanks 3D is a multiplayer game where players take control of their tanks and compete against each other in a free-for-all deathmatch setting. The game features several tank variants; multiple maps, including a city and a desert arena; and basic AI enemies. Players earn points by taking out the AI enemies and each other. The player with the most points at the end wins. The game is available online only via an internet connection.

**9:30-10:00 a.m.**

**Team: 211**

**Project: SuperChef**

**Team Members: Shiza Qureshi, Sami Almouzani, Dean McGahan, Lily Sica**

**Adviser: Dr. Md Faisal Kabir**

SuperChef is a web application that allows the user to enter ingredients, along with any preferences they have (such as dietary restrictions, specific kinds of cuisines, or different meal categories) to view recipes that use those ingredients. It will connect to an existing NLP model (such as ChatGPT) through an API to generate a recipe and will also search a database of recipes that have been generated in the past or uploaded by other users. Users will also be able to create their own account and save recipes they like, upload their own recipes, and rank and comment on recipes.

**10:00-10:30 a.m.**

**Team: 212**

**Project: A Journey Through Computer Science**

**Team Members: Hamza Bachnak, Alex Lee, Yusri Zafri**

**Adviser: Professor Michael Melusky**

This is an interactive visual novel game that walks players through the first year of college as a computer science major. Players live through a world that feels alive, with many AI-generated assets. Players will be able to experience a game that is both an entertaining journey filled with rich characters, as well as a great source of learning introductory computer science concepts.

**10:30-11:00 a.m.**

**Team: 213**

**Project: Livin It - An Apartment Finder**

**Team Members: Yash Patel, Krina Patel, Shreyas Joshi, Huy Ngo**

**Adviser: Professor Michael Melusky**

The team is developing an Apartment Rental Manager web application, specifically designed for students residing near University campuses. With intuitive tools that cater to the needs of the clients, the aim is to provide a seamless, affordable, and satisfying rental experience. The platform utilizes smart recommendations to match users with their ideal rental property, whether it be a walkable house near campus or a pet-friendly apartment.

For property owners, the website offers a convenient and easy-to-use platform to showcase their properties and attract potential renters. The straightforward and efficient screening process allows for quick and effective review of applicants. The monthly subscription model ensures that only serious and interested renters can contact the property owners, making the process of finding suitable tenants stress-free and effortless.

## **E212, Olmsted Building**

Moderator: Dr. Hien Nguyen

### **Zoom Presentation Webinar Link for TEAMS 214-218:**

[psu.zoom.us/j/95208666717?pwd=WkpBYTVneDRGdkxlbTduZjc1eDhCZz09](https://psu.zoom.us/j/95208666717?pwd=WkpBYTVneDRGdkxlbTduZjc1eDhCZz09)

**Webinar ID: 952 0866 6717 • Passcode: 270139**

**8:30-9:00 a.m.**

### **Team: 214**

**Project:** Upward Mobility - Hero's Quest

**Team Members:** Warren Roadcap, Gabe Le, Jason Isely

**Adviser:** Dr. Hien Nguyen

Embark on an epic adventure in Hero's Quest, a pulse-pounding, turn-based RPG built on the Unity game engine! Assemble a fearsome team of heroes, each with their own unique skills and abilities, and lead them to victory in strategic battles against formidable foes. Master the dynamic 2 vs 2 turn-based combat system, where clever tactics and split-second decisions can mean the difference between triumph and defeat. With the game-changing follow-up mechanic, your units can unleash devastating combinations and turn the tide of battle in an instant! Are you ready to rise to the challenge and become legendary heroes?

**9:00-9:30 a.m.**

### **Team: 215**

**Project:** HOA Management System

**Team Members:** Yijian Jin, George Young, Sanket Chandanshive, Jingke Shi

**Advisers:** Dr. Hien Nguyen, Professor Michael Melusky

This application aims to provide ease of communication between homeowners and the HOA association. It aims to help homeowners gain a better understanding of the status of their community and to help them communicate with and get help from the community. Homeowners have a responsibility to their community to report any noteworthy incidents in the community – be it a fire, dangerous stray animals, or a potential crime. This allows other homeowners in the community to be aware of such incidents and to take appropriate actions in response.

**9:30-10:00 a.m.**

**Team: 216**

**Project:** Beri'd Alive

**Team Members:** Isaiah Adigun, William Bernstein-Cuevas, Gabriel Fleming, Vedkumar Patel, Joosung Son

**Adviser:** Dr. Hien Nguyen

Beri'd Alive is a turn-based role-playing game with an emphasis on engaging, action packed combat. The game revolves around the player building a sequence of moves which they then must complete in order to successfully combat their opponents.

**10:00-10:30 a.m.**

**Team: 217**

**Project:** BidUp

**Team Members:** Devansh Shah, Hari Subedi, Jaishil Bhavsar, Het Patel

**Adviser:** Dr. Hien Nguyen

The team is developing a web-based auction system called BidUp. The system serves as a middle ground for sellers and bidders. On the seller side, the system allows users to post an item for an auction during a period of time with an extension option. On the buyer side, users can set up automatic bids within a price range. The system records all transactions and uses that information to recommend items to users.

**10:30-11:00 a.m.**

**Team: 218**

**Project:** Remember5

**Team Members:** Hasan Al-Quaid, Flamur Berisha, Anna Mahadeo

**Adviser:** Dr. Hien Nguyen

Remember5 is a web-based application that will serve as a hub for members of the Islamic community and all those curious about the religion. Remember5 builds a cohesive environment for its users by allowing them to communicate with each other, study religious texts, and receive reminders of the five daily prayers by using a push notification system. No matter where they are, Remember5 ensures users connect and congregate with fellow users by providing location services to make sure they never miss a prayer again and always have a friend to pray with!

# Electrical Engineering

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## **E218, Olmsted Building**

Moderator: Dr. Kiana Karami

### **Zoom Presentation Webinar Link for TEAMS 301-304:**

[psu.zoom.us/j/95629000197?pwd=SmNUS3dZRjhHQXZHb0FlazVrdUZ4Zz09](https://psu.zoom.us/j/95629000197?pwd=SmNUS3dZRjhHQXZHb0FlazVrdUZ4Zz09)

**Webinar ID: 956 2900 0197 • Passcode: 893734**

**8:30-9:00 a.m.**

**Team: 301**

**Project: An SSVEP-Based Brain Computer Interface System to Assist Locked-in Patients in Decision Making**

**Team Members: Dustin Cuscino, Raheeq Darweesh**

**Adviser: Dr. Nashwa Elaraby**

A decision-making system was developed using Electroencephalography (EEG) principles to communicate with locked-in patients. Steady State Visually Evoked Potential (SSVEP)-based brain computer interface process is introduced in this project. Brain signals are acquired through SSVEP using a biosensing board, EEG electrodes, and flickering LEDs. The locked-in patient will stare at a flickering LED of a specific frequency; afterward, the brain signals acquired from the test will be matched with the frequency of the LED to confirm the command that the patient desires.

**9:00-9:30 a.m.**

**Team: 302**

**Project: Protective Relay Basis Documentation**

**Team Members: Jonah Kelley, Benjamin Moody, Trent Oyler**

**Advisers: Dr. Md Habib Ullah, Dr. Morteza Talebi, Mr. Seth Vincent**

**Supported: TRC**

TRC Companies, Inc. Power Academy located in Lancaster, Pennsylvania provides a safe environment that simulates a utility substation. The academy contains protective relays that need to be documented and verified. To accomplish this, Protective Relay Basis Documentation assists employees, students, and clients by providing relay settings development, relay documentation, and support for future expansion plans for TRC's training facility. Protective Relay Basis Documentation includes relay synopses, relay communication, settings calculations, and logic diagrams that illustrate the functionality of the protective relays.

**9:30-10:00 a.m.**

**Team: 303**

**Project: Radio Telescope Control System**

**Team Members: Zachary Martin, Aaron Olsen, Loc Pham**

**Advisers: Dr. Kiana Karami, Dr. Arthur Pallone**

A low-cost, small-scale radio telescope can provide university undergraduate and high school students with the ability to learn the basics of radio astronomy, the universe, and electromagnetic waves by plotting measurements at the 1.42 GHz hydrogen line. A precision control system, including a custom embedded system, was created to point a directional antenna accurately and provide a generic interface with a control computer. This generic interface over USB enables a flexible and easily replicated system that can serve as the basis for a future goal of interferometric measurements between multiple systems.

**10:00-10:30 a.m.**

**Team: 304**

**Project: SolarEagle64 Wireless Trail Camera**

**Team Members: Hunter Berkheimer, Lee Heider**

**Adviser: Dr. Seth Wolpert**

The SolarEagle64 Wireless Trail Camera is a cutting-edge device designed for outdoor enthusiasts and hunters. It comes equipped with advanced features such as solar charging, wireless image download, and night vision capabilities. The solar panel allows the camera to charge its battery in the sunlight, eliminating the need for frequent battery changes. The wireless download feature enables the user to remotely download images and videos to a smartphone or computer, providing quick access to the captured footage. Additionally, the camera features night vision capabilities, allowing it to capture high-quality images and videos even in low-light conditions. With these features, the SolarEagle64 Wireless Trail Camera is a versatile tool for monitoring wildlife, surveillance, and security applications.

## **E219, Olmsted Building**

**Moderator: Dr. Xinwei Niu**

**Zoom Webinar link for Teams: 305-308**

**[psu.zoom.us/j/91328099082?pwd=b3lxV2VJRFJ0QS9VZ0RWZUZqdEpadz09](https://psu.zoom.us/j/91328099082?pwd=b3lxV2VJRFJ0QS9VZ0RWZUZqdEpadz09)**

**Webinar ID: 913 2809 9082 • Passcode: 415040**

**8:30-9:00 a.m.**

**Team: 305**

**Project: Air Cavities with Additive Manufacturing for Complex Dielectric  $\epsilon_k$  and Isolation Characterization**

**Team Members: Brandon Browne, Scott Siberski**

**Advisers: Dr. Sedig Agili, Dr. Aldo Morales**

**Sponsor: SAMTEC**

Develop, simulate, build, test, and correlate a chosen material's electrical characteristics ( $\epsilon_k$ ,  $d_f$  and Isolation) with air cavities from additive manufacturing methods. The purpose of this project is to identify (with simple well-known electrical structures, ex: coaxial cable-like cylinder) the electrical implications of additive manufacturing as a method to introduce air cavities. The additive's purpose is

to lower overall complex electrical characteristic values and increase signal isolation on high frequency transmission systems.

**9:00-9:30 a.m.**

**Team: 306**

**Project: Brake System Plausibility Device**

**Team Members: Ryan Escate, Hayden Pollack**

**Adviser: Dr. Mohammad Tofighi**

The Brake System Plausibility Device (BSPD) is a non-programmable safety device used by competitors within the Formula SAE collegiate design competition who are using Electronic Throttle Control (ETC). The BSPD integrates with the ETC system to monitor various sensors through the vehicle for unsafe driving conditions. If the BSPD detects any of these conditions, it will immobilize the vehicle to prevent further escalation of problems.

**9:30-10:00 a.m.**

**Team: 307**

**Project: Mobile Commissioning Training Box SEL-321**

**Team Members: Tyler Groft, Drew Harshbarger**

**Advisers: Dr. Seth Wolpert, Mr. Joseph Cavallio, Dr. Morteza Talebi**

**Supported: TRC**

The mobile commissioning box contains an SEL-321 protective relay, two breakers, a lockout relay, and other equipment to aid the functionality. The purpose of the commissioning box is to be easily transported across TRC's many facilities for training. The box will feature two breakers that can be opened and closed manually and through fault detection of the SEL-321. The lockout relay can also be tripped either manually or automatically through the SEL-321 and will lock the breakers in the open position for safety purposes. The mobile commissioning box will provide training to individuals on the SEL-321, breaker, lockout functionality, and fault detection.

**10:00-10:30 a.m.**

**Team: 308**

**Project: Non-Invasive Blood Perfusion Measurement Device**

**Team Members: Bruce Jarama, Kenyon Kelley, Ibrahim Koudougou, An Nguyen**

**Adviser: Dr. Mohammad Tofighi**

**Sponsor: Center for Medical Innovation**

The Non-Invasive Blood Perfusion Measurement unit is a medical device that raises the temperature of the skin/tissue from normal body temperature to up to 43 degrees Celsius. An infrared sensor is then used to measure the temperature change and to help determine the blood flow through the tissue. This device is the first of its kind, which utilizes the principles of a microwave heating system, an antenna, and infrared sensing, along with a closed-loop temperature response system to monitor and record blood flow on skin or tissue during flap perfusion.

## **E240, Olmsted Building**

Moderator: Dr. Md Habib Ullah

**Zoom Webinar Link for Teams: 309-311, 402, 403EE:**

[psu.zoom.us/j/97040902624?pwd=cGV6a0hXamFWT2MrQXRJMWN3VWRwUT09](https://psu.zoom.us/j/97040902624?pwd=cGV6a0hXamFWT2MrQXRJMWN3VWRwUT09)

**Webinar ID: 970 4090 2624 • Passcode: 256056**

**8:30-9:00 a.m.**

**Team: 309**

**Project:** ExaMAX Backplane Demonstration Board

**Team Members:** Carson Berkheimer, Gage Stoops

**Advisers:** Dr. Sedig Agili, Dr. Aldo Morales, Mr. Steve Blasko

**Sponsor:** Amphenol

This project aims to design and construct an operational backplane demonstration board with daughter cards. It is used to transmit data at a rate of 56 Gb/s using PAM4 modulation, and the backplane is mounted in a visually appealing chassis. The project sponsor, Amphenol, intends to utilize the demonstration backplane as a marketing tool for their ExaMAX product line of connectors. The board design consists of three connector configurations: coplanar, orthogonal direct, and traditional back-plane connections. All design parts are expected to meet or exceed IEEE and OIF compliance.

**9:00-9:30 a.m.**

**Team: 310**

**Project:** Slot Car Controller

**Team Members:** Luis Aponte, Derrick Watkins

**Adviser:** Dr. Seth Wolpert

The slot car controller uses a buck-boost converter to allow more power to the track, which increases the slot car's speed. To control the speed, a variable resistance knob is added to the controller for the user. The controller also has an anti-breaking capability to slow the slot car gradually and a turbo contact on the trigger to get the maximum output voltage to reach top speed.

**9:30-10:00 a.m.**

**Team: 402**

**Project:** Development of an Anesthesia Infusion Pump Controller

**Team Members:** Tristen Howe, Abigail Michaels (ME), Mordechai Raymond

**Advisers:** Dr. Anilchandra Attaluri, Elie Sarraf, M.D., C.M.

**Sponsor:** Penn State College of Medicine

Currently, infusion of anesthetic drugs using pharmacokinetic models is not approved by the FDA due to reliability and safety issues. The team's mission is to create an open-source system based on Raspberry Pi with a touchscreen to control model-based infusion to meet the FDA regulatory requirements. The team developed and validated a feedback controller (linear quadratic regulator) for three drug models. Additionally, an IV pole clamping mechanism was developed for the touchscreen to facilitate easy use for medical professionals.



**10:00-10:30 a.m.**

**Team: 403EE**

**Project: Pulmonary Hypertension Monitoring Vest**

**Team Members: Nathaniel Dentel, Lucy Yagodich, Neetu**

**Advisers: Dr. Seth Wolpert, Dr. Roopa Siddaiah**

**Supported: Penn State College of Medicine**

Pulmonary hypertension is a severe complication of the heart and lungs that results in high mortality of preterm infants. This project aims to develop a device that will detect the turbulent blood flow on the right side of the heart via acoustic analysis. A small-scale microphone measures capillary turbulence blood flow in the pulmonary vessels embedded in a gentle chest wrap. This non-invasive modality will be invaluable for fragile, underdeveloped infants possibly battling a fatal prognosis. This device has the potential to save resources and costs of needing cardiac catheterization procedures and will improve an infant's quality of life from frequent blood draws.

**10:30-11:00 a.m.**

**Team: 311**

**Project: Advanced Phone Charger**

**Team Members: Isaiah Lewis, Aden Miller**

**Adviser: Dr. Md Habib Ullah**

This device is geared towards anyone who uses a smartphone. The objective of this project is to provide a long-lasting device which can provide a faster charging speed. This consumer product is meant to lower the number of times a customer buys a new phone charger, which in turn benefits the environment. Lastly, the final product is safe and easy for anyone to use. This device is meant to handle an AC Voltage of 120Vmax at the input. The output is meant to have 5V, with the power  $\leq 10W$ .

# Mechanical Engineering

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## **E243, Olmsted Building**

Moderator: Dr. Rick Ciocci

**Zoom Webinar link for Teams 403ME, 404, 405, 411, 414:**

[psu.zoom.us/j/95094203242?pwd=MjVmUjNoYzNsQWhuYlVRK3pDNGtVUT09](https://psu.zoom.us/j/95094203242?pwd=MjVmUjNoYzNsQWhuYlVRK3pDNGtVUT09)

**Webinar ID: 950 9420 3242 • Passcode: 806719**

**8:30-9:00 a.m.**

**Team: 403ME**

**Project: Non-Invasive Measurement of Pulmonary Vascular Blood Flow in Infants Born Premature**

**Team Members: Joshua Africa, Morgan Oriolo, Jordan Sullivan**

**Advisers: Dr. Anilchandra Attaluri, Dr. Roopa Siddaiah**

**Sponsor: Penn State College of Medicine**

Premature babies continue to be at great risk. Nearly 22% of infants in the neonatal intensive care unit (NICU) develop pulmonary hypertension (PH), but practical, noninvasive diagnostic methods are limited. The team utilized a lightweight vest designed to accommodate noninvasive sensors, tested on a vascular network embedded in a gel phantom. Team members also are coordinating with an electrical engineering team specializing in sonic signal processing and data collection. The primary users of this technique would be medical staff, especially those working in the NICU. This platform provides stability for the safe and reliable diagnosis of PH to improve patient outcomes.

**9:00-9:30 a.m.**

**Team: 404**

**Project: Stirling Cycle Cryocooler**

**Team Members: Jason Albert, William Hubbard, Nicholas Sampsell**

**Adviser: Dr. Hessam Taherian**

**Supported: ASHRAE grant (American Society of Heating, Refrigerating and Air-Conditioning Engineers), PI - Dr. Hessam Taherian**

This project is the design and production of a Stirling Cycle powered cryocooler to be used for research purposes, mainly in the storage and transport of biological samples. This chamber is designed to reach a temperature of -80 degrees Celsius within a five to six hour time frame. Designed to use less than 200 Watts of input power, the unit is to be programmed through Raspberry Pi. In addition, the cryocooler will have a display screen showing and tracking important operating parameters such as COP (coefficient of performance), airflow in the chamber, etc.

**9:30-10:00 a.m.**

**Team: 405**

**Project: Thermodynamics Demonstration Unit**

**Team Members: Michael A. Hergan, Ryan W. Mirarchi, Nicholas J. Rohn, Bryan W. Spivey**

**Adviser: Dr. Hessam Taherian**

The thermodynamics demonstration unit was designed and built to help visualize the first law of thermodynamics. The unit displays phase changes of a working fluid (water) to help simplify the concepts taught in thermodynamics. This is accomplished by the combination of added heat and lowered pressure inside a controlled environment to experiment with saturation values. To incorporate those values in an experiment, a control device is used to ensure an automated experiment with steady values, data acquisition, and safety limits. The unit offers a safe and easy-to-use method of seeing phase change from paper to real-life applications.

**10:00-10:30 a.m.**

**Team: 411**

**Project: Exhaled Breath Condenser**

**Team Members: Hermi Davalos, Kyle LaRue, Muhamad al Hakim bin Asri, Akul Vaidya**

**Advisers: Dr. Hessam Taherian, Dr. Anilchandra Attaluri**

**Supported: Dr. E. Scott Halstead**

The purpose of this project is to create a safer and less invasive method to extract lung fluid from patients with highly infectious respiratory diseases requiring ventilator support. Lung fluid is the best way to prescribe treatment to patients, as it offers the most dynamic data. This device enters the ventilator circuit before the expiratory filter and utilizes thermoelectric cooling to condense breath and collect fluid to be used for analysis and precise treatment of patients.

**10:30-11:00 a.m.**

**Team: 414**

**Project: Climate Battery**

**Team Members: Molly Rose Grimme, Adelaide Pearce, Somer Pedersen, Kaitlyn Schlemmer**

**Adviser: Dr. Hessam Taherian**

**Supported: Tim Clymer from Atmos Greenhouse Systems**

The team's objective is to study, simulate, and formulize the behavior of heat transfer and velocity distribution through a greenhouse climate battery, or ground-to-air heat transfer system. The final goal is to provide recommendations for improvement of the current design that will increase the efficiency of heat transfer and provide equal velocity distribution across the climate battery cell. The tasks will be completed by numerical analyses by using several software tools. Utilizing our recommendations, a greenhouse can be maintained at a safe temperature to preserve plants without heating by fossil fuels. Through this, fresh exotic and tropical produce can be provided to the local community.

## **E244, Olmsted Building**

Moderator: Dr. Brian Maicke

**Zoom Webinar link for Teams: 401, 412, 415, 422:**

[psu.zoom.us/j/96143986033?pwd=Y2NEcThKRjdtSEFZak1meURTa296dz099](https://psu.zoom.us/j/96143986033?pwd=Y2NEcThKRjdtSEFZak1meURTa296dz099)

**Webinar ID: 961 4398 6033 • Passcode: 961990**

**8:30-9:00 a.m.**

**Team: 401**

**Project:** Thermoelectric Cooling Box

**Team Members:** Paul Force, Ryan Langhorne, Dane Zimmerman

**Advisers:** Dr. Dassou Nagassou, Ms. Abigail Fanelli

**Sponsor:** Center for Medical Innovation

This project's goal is to design a new, more reliable system for the storage of 24-hour urine specimen containers in the hospital setting. Urine specimens must be held between 35 and 46 degrees Fahrenheit to achieve an accurate test, and the current system does not allow for this. The new unit allows for precise temperature control, ease of use, and increased capacity. The goal of the new unit is to provide accurate test results to patients and ease stress from employees. Along with cooling urine specimens, this new unit is also being designed with a heating option for warming IV bags.

**9:00-9:30 a.m.**

**Team: 412**

**Project:** Designing an Efficient Immersion Cooling System for ASIC Miners

**Team Members:** Fahad Alanazi, Sawyer Garrod, Nahom Kenna, Javier Ortiz

**Advisers:** Dr. Dassou Nagassou, Dr. Eskafur Rahman

The goal of this project is to design an aluminum tank to be used for liquid immersion cooling of 1-4 ASIC (application-specific integrated circuit) miners. The tank should be modular and fit 1-4 ASICs of any current model. The flow rate of the coolant must be optimized to allow the ASICs to run at 100% power, and occasionally overclocking power without overheating.

**9:30-10:00 a.m.**

**Team: 415**

**Project:** Design of Improved Acoustics in a Community Meeting Space

**Team Members:** Lukas Beard, Jacqueline Dexheimer, Alex Shaer, Ryan Swarhout

**Adviser:** Dr. Dassou Nagassou

This project aims to improve the acoustics in a 55+ community event hall. Currently, the room is experiencing an echo and sound transfer problem. These problems stem from the types of surfaces that are throughout the room, such as tile floors and glass windows. The customer would like at least two viable solutions which do not require major renovations. Remedying these problems will allow more residents to attend events in this community space.

**10:00-10:30 a.m.**

**Team: 422**

**Project:** Acoustic Test Experimental Set-Up

**Team Members:** Brandon Feltman, John Rinehimer, Ryan Smith, Parker Yeakel

**Adviser:** Dr. Dassou Nagassou

The team is building an acoustic testing device that will be used to test the acoustical properties of sample materials. The device consists of a main tube body where a sample of material will be placed at one end and a speaker on the other. This speaker will emit sound that will travel through the tube and reflect off of the sample material. This sound will be captured by microphones placed along the tube and then analyzed to find acoustical properties of the material. The project will be used at Penn State Harrisburg for future sound and vibration studies.

## **E254, Olmsted Building**

**Moderator:** Dr. Amit Banerjee

**Zoom Webinar link for Teams 418, 419, 420, 421:**

[psu.zoom.us/j/95787534368?pwd=QWtVa1VtM2ljejdBdGIQTTJkN1dHQOT09](https://psu.zoom.us/j/95787534368?pwd=QWtVa1VtM2ljejdBdGIQTTJkN1dHQOT09)

**Webinar ID: 957 8753 4368 • Passcode: 259935**

**8:30-9:00 a.m.**

**Team: 418**

**Project:** Simulation of the Mechanical Properties of Spicule Structures

**Team Members:** Michael Melly, Alyssa Napora

**Adviser:** Dr. Fariborz Tavangarian

**Supported:** NSF Career Grant (National Science Foundation), PI - Dr. Fariborz Tavangarian

Euplectella aspergillum deep sea sponges are comprised of spicules with a uniquely nested cylindrical structure which provides increased mechanical properties compared to a solid rod. In this project, the mechanical properties of spicules will be simulated in three-point bending and compared to 3D printed spicules of the same configuration.

**9:00-9:30 a.m.**

**Team: 419**

**Project:** Water and Weatherproof Automatic Pergola

**Team Members:** Bradley Baughman, Dalton Benedict, Tola Odumakinde, Luke Shetler

**Adviser:** Dr. Fariborz Tavangarian

**Sponsor:** DeltaAfrik Engineering Limited

Standard pergolas provide shade and a decorative environment to rest or cover walking areas. Normally, they are solid structures with a fixed design and decorations such as lattice. The waterproof and weatherproof automatic pergola will provide the same function with the addition of automatic shade control, waterproof capabilities, and options for bug repellent to allow longer use of the pergola and convenience for the user.

**9:30-10:00 a.m.**

**Team: 420**

**Project:** Designing a New Car Panel

**Team Members:** Joel George, Ilary Harfy, Young Jun, Matthew Parks

**Adviser:** Dr. Fariborz Tavangarian

The parameters of this project include design and manufacture of a car panel that will meet the consumer needs and remain within budget. The car panel must be an improvement over the existing one and has to be competitive with current market options available. This team selected a car diffuser for this assignment and the main goals are to improve the performance of the vehicle as well as its looks.

**10:00-10:30 a.m.**

**Team: 421**

**Project:** Electric Dispensing Gun

**Team Members:** Eric Freitag, Tyreek Kahseem Porter (EET), Emilio R. Perez Abreu, Joshua Robert, Dan Vu

**Adviser:** Dr. Fariborz Tavangarian

**Sponsor:** TE Connectivity

The group was tasked with the design and manufacturing of a dispensing gun for high viscosity silicone. The silicone must be dispensed at a high enough pressure to fill all the cavities inside a 3D printed mold without any air bubbles. The dispensing gun must also be electric to prevent physical strain due to the viscosity of the fluid.

## **E257, Olmsted Building**

**Moderator:** Dr. ZheZhen Fu

**Zoom Webinar link for Teams 406, 407, 408, 409, 416:**

[psu.zoom.us/j/96202067785?pwd=YW9WdUowZGMrK0psZjNSUmgRQVZ2UT09](https://psu.zoom.us/j/96202067785?pwd=YW9WdUowZGMrK0psZjNSUmgRQVZ2UT09)

**Webinar ID: 962 0206 7785 • Passcode: 787536**

**8:30-9:00 a.m.**

**Team: 406**

**Project:** Magnetic Navigation Testbed

**Team Members:** Simeon Davis, Jonathan Gartley, Madison Opalka, Trenton Schlemmer

**Adviser:** Dr. Anilchandra Attaluri

Liver cancer is a growing health issue around the world. Transarterial Chemoembolization (TACE) is a standard-of-care treatment for advanced liver cancer patients with limited success. Magnetic steering of drug-loaded magnetic microparticles (MMP) is being explored to improve TACE tumor targeting efficiency. The goal of this project is to design and develop a robust testbed to study the effect of magnet(s) placement and catheter location on tumor targeting efficiency. The team developed a realistic 3D model of the human hepatic artery based on medical images. Computational fluid dynamic simulations were performed on the 3D artery model to optimize the placement of magnets. The testbed consists of a fluid flow network with a 3D printed artery model, flow and pressure sensors, and cameras to measure the MMP magnetic steering efficiency.

**9:00-9:30 a.m.**

**Team: 407**

**Project: Orthopedic Cast Saw**

**Team Members: Ryan DeJesus, Nicholas Graham, Evan Lunney, Jaedan Morton**

**Advisers: Dr. Anilchandra Attaluri, Dr. Joseph Petfield**

The goal of this project is to reduce injuries during the cast removal process caused by a cast saw. The team developed a low-cost modular guard attachment for the current cast saw. Team members used computer-aided design to create prototypes, then 3D printed each prototype. End-users will test the prototypes and provide feedback, which will be used to improve the design. Additional features, such as motorized guard adjustment, are being implemented.

**9:30-10:00 a.m.**

**Team: 408**

**Project: Distribution Manifold**

**Team Members: Gobind Aulakh, Micah Gallagher, Tanner Martin, Scott Vaught**

**Advisers: Dr. Hessam Taherian, Dr. Anilchandra Attaluri**

**Sponsor: Sartorius AG**

This project is to design a mechanism(s) for Sartorius AG to remove safety caps from a distribution manifold and install new Luer-Barbed fittings in place of the safety caps as part of their production process. Investigating the Product Design Specifications for the customer was key in determining that employee fatigue needs to be reduced while increasing production capacity. Brainstorming, concept generation, and concept screening/scoring, along with “out of the box” ideas, provided a clear path for prototyping and testing. Hand calculations and computational analyses led the team to a concrete design. The final goal is to build two tabletop mechanisms; one will mechanically operate the unit to remove the caps, and a second motor/belt driven assembly will install the new caps at the customer’s desired torque specifications. Each unit will be presented as a professionally designed, off-the-shelf product ready to use by Sarotius.

**10:00-10:30 a.m.**

**Team: 409**

**Project: Needleless Access Assembly Machine**

**Team Members: Ryan Custer, Federico Molina, Thomas Spillane**

**Advisers: Dr. Anilchandra Attaluri, Dr. Hessam Taherian**

**Sponsor: Sartorius AG**

This project aims to design and build a machine that can assist in the production of needle-less access sub-assemblies for fluid management. This process has a potential risk of injury to the operators due to the size of the components and repetitive functions. Each assembly is composed of three injection-molded components which are torqued together and built in a cleanroom. The final goal is to have a simple and safe machine that can reliably and reproducibly assemble the components.

**10:30-11:00 a.m.**

**Team: 416**

**Project: Smart Hydroponics Growth Chamber**

**Team Members: Brock Crawford, Adrienne German, Amer Kanbari, Drew Nickerson**

**Adviser: Dr. Anilchandra Attaluri**

**Supported: Central Pennsylvania Research and Teaching Laboratory for**

**Biofuels/Dr. Sairam Rudrabhatla**

The goal of this project is to design and build a smart hydroponics growth chamber to improve efficiency of laboratory experiments while minimizing effort and human error. The developed system helps researchers easily monitor and control nutrient supply, water level, and environmental factors such as temperature, humidity, and pH, to study the influence on the plant growth rate and yield. The team used a combination of sensors, a microprocessor, and micro-controller to accurately monitor and control the parameters.



# **SPECIAL THANKS**

On behalf of the School of Science, Engineering, and Technology, I would like to extend a special thanks to the Capstone Design Conference committee and capstone project instructors for their hard work and dedication in organizing this conference.

Vahid Motevalli, Ph.D., P.E., Fellow ASME  
*Director, School of Science, Engineering, and Technology*

## **Capstone Design Conference Committee**

Shashi Marikunte, Ph.D., P.E.

*Committee Chair*

Anilchandra Attaluri, Ph.D.

Kiana Karami, Ph.D.

Hyuntae Na, Ph.D.

SSET Administrative Staff

## **Capstone Project Instructors**

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Yen-Chih Chen, Ph.D.

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Kiana Karami, Ph.D.

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Grady Mathews IV, Ph.D., P.E.

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Hien Nguyen, Ph.D.

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Hessam Taherian, Ph.D., P.E.

Fariborz Tavangarian, Ph.D.

Md Habib Ullah, Ph.D.

Sofia Vidalis, Ph.D.

## Capstone Design Conference Awards

Please join us at 4:00 p.m. on Saturday, April 22, 2023, for the presentation of awards to the student teams, followed by the Order of the Engineer. There are a total of six awards:

- First Place Award, Civil, Construction, and Environmental Engineering
- First Place Award, Computer Science and Mathematics
- First Place Award, Electrical Engineering
- First Place Award, Mechanical Engineering
- James A. Andrews Memorial Award for Excellence in Capstone Design
- Student Choice Award

### Zoom Webinar Link:

[psu.zoom.us/j/98723784898?pwd=SmZ5TTRtMWlCbmxhTUlNOEZUTDdRZz09](https://psu.zoom.us/j/98723784898?pwd=SmZ5TTRtMWlCbmxhTUlNOEZUTDdRZz09)

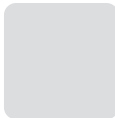
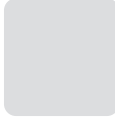
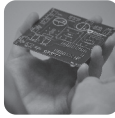
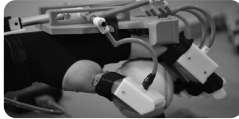
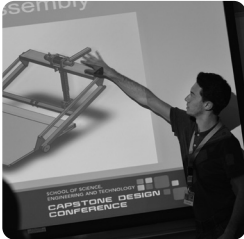
**Webinar ID: 987 2378 9923 • Passcode: 965959**

## The James A. Andrews Memorial Award for Excellence in Capstone Design

The James A. Andrews Memorial Award for Excellence in Capstone Design was established to recognize and encourage students who best demonstrate interest, motivation, and ability in identifying and solving an engineering problem that addresses a real-world concern. The award is intended to honor students who couple creative approaches with practical ability to successfully resolve a situation. James (Jim) Andrews was that kind of engineer. He applied his skills at work for several companies, but the longest as senior field support engineer for Rockwell Automation. This award was established in admiration of Jim's flexible, can-do spirit.

## Order of the Engineer

The Order of the Engineer was initiated in the United States to foster a spirit of pride and responsibility in the engineering profession, to bridge the gap between training and experience, and to present to the public a visible symbol identifying the engineer. The Obligation of the Order of the Engineer uses a wrought iron ring on the pinky finger which symbolizes the pledge to uphold the standards and dignity of the engineering profession, follow the Canon of Ethics, and to serve humanity by making the best use of Earth's precious wealth.



PENN STATE HARRISBURG  
**School of Science, Engineering,  
and Technology**

[harrisburg.psu.edu/capstone-conference](http://harrisburg.psu.edu/capstone-conference)

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Director

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# SPONSOR A PROJECT

The purpose of the Capstone Design Engineering Project is to help bring the real-world into the classroom by providing engineering students with practical, hands-on experience.

## PARTNERSHIPS WITH INDUSTRY: WIN-WIN

This program was instituted following recommendations from our industry partners who recognized the need for graduates who are well-trained in the engineering fundamentals and professional skills necessary to effectively compete in today's marketplace, such as teamwork, project management, cross-functional networking, communications, and design.

For small companies, Capstone Design Engineering Project teams can be a boost to an engineering workforce. For larger companies, these teams help develop new ideas or improve current practices, both of which can positively impact a company's bottom line.

Cooperative projects are a great way for companies to get to know students when looking for new interns or employees, and they are also helpful in training junior-level engineers and managers by providing project management experience in a low-cost, low-risk, potentially high-payoff setting.

## SPONSOR BENEFITS

Some of the benefits of sponsoring a Capstone Design Engineering Project are:

1. Work on "back burner" projects and help refine ideas
2. Help start-up and small companies with prototyping and development work (while fleshing out a business plan through collaboration with a team of students)
3. Direct access to some of the best Penn State Harrisburg students (15-week interview)
4. Company liaison overseeing the project gains valuable project management experience
5. Increase company brand awareness among Penn State Harrisburg students and faculty
6. Network with other companies through events and cross-promotions
7. Opportunity to give back to the college and influence the education and careers of many students
8. Invited to attend the annual Capstone Conference

## SPONSOR RESPONSIBILITIES

Sponsors are expected to make a tax-deductible contribution, submit a proposal explaining the scope of the project, identify an industry liaison to serve as the team's point of contact for the project, interact regularly with the student team, review reports and provide feedback, and evaluate the students' performance at the Capstone Design Conference.

## ADDITIONAL DETAILS

For additional information and details on how sponsoring projects can work for your company, please contact the School of Science, Engineering, and Technology at 717-948-6116 or by email, [pschcapstoneproj@psu.edu](mailto:pschcapstoneproj@psu.edu), or submit a proposal at [harrisburg.psu.edu/webform/capstone-design-engineering-proposal](http://harrisburg.psu.edu/webform/capstone-design-engineering-proposal)

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| <p><b>A.</b> Olmsted Building<br/>Administrative/Academic Offices<br/>Alumni and Development<br/>Auditorium<br/>Chancellor's Office<br/>Gallery Lounge<br/>Oliver LaGrone Cultural Arts Center<br/>Stacks/Biscotti's (food court/<br/>coffee shop)</p> <p><b>B.</b> Science and Technology Building (TL)</p> <p><b>C.</b> Student Housing</p> <p><b>D.</b> Madlyn L. Hanes Library<br/>Morrison Gallery</p> <p><b>E.</b> Student Enrichment Center (SEC)<br/>Bookstore<br/>Mukund S. Kulkarni Theatre<br/>Lambert Undergraduate Advising<br/>Center<br/>Outpost (food services)<br/>Provisions (convenience store)<br/>Russell E. Horn Sr. Learning Center<br/>Russell E. Horn Sr. Spiritual Center<br/>Student Affairs</p> <ul style="list-style-type: none"> <li>• Counseling and Psychological Services</li> <li>• John Crain Kunkel Career Center</li> </ul> | <ul style="list-style-type: none"> <li>• Student Accountability and Conflict Response</li> <li>• Student Care and Advocacy</li> <li>• Student Disability Resources</li> <li>• Student Engagement</li> </ul> <p><b>F.</b> Educational Activities Building<br/>1. South (EducAct)<br/>Intercollegiate Athletics Office<br/>2. North (EAB)</p> <p><b>G.</b> Capital Union Building (CUB)<br/>Aquatics/Pool<br/>Events Room<br/>Recreation and Fitness Center<br/>Gymnasium<br/>Hoverter Tennis Complex<br/>Student Health Services</p> <p><b>H.</b> Swatara Building<br/>Admissions<br/>Bursar<br/>Financial Aid<br/>Office of Multicultural Recruitment<br/>Registrar<br/>Veterans Affairs</p> <p><b>I.</b> Maintenance and Operations<br/>Business Services<br/>Physical Plant<br/>Vehicle Registration</p> | <p><b>J.</b> Susquehanna Building<br/>University Police and Public Safety</p> <p><b>K.</b> Engineering Technology Laboratory</p> <p><b>L.</b> Power Plant</p> <p><b>M.</b> Church Hall<br/>Continuing Education<br/>Institute of State and Regional Affairs</p> <ul style="list-style-type: none"> <li>• Center for Survey Research</li> <li>• Information Technology Center</li> <li>• Pennsylvania State Data Center</li> </ul> <p>Recycling Markets Center</p> <p><b>N.</b> Central Pennsylvania Research and Teaching Laboratory for Biofuels<br/>Select Medical Nursing Simulation Lab</p> <p><b>O.</b> Fleet Services</p> <p><b>P.</b> Parking Areas</p> <p><i>Handicapped parking is available in all parking lots noted on map and also in front of the Olmsted Building and the CUB.</i></p> <p><b>★ Daily parking permit kiosk</b></p> |
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