SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

CAPSTONE DESIGN CONFERENCE

SCHEDULE OF EVENTS

7:30 a.m.	**Breakfast** (Gym, Capital Union Building)
8:00 a.m.	**Welcome:** Dr. Rafic A. Bachnak, P.E. Director, Penn State Harrisburg School of Science, Engineering, and Technology
8:10 a.m.	**Featured Speaker:** Susan Steele, P.E. Senior Bridge Erection Engineer, High Steel Structures, LLC.
9:00 a.m.	**Student Presentations** *Civil Engineering* C213 Auditorium, Olmsted Building C211 Olmsted Building *Structural Design and Construction Engineering Technology and Civil Engineering (Environmental)* C211 Olmsted Building *Computer Science* E243 Olmsted Building E244 Olmsted Building *Electrical Engineering and Technology* C212 Olmsted Building E209 Olmsted Building E218 Olmsted Building *Multi-Disciplinary Projects* E219 Olmsted Building *Mechanical Engineering and Technology* E240 Olmsted Building E254 Olmsted Building E258 Olmsted Building E261 Olmsted Building E265 Olmsted Building
Noon	**Lunch** (Gym, Capital Union Building)
12:45 p.m.	**Featured Speaker:** Dennis J. Butler, Esq. Partner, Panitch Schwarze Belisario & Nadel LLP, Intellectual Property Law
1:30 p.m.	**Student Project Exhibition and Demonstrations** (Educational Activities Building, and Engineering Technology Laboratory)
3:30 p.m.	**Order of the Engineer Ring Ceremony** (EAB 102)
4:00 p.m.	**Awards Ceremony** (EAB 102)

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

CAPSTONE DESIGN CONFERENCE SPEAKER

Susan Steele, P.E.
Senior Bridge Erection Engineer,
High Steel Structures, LLC.

Susan Steele has worked with High Steel Structures since 2008. Prior to that, she worked as an engineer for High Concrete Group from 2001 to 2008. In addition, she was a general contractor for 11 years, focusing on commercial and residential rehabilitation.

Steele is the engineer-in-charge for the construction of steel and concrete bridge superstructures. The company erects difficult, complex structures over major interstates and job sites with challenging terrain, operating along the east coast from Virginia to New York.

She graduated from Penn State Harrisburg with a B.S. degree in structural design and construction engineering technology and a master's degree in engineering science.

Steele has presented case studies of long-span bridge construction for the New York City Bridge Conference, the American Society of Highway Engineers, World Bridge Symposium, the Maryland Department of Transportation, and the PennDOT Technical Session, as well as many others.

Her professional experience includes the construction of the superstructure of the Jim Thorpe Memorial Bridge in Carbon County, Pennsylvania and the State Route 22 Bridge in Lehigh County, Pennsylvania. She currently is a consultant for the Purple Line Transit Constructors in Bethesda, Maryland.

She serves as a member of the Board of Advisers and the Advisory Board for Structural Design and Construction Engineering Technology at Penn State Harrisburg.

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

CAPSTONE DESIGN CONFERENCE SPEAKER

Dennis J. Butler, Esq.

Partner, Panitch Schwarze Belisario & Nadel LLP, Intellectual Property Law

Dennis J. Butler focuses his practice on intellectual property and technology law, including IP litigation and representation of clients before the U.S. Patent and Trademark Office and foreign patent offices. He has extensive experience with patent litigation in U.S. federal courts and patent inter partes disputes in the U.S. Patent Office. Butler has vast experience in preparing and prosecuting patent applications, concentrating in mechanical technologies, including medical implants, small appliances, automotive mechanisms, cleantech technologies, structural composite assemblies, bicycle technology, indoor games and electro/mechanical devices. He has been named a Pennsylvania "Rising Star" by Thomson Reuters. As a student and an editor for the *Temple Journal of Science, Technology & Environmental Law*, he won the Temple Beasley School of Law's Technical Advisory Service for Attorneys (TASA) Prize for excelling in the "Field of Evidence." Prior to joining Panitch Schwarze Belisario & Nadel LLP, he was a patent counsel at a global medical device company, where he managed the patent portfolio, assisted with patent litigation, formulated business arrangements, and analyzed mergers and acquisitions. He was previously an associate and patent agent at Akin Gump Strauss Hauer & Feld LLP and an engineer with the helicopters division of Boeing Defense and Space Group and Pratt & Whitney, a United Technologies Corporation company.

Butler is registered to practice before the United States Patent and Trademark Office and is admitted to practice before the United States District Court for the District of Delaware, U.S. Court of Appeals for the Federal Circuit, U.S. District Courts for the Eastern and Western Districts of Pennsylvania, and the Delaware Supreme Court. He is a member of the Delaware Bar, the Pennsylvania Bar, the Irish American Business Chamber & Network, the Penn State Alumni Association and the Nittany Lion Club. He earned his law degree from Temple University's Beasley School of Law, and a master's degree in engineering mechanics and a bachelor's degree in mechanical engineering technology from Penn State.

Civil Engineering Capstone Design Presentation

C213, Auditorium, Olmsted Building

Moderator: Dr. Shashi Marikunte
Project: Ash Recycling and Processing Facility Construction – Student Perspective

Sponsors: York County Solid Waste and Refuse Authority and Barton & Loguidice, D.P.C.
Faculty Advisers: Dr. Shashi Marikunte, Dr. Saravanan Gurupackiam, and Dr. Roger Subramanian

The Ash Recycling and Processing Facility is a new construction project to support the recycling needs of York County Solid Waste and Refuse Authority. The 72,000 gross square foot (GSF) new construction will house machinery to process the ash generated at the incinerator for beneficial use. Students in the Civil Engineering Capstone Design class worked on the project in small groups to provide an alternate design and compete with other groups. Five teams diligently worked on the project in true competition style to incorporate changes through value engineering, sustainability, energy efficiency, and other modern tools to improve the functionality or other aspects of this new construction. Teams will disclose their approach to make the Ash Recycling and Processing Facility a "State-of-the-Art" construction project, from their perspective.

9:00 – 9:30 a.m.

Group #101: CC Engineering
Project: Simple Cycles
Group Leader: John Taylor Jr.
Members: Bryan Chin, Alex Cline, Nicholas Elefante, Thomas Lichtenwalner, Daniel Murray, Christopher Smidl

The team recommends the York Ash Recycling and Processing Facility make significant changes to the storage and shipping of processed ash. The loadout hall, located on the west side of the building, will be transformed into a storage area with elevated silos used to house the processed ash prior to transportation. Elevated silos were desirable storage alternatives allowing trucks to pull directly under each silo and receive the processed ash for transport, eliminating the need to load each truck with a wheeled loader. Additional structural modifications and value engineering has been performed throughout the entire facility. Students have worked to incorporate simple cycles throughout the construction and operation of this facility.

9:30 – 10:00 a.m.

Group #102: Midtown Civil Design Group
Project: Introducing Sustainable Energy to New Building Design
Group Leader: Jacob Leimbach
Members: Jacoby Brumbach, Sean Hayden, Keith Miller, Nicholas Showers, Brian Taylor, Ryan Yetter

This project will focus on using environmentally friendly materials and solar resources to create a more sustainable building. The redesign of the roof will include solar panels that assist in providing power to run the recycling facility. The design of the roadways will incorporate recycled aggregates to help save money without compromising strength. Finally, the construction process will be completed using eco-friendly equipment and recycled material when possible. Focusing on becoming a sustainable building will provide economic and environmental benefits throughout the life of the building.

10:00 – 10:30 a.m.

Group #103: Appalachian Engineering
Project: ECO Revamp
Group Leader: Kayla Peters
Members: Trevor Engle, Chad Hollinger, Ian Masters, James Pineda, Matthew Pugliese, Elijah Wireman

Appalachian Engineering proposes project ECO Revamp, a modernization for the Ash Recycling and Processing Facility in York, Pennsylvania. The goal is to make buildings more LEED friendly while retaining a pleasing, aesthetic look. The group plans to incorporate permeable pavement into the parking lot to help better manage runoff water, update the roof with solar panels for a more energy-efficient design, and utilize precast, prestressed concrete for the building structure. In addition, a cost analysis and a detailed schedule will be provided.

10:30 – 11:00 a.m.

Group #104: Original Building Solutions
Project: Green Infrastructure
Group Leader: Jacob Fenby
Members: Sergio Aguilar, Matthew Baker, Mason Brandt, Jared Harbold, Jaryd Olweiler, Nicholas Vereb

Original Building Solutions is proposing the following design modifications to the project: the addition of green infrastructure above the administrative portion of the complex and the utilization of skylights throughout the structure, incorporating solar roofing tiles where viable. These additions to the design of the structure will benefit the operation of the facility on a multi-faceted level. The green infrastructure will incorporate an area where employees can escape the hazardous atmosphere of the processing floor. Further, the institution of a pervious surface will reduce water runoff. Lastly, skylights will further enhance the working atmosphere by allowing natural light to infiltrate the facilities processing areas, while solar roof tiles will efficiently utilize the expansive roof system through collecting energy and reducing the resource consumption of the facility.

11:00 – 11:30 a.m.

Group #105: BYL Engineering
Project: Green Refit
Group Leader: Brian Strosnider
Members: Tolulope Adesina, Dietrik Ferster, Mohamed Gaafar, Emanuel Quintana Vergara, Hoyt Rowe, Gavin Smith

BYL Engineering plans to redesign the Ash Recycling and Processing Center to incorporate proposed eco-friendly and sustainable improvements to the existing design. It has been proposed that these improvements will include the structural, construction management, and transportation aspects of the design. These improvements will be consistent with, but not limited to, those specified in Leadership in Energy and Environmental Design (LEED). Specifically, the improvements will include solar panels, rain water harvesting, and geothermal power and heat.

C211 Olmsted Building

Moderators: Dr. Yuefeng Xie, Dr. Shirley Clark, and Dr. Sai Kakuturu

10:00 – 10:30 a.m.

Project: D Town Drinking Water Treatment Plant Design
Group #106: Andrew Miller, Dylan Shank
Faculty Adviser: Dr. Yuefeng Xie

The group will report a preliminary design for a conventional surface water treatment plant for the Borough of Middletown, Pennsylvania. The design includes the selection of raw water sources, plant sites, water pumping, treatment, storage, and distribution facilities. The group will also present their design and operating criteria, calculation, and cost estimates for these facilities. The layout of various treatment units and their hydraulic grade line will be presented as well.

10:30 – 11:00 a.m.

Project: Mitigating Flooding in Middletown Borough
Sponsors: Borough of Middletown, Computational Hydraulics International, HRG, Inc., Keystone Aviation, Lower Swatara Township, Middletown Area School District, and SAARA
Group #107: Huzeifa Amiji, Colton Bowen, Angela Brackbill, Mitchell Brady, Steven Gross, Christopher Homer
Faculty Advisers: Dr. Shirley Clark and Dr. Jennifer Sliko

On July 23, 2017, Middletown, Pennsylvania received 4.7 inches of rain in an hour. Flooding occurred in several areas of town, causing damage to homes and businesses. The borough asked Penn State Harrisburg's civil engineering program to investigate the problem and propose solutions to mitigate the flooding. This capstone course modeled the stormwater runoff draining to, and generated in, the borough, and proposed several levels of solutions to reduce the impacts of flooding from intense storms.

11:00 – 11:30 a.m.

Project: Multi-story Two Bedroom Apartment for Low-income Families
Group #108: Theresa Colombo, Victoria Dziekciasz, Matthew Hammaker, Chad Mcconnell
Faculty Adviser: Dr. Sai Kakuturu

A 14.2-acre parcel of land available on Erford Road in Camp Hill, Pennsylvania is developed to build multi-story, two bedroom apartments for low-income families. This team has developed the project in accordance with the zoning ordinances of East Pennsboro Township, keeping in view the aspects of safety, economy, environmental protection, and sustainability.

11:30 a.m. – Noon

Project: Multi-story One Bedroom Apartments for Senior Living
Group #109: Jonathan Czerpak, Katelyn Kirst, Connor Schaeffer, Daniel Sourbeer, Luke Thomas
Faculty Adviser: Dr. Sai Kakuturu

A 14.2-acre parcel of land available on Erford Road in Camp Hill, Pennsylvania is developed to build multi-story, one bedroom apartments for senior living. This team has developed the project in accordance with the zoning ordinances of East Pennsboro Township, keeping in view the aspects of safety, economy, environmental protection, and sustainability.

Structural Design and Construction Engineering Technology Capstone Design Presentation

C211, Olmsted Building

Moderators: Dr. Joseph Cecere and Dr. Grady Mathews IV
Project: Design-Build Restaurant
Sponsors: C.S. Davidson, Inc., and Professional Design & Construction, Inc.
Faculty Advisers: Dr. Joseph Cecere and Dr. Grady Mathews IV

A Comfort Inn Hotel is being constructed in Middletown, Pennsylvania. The four-story hotel is 47,050 sq.ft. and houses standard hotel amenities along with an indoor pool. The construction is scheduled to begin on June 30, 2018 and is set to open on July 1, 2019. However, the owner has decided to put a restaurant addition onto the building. In the fall, design-build teams produced a structural layout, exterior shell, and construction preliminary schedule for the restaurant. In the spring, teams designed the building's structural components, created a more detailed schedule, and assessed the cost, energy efficiency, and sustainability of their designs.

9:00 – 9:30 a.m.

Group #110: S.E.M. Enterprises and ABBC Structural
Members: Scott Barshinger, Tristan Buck, Cody Dakin, Kenneth Dodson, Wyatt Grossman, Robert Harper, Bridget Leger, Eric Myers, Andrew Schilb, Matthew Zook

9:30 – 10:00 a.m.

Group #111: SGK Contractors and TGM Inc.
Members: James Daniels, Lindsey Grasinger, Damien Graybill, Nikolas Kindya, Jeremy Murphy, Daniel Six, Colby Stouffer, John Thompson

Computer Science Capstone Projects

E243, Olmsted Building

Moderator: Dr. Kevin Li

9:00 – 9:30 a.m.

Project: CleanSweep
Group #201: Grant Abbondanza, Christian Brand, Adina Lamboy, Stuart Perry, James Ringler, Kyle Weldon
Faculty Adviser: Michael Melusky

CleanSweep is a room cleaning optimization web application designed for any browser compatible device. This program will be used by maids and front desk staff to maintain orderly and efficient cleaning, accommodate guest requests, and minimize the dead time between when a room is cleaned and when a guest can check in. This program will be a windows application that is based at the front desk. Maids will use any device with a browser to receive the most up-to-date information such as: room maintenance, last minute changes, and the order in which rooms should be cleaned.

9:30 – 10:00 a.m.

Project: KittyPath Assistant
Group #202: Abderrazzak Asmaayni, Jakub Grzegorzewski, Joseph Hernandez, Joshua Holden, Azalee Mcalpine, Neil Pasricha
Faculty Adviser: Dr. Linda Null

KittyPath Assistant is a Google Chrome extension that will help students utilize planning features that Penn State Harrisburg offers. The KittyPath Assistant helps gather information the student can use to schedule courses, view their recommended degree plan, search through courses, view degree requirements and more. KittyPath Assistant will provide all these features in a concise and easily navigable package. Advisers will also be able to use the assistant to help students with their questions and provide advice based specifically on a student's degree audit and their needs.

10:00 – 10:30 a.m.

Project: Moodi
Group #203: Arthur Byra, Jonathan Engel, Shreya Jacob, Dustin Strunk, Gerald Swan
Faculty Adviser: Dr. Linda Null

Moodi is a mobile application for people that have trouble with social interactions. Using IBM's Watson technology, Moodi takes speech, processes/analyzes it, and lets the user know what the tone of the speech is. It will also be able to store those interactions for reference later by the user, or perhaps a parent or guardian for younger users. Moodi will have an easy to use interface to allow anyone to be able to use it.

10:30 – 11:00 a.m.

Project: Pollato
Group #204: Tyler Hughes, Pablo Orellana, David Rowe, Tyler Ruch, Scott Wilson
Faculty Adviser: Dr. Linda Null

Pollato is a polling system for students to answer teacher-created questions during class. Teachers can create questions in various formats that students can answer using a web browser or an Android mobile device. Pollato will provide a platform for students and teachers to communicate inside and outside the classroom in a hassle-free manner. After the teaching period ends, teachers have the ability to access in-depth data about the polls that their students completed.

E244, Olmsted Building

Moderator: Dr. Hyuntae Na

9:00 – 9:30 a.m.

Project: LionPals
Group #205: Nicolas Correa, Taras Derewecki, Gabriel Quade Jones, Jonathan Shaub, Bradley Westhafer, Raj Zaveri
Faculty Advisers: Dr. Wanda Kunkle and Dr. Brian Adams

The LionPals service is a web-based social media platform that uses artificial intelligence techniques to predict friendship compatibility within the student community. The service uses information about student interests and program of study to recommend individuals with similar backgrounds. The system uses an e-mail verification mechanism to guarantee that only individuals with a Penn State access account can use the service. Additionally, the system imports existing information available on the University student directory webpage to establish the initial academic information.

9:30 – 10:00 a.m.

Project: Distribution-Resource Optimizer
Group #206: Salman Al-Habieli, Jason Fredericks, Hayden Gfeller, Pranav Presenan Christopher Williams, Ian Wright
Faculty Adviser: Dr. Hyuntae Na

Penny Chain is an application aimed for the business environment. The goal is to provide an optimized allocation of business infrastructure given a geographical map, with users able to utilize publicly available information and their own constraints to attain the desired results. The application offers the capability of further optimization using the business's own collected data about its current business model and the surrounding population. Finally, users are able to easily load, save, and share their results via a secure online database system.

10:00 – 10:30 a.m.

Project: LionAR
Group #207: Jacob Arnold, Jonathan Bauman, Supawadee Boonwoen, John Gilbertson, David Peralta
Faculty Adviser: Dr. Hyuntae Na

LionAR is an augmented reality campus tour of the Penn State Harrisburg campus that will run on Android devices. Using augmented reality, the application provides the user audio and text information about important buildings and rooms on campus while the user is pointing their camera at that location. The application will also offer a navigation feature that guides the users from building to building and room to room.

10:30 – 11:00 a.m.

Project: Healthier Days App

Group #208: Valerie Clark, Benjamin Cook, Injung Kim, Nian Ming Moh, Muhammad Hazir Othman
Faculty Advisers: Dr. Jeremy Blum and Dr. Hyuntae Na

The project is to program an Android application (app) that interacts with its respective database. The purpose of this software is to aid the user in pursuing their goals to living a healthier lifestyle. During the user's interaction with the app, they will be encouraged to create new profiles, which encompasses the user's goals. Their progress, which is presented numerically and graphically, depends on how the user constructs each goal. Information pertaining to the user will be stored in a database. By utilizing the Healthier Days application, the user can manage their goals anywhere.

11:00 – 11:30 a.m.

Project: Washington State Department of Transportation Safety Visualization System
Group #209: Alexander Bouril, Sai Pravallik Gujjula, Joseph Heisey, Mukunda Mensah-Dzomley, Sierra Schellenberg, Colin Walsh
Faculty Adviser: Dr. Jeremy Blum

The project is a web application that will be used by engineers at WSDOT to offer insight into how roadway design choices impact the incidence of motor vehicle accidents. Dr. Jeremy Blum has used historical accident data and machine learning techniques to build statistical models that can predict how attributes of roads affect their safety. The goal of the system is two-fold: (1) provide the ability to visualize relationships between crashes and geometric attributes via graph plots and heat maps for routes in Washington and (2) be able to investigate the effect of changes in geometric attributes on predicted crash counts, according to the statistical models.

Electrical Engineering and Technology Projects

E209 Olmsted Building

Moderator: Dr. Javad Khazaei

9:00 – 9:30 a.m.

Project: HomePlus – Home Battery System
Group #301: Brian Ackler, Alvin Branch
Faculty Advisers: Dr. Javad Khazaei and Dr. Seth Wolpert

The HomePlus system is designed to supplement the energy needs of homes. The system can charge at night when energy is cheaper. The HomePlus system is meant to lessen the cost of powering a home while also providing a source of power during periods of power outages.

9:30 – 10:00 a.m.

Project: Training Feedback Shirt (TFS)
Group #302: Alex Doyle, Cullen Laygo
Faculty Adviser: Dr. Javad Khazaei

The TFS will be able to take measurements that record an individual's heart-rate, respiratory rate, and the amount of work a muscle is exhibiting while providing feedback to an app that can be downloaded on the individual's cellular device. The respiratory rate subsystem is the focus of this design by the students. A microcontroller will be the central system analyzing the inputs from the user and then using neural networks to provide feedback to the user.

10:00 – 10:30 a.m.

Project #303: MiniBUS (Minimal Bus)
Group: Matthew Gydosh, Robert Ostrowski
Faculty Advisers: Dr. Javad Khazaei and Dr. Seth Wolpert

The Minimal Bus (MiniBUS) device allows for the control of numerous automotive systems by a microcontroller on a serial data bus. Controlled systems could include ignition, lighting, HVAC, and instrumentation (for display or data logging.) Its intended use is on small, non-production vehicles. With adequate refinement, it could prove viable for commercial vehicles to enhance safety, performance, and efficiency. The goal is to reduce the number of microcontrollers/microcomputers required for the management of vehicle systems and to reduce the total amount of wires necessary for communication between vehicle systems.

10:30 – 11:00 a.m.

Project: Microwave Heater with IR Temperature Sensors
Group #304: Quincy Nissley
Faculty Advisers: Dr. Javad Khazaei, Dr. Mohammad Tofighi, and Dr. Anilchandra Attaluri

Microwave heating is used for the diagnosis and/or medical treatment of various conditions, such as tumors. In this project, a microwave antenna will be used for the heating of skin and an infrared thermometer for measuring temperature during the heating. The system will provide a safe and comfortable treatment option for patients.

11:00 – 11:30 a.m.

Project: Solar Panel Voltage Converter
Group #305: Dylan Kroah, Michael Zimmerman
Faculty Advisers: Dr. Javad Khazaei and Dr. Scott van Tonningen

The project is to design and demonstrate a key component in every solar panel system: the DC voltage converter. The DC voltage converter will input a lower voltage supplied by a photovoltaic (PV) solar cell array and output the higher voltage required by the system. The voltage conversion technology seen in this project is commonly used in a number of modern applications, including electric cars.

11:30 a.m. – Noon

Project: Smart Park System
Group #306: Michelle Figueroa and Alexis Quinn
Faculty Advisers: Dr. Javad Khazaei and Dr. Nashwa Elaraby

The Smart Park System is designed to give faculty and students the opportunity to know whether the Educational Activities Building parking lot is full before entering. The system will display information on a screen just before entering the lot. The information will include the time, date, weather, spots available, and whether or not the lot is full.

E218 Olmsted Building

Moderator: Dr. Scott van Tonningen

9:00 – 9:30 a.m.

Project: ABT Effects
Group #307: Patrick McKeone
Faculty Advisers: Dr. Seth Wolpert and Dr. Scott van Tonningen

An ABT Effects pedal allows musicians to make music with creative and expressive tones through a variety of adjustable features and parameters. Any instrument can be enhanced with an ABT Effects pedal to create unique sounds that capture the imagination of the musician. This project features design and demonstration of an active overdrive ABT Effects pedal. The pedal uses analog signal paths to preserve quality and produce superior audio output.

9:30 – 10:00 a.m.

Project: Automated Aquaponics System
Group #308: Sami Abdelmalak, Brennan Trussell
Faculty Advisers: Dr. Nashwa Elaraby and Dr. Scott van Tonningen

The Automated Aquaponics System is a residential garden and aquarium. It is designed to find the best relation between efficiency and self-regulation. The major achievement of the system will be reducing the workload of the owner in producing yields and maintaining the physical system. In addition, the user will be able to leave it unattended for many days. This will be a great improvement on current models that require significant oversite and maintenance.

10:00 – 10:30 a.m.

Project: Drowsiness Detection System
Group #309: Raghu Acharya, Raja Suryadevara
Faculty Adviser: Dr. Aldo Morales

The driver's Drowsiness Detection System (DDS) is a safety system that helps prevent accidents caused by drowsy drivers. This system detects drowsiness and alerts the driver in real time. Although companies like Mercedes, Toyota, Ford, etc., have systems to detect drowsiness in newer cars, there is

no standard product on the market that can be retrofitted to older cars. Also, there are new cars from many companies that do not have a drowsiness detection system.

10:30 – 11:00 a.m.

Project: Amateur 40-Meter Technician Class Continuous Wave (CW) Transmitter
Group #310: Jason Hoffman
Faculty Advisers: Dr. Mohammad Tofighi and Dr. Scott van Tonningen

The Amateur 40-Meter Technician Class Continuous Wave (CW) Transmitter is designed to transmit telegraph signals wirelessly while being completely portable. Features include an adjustable power level, wattmeter, and an external crystal socket so that the operating frequency of the device can be altered by the user as desired. The antenna and telegraph keys will be completely detachable to make relocation as easy as possible.

11:00 – 11:30 a.m.

Project: Wi-Fi Dual Band Antenna
Sponsor: TE Connectivity
Group #311: Artem Morozov
External Adviser: Dr. Jane Yun (TE Connectivity)
Faculty Advisers: Dr. Mohammad Tofighi and Dr. Scott van Tonningen

Many households use Wi-Fi technology for wireless access to the internet for a variety of electronic devices, such as personal computers, laptops, smart phones, and gaming consoles. The project will describe the application of a Wi-Fi antenna in automotive systems. It is being developed with representatives from TE Connectivity. The passengers in a car will be able to access the internet at any time through the use of the installed Wi-Fi antenna.

11:30 a.m. – Noon

Project: Micro-Hydro
Sponsor: The Masonic Village at Elizabethtown
Group #312: Adam Still, John Fox
External Adviser: Mr. Patrick Sampsell (The Masonic Village at Elizabethtown)
Faculty Advisers: Dr. Javad Khazaei and Dr. Scott van Tonningen

The Micro-Hydro system will be designed to supply power to a small laboratory. This system will be integrated into a pre-existing pond and dam. Using the water supply, the system will carry water to the generator to produce electricity. Once the power is collected, it will be sent to the lab to be stored for later use.

Multi-Disciplinary Projects

E219 Olmsted Building

Moderator: Dr. Richard Ciocci

9:00 – 9:30 a.m.

Project: Hot Car Detection System
Sponsor: Dr. and Mrs. Richard Ciocci
Group #401: Andrew Bloschichak, Robert Patterson, Steven Santangelo, Michael Sinyagin, Tyler Smink
Faculty Advisers: Dr. Richard Ciocci and Dr. Scott van Tonningen

The Hot Car Detection System will help prevent parents or pet owners from leaving their children or pets in a hot car, as well as cool down the cab of the car. Using the latest technology, children and pets will be safe if accidentally left in a vehicle on a hot day.

9:30 – 10:00 a.m.

Project: TE's MultiSensor Module: Performance under Design Variations
Sponsor: TE Connectivity
Group #402: Yousif Almeer, Aaron Doriani, Fatiha Haque, Zakaria Sven
Faculty Advisers: Dr. Javad Khazaei, Dr. Scott van Tonningen, and Dr. Ma'moun Abu-Ayyad

Multi Sensor Module (MSM) is a crucial contribution to smart facility security and control. TE Connectivity markets four- and six-sensor modules, ideal for measuring environmental conditions. This project will simulate and test different sensor placements on the six-sensor (movement, sound, light, IR, temperature, humidity) circuit board, under various enclosure types. The first goal is to maintain MSM's performance even while alternating onboard sensor placements and using various types of enclosures, thus validating the placements and enclosures as system enhancements. The second goal is tentative temperature and relative humidity (%RH) measurement accuracy improvements of 0.05°C and 0.1 percent, respectively.

10:00 – 10:30 a.m.

Project: Siemens Controls, Automation, and Robotics Lab – Sample Workstation
Sponsor: Shingle and Gibb Automation
Group #403: Khalid Alhusayni, Khalid Al Taeei, Mohammed Bamehriz, Kemo Hasanovic, Fahim Mobin, James Piscotta
Faculty Advisers: Dr. Javad Khazaei, Dr. Scott van Tonningen, and Daniel Massey

In the near future, the Siemens Controls Automation and Robotics Lab will simplify the setup required to control a variety of objects electronically for students and faculty. To demonstrate this, a sample workstation containing new control equipment is designed using experiments from the central Programmable Logic Controller (PLC). The first experiment allows an end user to control the position and hand of a robotic arm with three degrees of freedom. The second experiment changes the speed and direction of a single motor while reflecting those changes on an onboard speedometer.

10:30 – 11:00 a.m.

Project: Adjustable Exoskeletal Arm
Group #404: Cody Lutz, Oliver Martin, Gabe Schroff
Faculty Advisers: Dr. Abdelkader Abdessameud, Dr. Scott van Tonningen, and Dr. Esfakur Rahman

The adjustable exoskeletal arm is designed for strength augmentation purposes. It is adjustable and compatible with a variety of arm sizes and body types. The device detects the motion of the wearer and engages with the body's natural motion to reduce stress on the user, allowing wearers to lift more using less of their own energy.

11:00 – 11:30 a.m.

Project: 3-D Scanning Drone
Group #405: Tyler Benner, Matthew Maisano, Joshua Smay, James Then
Faculty Advisers: Dr. Ola Rashwan, Dr. Mohammad Tofighi, and Dr. Scott van Tonningen

This capstone project is to design and fabricate a quadcopter drone with a camera that is capable of autonomous flight, imaging, and three-dimensional (3-D) scanning. Object images are sent wirelessly to a computer that converts them into a 3-D model. The goal of such a drone is to aid in the inspections of various structures, such as bridges and water towers.

Mechanical Engineering and Technology Projects

E240 Olmsted Building

Moderators: Dr. Ma'Moun Abu-Ayyad and Dr. Shirley Clark

9:00 – 9:30 a.m.

Project: Automated Epoxy Application
Sponsor: TE Connectivity
Group #501: John Dimeo, Karthika Krishnan, Aleksandr Yelesin
Faculty Adviser: Dr. Ma'moun Abu-Ayyad

The Automated Epoxy Machine is a proof of concept for TE Connectivity's search for an improvement to the current human-performed operation. TE wants repeatability without operator dependency or the cost of purchasing new machinery. The team will adapt a rubber scraper and mesh screen to the axial head of a 3-D printer, which will spread epoxy with a known force in a repeatable manner. This machine will act as a proof of concept for TE that a machine can be made simply to outperform human operators in the epoxy scraping process.

9:30 – 10:00 a.m.

Project: Automated Fiber Optic Connection
Sponsor: CommScope
Group #502: Mitchell Cadwallader, Luke Earle, Jordan Hillard, Tyler Kleinfelter
Faculty Adviser: Dr. Ma'Moun Abu-Ayyad

Students designed and built a modular machine that autonomously connects and disconnects fiber optic connectors. Commscope will be using this project to present their connectors to potential clients and partners who visit Commscope's facilities and perform laboratory tests using the device. The project will test and display the loss over time for fiber optic connectors to ensure they are exceeding industry standards.

10:00 – 10:30 a.m.

Project: Vertical Column Climbing Device (MVCCD)
Sponsor #503: Louis Mazziotta
Group: Christopher Mazziotta, Laura Miller, Tia Sellers, Douglas Tapfuma
Faculty Adviser: Dr. Ma'Moun Abu-Ayyad

The MVCCD is a machine designed to be used for outdoor recreational and industrial use. It meets client specifications to grip a vertical column less than or equal to one meter in diameter with the ability to climb to a height where the minimum diameter is 25 centimeters. It will navigate obstacles by removing or avoiding them to continue ascent. It is semi-autonomous and attaches to the vertical column with one claw at a time to ascend and descend. The motion is achieved using cables and actuators.

10:30 – 11:00 a.m.

Project: TE Connectivity - Crimping Head Setup Tool
Sponsor: TE Connectivity
Group #504: Joshua Bachert, Antonio Lentini, Camila Proano, Gregory Renko
Faculty Adviser: Dr. Ma'Moun Abu-Ayyad

This project created a device to adjust and measure the set up dimension of various wire crimping tool heads. The set up dimension varies with product lines, therefore, the assemblers need an efficient way to quickly adjust the tools to the specified dimensions. The linear measuring device used can measure

from zero to six inches. Additionally, to care for the plastic threads on the tool heads, the spring was compressed in the holding block. For stability during length adjustments, one end of the tool head is captured in a rotating bearing, and the other at a height-adjustable anvil.

11:00 – 11:30 a.m.

Project: High-Resolution of Visual Inspection of Connectors in Extreme Environments
Sponsor: CommScope
Group #505: Steven Brown, Zachary Johnson, Sunil Rai, Chance Wagner
Faculty Advisers: Dr. Ma'Moun Abu-Ayyad and Daniel Massey

Students designed a testing chamber to visually monitor the performance of optical connectors exposed to a wide range of temperatures and humidity levels in order to aid in the development and improvement of new connector systems and the failure analysis of existing products. The fiber optic connector requires extremely precise alignment to maintain signal strength. This sub-micron alignment must be maintained over fluctuating environmental conditions. The goal is to design and construct an environmental chamber that can safely be used in conjunction with the current coordinate measuring machine equipment at CommScope's facilities in Middletown, Pennsylvania.

11:30 a.m. – Noon

Project: Increasing Real-time Storage in Detention Ponds using a Water-level Controlled Sluice Gate
Sponsors: Borough of Middletown, HRG, Inc., Lower Swatara Township, and Middletown Area School District
Group #506: Thomas Dickerson III, David Sprenkle
Faculty Advisers: Dr. Shirley Clark and Daniel Massey

On July 23, 2017, Middletown received 4.7 inches of rain in an hour. Flooding occurred in several areas of town, causing damage to homes and businesses. One potential solution is to improve control of the stormwater retention ponds installed throughout the watershed by modifying the pond outlet structure to regulate the discharge from the pond using the pond water level as a control. The team developed a float-operated sluice gate to adjust the outlet structure and improve real-time control of pond storage.

E254 Olmsted Building

Moderators: Dr. Esfakur Rahman and Dr. Brian Maicke

9:00 – 9:30 a.m.

Project: Exoskeleton Hand for Rehabilitation
Sponsor: Penn State Milton S. Hershey Medical Center
Group #507: Elham Gholamiazizi, Alexander Hopkins, Christopher Maceren, Yogi Patel
Faculty Adviser: Dr. Esfakur Rahman

The main goal of this project is to develop, test, and experiment a device for hand rehabilitation. The proposed system is intended for people who have partially lost the ability to control correctly the hand musculature. Using 3-D printing technology to print the articulated linkage of the device, a single linear actuator helps the finger move in order to perform tasks. The Exoskeleton Hand will be designed to restore hand function to patients suffering from muscular disorders.

9:30 – 10:00 a.m.

Project: Pre-Preg Carbon Fiber Welder
Sponsor: FLSmidth, Inc.
Group #508: Timothy Martin Jr., Eric Sindall, Abigail Strouse
Faculty Adviser: Daniel Massey

The Pre-Preg Carbon Fiber Welder will automate and improve FLSmidth's heating and shearing process. The system will offer improvements to feed and clamp the material, as well as versatility to allow for adjustable feed widths. Utilizing sensors and alarms, the system will be able to detect misalignment, weld failure, and faulty material. This system will allow FLSmidth to produce 2-ply carbon fiber material without the constant monitoring of an operator.

10:00 – 10:30 a.m.

Project: Rocket Nozzle
Group #509: Anthony Glusko, Samantha Heisey, Matthew Miller, David Poole
Faculty Adviser: Dr. Brian Maicke

The nozzle and cooling methods group was tasked with designing a nozzle with integrated cooling to be built utilizing additive manufacturing. Cooling channels are wrapped around the nozzle to allow the engine to maintain its integrity during operation and to promote reusability. These cooling channels provide a constant flow of RP-1 fuel to absorb heat energy that would otherwise melt the nozzle walls. In addition to the nozzle design, changes were made to the engine so that the flow of fuel and oxidizer is continuous throughout the system, accounting for any frictional losses or other pressure drops.

10:30 – 11:00 a.m.

Project: Rocket Fuel Delivery System
Group #510: Carlos Rivera, Austin Ryan, Nicholas Stahr
Faculty Adviser: Dr. Brian Maicke

The Rocket Fuel Delivery System is a pressure-fed system that delivers oxidizer and propellant to a rocket engine. A minimum safety factor of two is enforced on all stressed members of the design and the system is automated to minimize human intervention. The system will provide the fuel and oxidizer needed for a hot fire test of a liquid rocket engine. The final design is a system capable of delivering 0.357 kg/s of RP-1 and 2.833 kg/s of Nitrous Oxide over a ten-second period and is capable of withstanding a pressure of 22 MPa.

11:00 – 11:30 a.m.

Project: Automated Grit Blast Machine
Sponsor: Wyman-Gordon Pennsylvania
Group #511: Fady Ibrahim, Ryan Schwartz, Mariou Shenouda
Faculty Adviser: Daniel Massey

The automated grit blast machine will enable Wyman-Gordon Pennsylvania to clean built-up slag from weld tools used in the process of flash butt welding. The project incorporates a drive system (power transmission), an air delivery system (pneumatics), and a control system (computer science).

11:30 a.m. – Noon

Project: Automated Car System
Group #512: Essau Alli, Aetagan Arivalahan, Mahmud Jimada
Faculty Adviser: Daniel Massey

The Automated Car Jack System is an application that will be used for car repair activities. Students designed a device that can be installed into a car that will not damage any original components of the vehicle. With the application, one would be able to lift the car off the ground using very minimal physical effort.

E258 Olmsted Building

Moderator: Dr. Anilchandra Attaluri

9:00 – 9:30 a.m.

Project: Magnetic Navigation of Therapeutics in Vascular Structures
Group #513: Scott Anderson, Matthew Charles, Darien Perez, Luke Puller
Faculty Adviser: Dr. Anilchandra Attaluri

The goal of the project is to develop a patient-specific method to steer magnetic drug-carrying particles through complex vasculature structures to increase the drug delivered to tumors. The ability of an external electromagnet to steer magnetic particles at a bifurcation is modelled using computational simulations. Closed-loop fluid flow experiments in the presence of an electromagnet are used to verify the results from the simulations. Feasibility of the novel magnetic steering technology will be demonstrated on a 3-D printed vascular network.

9:30 – 10:00 a.m.

Project: Personalized 3-D Printed Implant for Pediatric Oncology Bone Loss
Sponsors: Four Diamonds and Penn State Milton S. Hershey Medical Center
Group #514: Joshua Adams, Ali Elakkari, Alex Preniczky, Phu Trinh
External Advisers: Dr. Gregory Lewis and Dr. Edward Fox, M.D. (Penn State Milton S. Hershey Medical Center)
Faculty Adviser: Dr. Anilchandra Attaluri

The objective of this project was to design a personalized 3-D printed orthopedic implant for pediatric oncology patients. This proof-of-concept project is geared towards cases where existing manufactured implants do not match the patients' unique anatomies and are unable to spare the local joints. The specific case-study involves a patient with osteosarcoma in the distal femur. MRI scans were used to reconstruct a CAD model of the distal femur. The final design incorporated a lattice structure to promote bone in-growth. The implant was computationally modeled to simulate estimated physiological loading. Prototypes of the implant were 3-D printed from both PLA plastic and titanium alloy. Biomechanical load testing is planned for the titanium alloy prototype.

10:00 – 10:30 a.m.

Project: Improving the Visibility of Car Side Mirror
Group #515: Andrew Morgan, David Yang, Dennis Yaschenko, Zhiqiang Zhang
Faculty Adviser: Dr. Anilchandra Attaluri

The main objective of the project is to design a system that will decrease the number of accidents by allowing drivers to gain full visibility within the vicinity of their vehicle in bad weather conditions such as rain, snow, and fog. The final design of the system consists of a heated pad, motor, and fan in the housing of the side view mirror. The heated pad is attached to the back of the mirror to thaw ice and evaporate condensation from the mirror. The motor and fan sits on the base of the housing. The fan draws air from a small opening and delivers to a nozzle. The nozzle directs the forced air down on to the front of the mirror to clear fog and rain.

10:30 – 11:00 a.m.

Project: Low Head Mini Turbine Systems
Sponsor: Penn State Harrisburg – Office of the Physical Plant and Maintenance Operations
Group #516: James Turns, Matthew Caswell, Grant Brubaker, David Nevius Jr.
Faculty Adviser: Dr. Anilchandra Attaluri

Students designed a low-head turbine system that will create energy from slow moving water off a chiller blowdown. This system has to be durable enough to withstand the hard blowdown water, easy to maintain, and not restrict the flow of water. The goal is to create enough power so the chiller controller could be self-sustaining.

11:00 – 11:30 a.m.

Project: Propane Recovery and Recycling System
Sponsor: Pennsylvania Recycling Markets Center
Group #517: Marc Bean, Brandon Boltz, Edward Roubal IV, Zachary Seitz, Sai Hemanth Tirumandas
Faculty Advisers: Dr. Anilchandra Attaluri and Daniel Massey

The objective of the project was to utilize engineering concepts to solve a problem presented as a real world application. The project, propane tank recovery and recycling system, sponsored by the Pennsylvania Recycling Markets Center, consists of two steps: extracting propane and preparing the tanks for recycling. In the fall, students designed a recovery system and crushing mechanism using SolidWorks, created a bill of materials and a Gantt chart to track progress. In spring, students followed the plan to build a cost-efficient propane cylinder recovery system for recycling facilities in Pennsylvania to minimize accidents and improper recycling.

E261 Olmsted Building

Moderator: Mike Dideban

9:00 – 9:30 a.m.

Project: Elastomeric Material Characterization
Sponsor: TE Connectivity
Group #518: Matthew Bobetsky, Khalil Folkes, Joseph Larry, Tyler Martin
External Adviser: Andrew Martin
Faculty Adviser: Dr. Ola Rashwan

TE Connectivity has tasked the group with developing a procedure for characterizing elastomers and designing a three-lipped O-ring seal for connectors. The primary goal is to find the mechanical properties of the elastomers, such as tensile strength, shear strength, compression strength and Young's Modulus, while developing a step-by-step testing procedure. The characterization procedure involves design and fabrication of the specimens' molds, physical testing and finite elements simulations. Furthermore, students use the knowledge gained to design, mold, and test an O-ring elastomeric seal.

9:30 – 10:00 a.m.

Project: Extendable Tailgate Ramp
Group #519: Kylie Courtney, Zachary Titus, Matthew Wilkins
Faculty Adviser: Dr. Ola Rashwan

Truck owners have struggled with loading/unloading heavy objects into truck beds, which is not always safe or simple. Injuries, damages to property, and inefficiency are common problems that can be resolved through developing an innovative method to transfer heavy objects to the truck bed. The goal of this project was to develop a unique built-in ramp in the tailgate for an average pickup truck

by designing a lightweight, wide ramp that can be easily stored within the tailgate of the truck. The ramp is able to adjust to various heights to improve versatility and it can support a total weight of up to 1,800 lbs.

10:00 – 10:30 a.m.

Project: Quick Change- Over Fixtures for Mecmesin Multitest 2.5i
Sponsor: TE Connectivity
Group #520: Trey Ahearn, William Mallios, Zachary Waltman, Tyler Wilson
External Adviser: Nicholas Ruffini
Faculty Adviser: Dr. Ola Rashwan

The TE Connectivity Product Development Department uses the Mecmesin Multitest 2.5i to evaluate the tensile and compressive strength of new components. The group was tasked with improving the method to fasten fixtures that are to be tested. Currently, setup time for securing the fixture can take up to 15 minutes for a single experiment. Utilizing concepts from lean philosophy, such as Single Minute Exchange of Die (SMED), the group designed and fabricated fixtures that would reduce the setup time to three to five minutes.

10:30 – 11:00 a.m.

Project: Semi-Autonomous Tire Changing Robot
Group #521: Alejandro Davila Ibarra, Jose Fernandez, Julio Guzman, Daouda Kassimou
Faculty Adviser: Dr. Ola Rashwan

The Semi-Autonomous Flat Tire Changing Robot for a 2000 Toyota Camry is a user friendly flat tire changing system. It is composed of two devices: a lug nut plate that will be used to unscrew or screw all five lug nuts simultaneously and an autonomous jack cart. Both devices will be controlled by an Arduino microcontroller.

11:00 – 11:30 a.m.

Project: Truck Bed Loading System
Group #522: Nicholas Berger, Alexander D'Agostino, Matthew Rudy, Brock Snellbaker
Faculty Adviser: Dr. Ola Rashwan
The project was created to help truck owners with lifting large, heavy items into the bed of a pickup truck. Truck owners need a safe, affordable solution to lift these items from ground level to the pickup truck bed. By inserting the device into the hitch of the truck, items up to 600 lbs, such as refrigerators, washers, dryers, furniture, etc. can be lifted to the truck bed at the push of a button. The system can then be easily transformed to a safe "transport setting," in order to be ready to use when unloading items at the destination.

E265 Olmsted Building

Moderator: Daniel Massey

9:00 – 9:30 a.m.

Project: Motorcycle Maintenance Platform
Group #523: Jasper Edwards, David Hall, Brian Kearney, John Schultz III
Faculty Adviser: Daniel Massey
The group built a motorcycle maintenance lift that will be used to perform every day repairs on a motorcycle. The lift uses electronic linear actuators instead of hydraulic or pneumatic lift systems and also includes a built-in center stand to make work easier. This allows the lift to be greener, cheaper, and more effective than current solutions.

9:30 – 10:00 a.m.

Project: Auto Modification of 1981 Toyota Corona
Sponsor: Down 'N' Dirty Offroad
Group #524: John Feher IV, Andrew Kaiser, Kevin Myers, Pete Pirog
Faculty Adviser: Daniel Massey

The group created a cost effective Chevy small block engine swap kit for 1980's Toyota Coronas, Corollas, and Supras to create more powerful racecars. The kit includes adjustable two-piece engine mounts and an adjustable transmission crossmember. Some project specific modifications made to the 1981 Toyota Corona include a safety roll cage, a sturdier rear axle, and new front suspension components.

10:00 – 10:30 a.m.

Project: Jet Drive Boat
Group #525: Norman Hahn, Lee Kennedy, James Martin, Joel Rush
Faculty Adviser: Daniel Massey

The goal of this project is to make a high performance watercraft designed for fishing that is capable of maneuvering in shallow water conditions. The project will be borrowing the jet drive propulsion system from a donor jet ski and affixing it to the bottom of an aluminum boat.

10:30 – 11:00 a.m.

Project: MAE-Eitel RP-16 Retrofit
Sponsor: MAE-Eitel, Inc.
Group #526: Christopher Calzolari, John Devenney, Robert Miller
Faculty Adviser: Daniel Massey

The RP-16 retrofit will use a Rexroth servo hydraulic system. Frame alteration will reduce cost and production time while maintaining structural integrity. Replacing most MAE-Eitel custom components to align with their MAE parent company will increase production speed and reduce cost, giving MAE-Eitel a more streamlined, competitive straightening press.

11:00 – 11:30 a.m.

Project: Seakeeper Assembly Process Improvement
Sponsor: Flinchbaugh Engineering, Inc.
Group #527: Blake Cottam, Derek Nuebauer, Martin Stika
Faculty Adviser: Daniel Massey

Flinchbaugh Engineering Incorporated (FEI) delivers lean manufacturing through Strategic Cell Migration to deliver six-sigma quality manufacturing of complex metal parts for companies looking to outsource their manufacturing. The project is an attempt to improve the current assembly process for one of FEI's newest customers, Seakeeper Inc., which manufactures gyroscopic boat stabilization systems. The design focuses specifically on the heating and cooling process of aluminum cast parts to allow an interference fit of a cast iron bearing housing. The proposal identifies the major problems in the current design and offers logical explanations for design improvements.

11:30 a.m. – Noon

Project: XS650 Custom Bobber Motorcycle
Group #528: Albert Gremmel III, Joseph Hargenrader III, Nicholas Jones
Faculty Adviser: Daniel Massey

This project is the conversion of a stock vintage XS650 motorcycle to a hardtail frame. This will also include weight reduction and component upgrades. A new wiring harness will be implemented to eliminate unnecessary systems present in the stock XS650. New tires will be installed for better traction and ride quality, as there will be no traditional suspension. Another performance upgrade is new carburetors, which are more reliable and better performing; new pipe routing, which eliminates flow restrictions; and shorter fuel delivery routing.

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.

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